Chapter 13
International Portfolio Management: Theory and Method

Wan-Jiun Paul Chiou and Cheng-Few Lee

Abstract This paper investigates the impact of various investment constraints on the benefits and asset allocation of the international optimal portfolio for domestic investors in various countries. The empirical results indicate that local investors in less-developed countries, particularly in East Asia and Latin America, benefit more from global diversification. Although the global financial market is becoming more integrated, adding constraints reduces but does not completely eliminate the diversification benefits of international investment. The addition of portfolio bounds yields the following characteristics of asset allocation: a reduction in the temporal deviation of diversification benefits, a decrease in time-variation of components in optimal portfolio, and an expansion in the range of comprising assets. Our findings are useful for asset management professionals to determine target markets to promote the sales of national/international funds and to manage risk in global portfolios.

Keywords International portfolio management • Investment constraints

13.1 Introduction

In the past three decades, financial markets throughout the world have experienced evolutions that leave challenges and opportunities to international portfolio management: more openness to domestic and foreign investors, increasing integration with other countries, gradual liberalization from governmental control, and innovations of financial products and services. Specifically, as the investibility and the legal limitation to foreign investment vary across countries, it is nature to question the asset allocation of the unrestricted efficient frontier suggested by Markowitz (1952).[1] Furthermore, understanding changes in the benefits of international diversification strategies helps to structure dynamic portfolio rebalancing when the world financial market has been increasingly integrated. To ensure the achievability of strategies, the obstacle of the extreme allocations on the optimal international portfolio, such as negative and enormous weights, needs to be taken into account. This chapter explores the theory and method of global asset management by investigating the attributes of the diversifying portfolio. We also provide the evidence of significance to include various investment constraints by observing the change in weights and mean-variance efficiency.

Previous studies investigate the strategies of international portfolio management with short-selling constraints (for a more detailed discussion, see Cosset and Suret 1995; De Roon et al. 2001; De Santis and Gerard 1997; Driessen and Laeven 2007; Fletcher and Marshall 2005; French and Poterba 1991; Harvey 1995; Li et al. 2003; Novomestky 1997; and Obstfeld 1994). Yet, the impact of other investment restrictions on the global diversification benefits remains unclear. There are three reasons for portfolio managers to consider the unattainability of the "corner solutions" on the efficient frontier. First, both profitability and liquidity of the diversifying portfolio should be taken into account when asset allocation in international markets is determined. The heavily positive/negative weights of investments in the minor markets recommended by less-constrained strategies may cause illiquidity of the portfolio. Second, the excessive foreign capital in- and out flows in minor markets tend to trigger instability in security prices. This may generate dramatic variation in returns, risks, and correlations. Finally, in many countries, particularly developing nations, governmental regulations prohibit foreign investors to short sell and/or

W.-J.P. Chiou (✉)
Department of Finance, John L. Grove College of Business, Shippensburg University, Shippensburg, PA 17257, USA
e-mail: wpchio@ship.edu

C.-F. Lee
Department of Finance and Economics, Rutgers Business School, Rutgers University, New Brunswick, NJ 08854, USA

[1] The investiblity of the stock market is indicated by the degrees with which foreign investors can trade as do local investors in the domestic markets and the liquidity of assets. See Bae et al. (2004).

C.-F. Lee et al. (eds.), *Handbook of Quantitative Finance and Risk Management*,
DOI 10.1007/978-0-387-77117-5_13,

to hold more than a certain proportion of company shares.[2] From legal and institutional aspects, a large percentage of foreign capital allocation to securities in those small financial markets is impractical. Accordingly, the results of this chapter are more realistic for asset management since illiquidity of portfolio and variation in return and volatility, as well legal limitations, are considered when the optimal portfolio strategies are formed.

To appropriately estimate the effectiveness of international portfolio management, two straightforward measures, the increase in risk-adjusted premium by investing in the maximum Sharpe ratio (MSR) portfolio and the reduction in the volatility by investing the minimum variance portfolio (MVP) on the international efficient frontiers, are used. Additionally, this chapter extends the study in diversification benefits by including over-time comparison and cross-region analyses. An increase of correlations and reduction of returns in the global market cast a shadow of doubt on the effectiveness of international investment. An intertemporal analysis of the benefits of diversification is helpful to determine the impact of integration of the international financial market.

Our empirical findings confirm the benefits of international portfolio management with various investment constraints. The cross-country comparison suggests that domestic investors in emerging markets, particularly in East Asia and Latin America, benefit more from international diversification. It is also found that the global diversification benefits vary as the world financial market has became more integrated. Although the lower and upper bounds of weights worsen the mean-variance efficiency of the optimal portfolio, they generate some desired attributes for asset management and therefore enhance the feasibility of asset allocation strategies. Specifically, the addition of overweighting investment constraints substantially reduces the time-variation in gains and weights of the global diversification. The expansion of coverage in the optimal portfolio makes the asset allocations more realistic.

The chapter is organized as follows. Section 13.2 reviews development of global portfolio management. Section 13.3 reviews literature. The estimate of the benefits of international diversification is described in Sect. 13.4. Section 13.5 reports the empirical results of the benefits of international diversification. The over-time examination of components of the optimal portfolios is reported in Sect. 13.6. Conclusions are presented and relevant issues are discussed in Sect. 13.7.

[2] For instance, the ownership of listed companies by foreigners cannot exceed the limit of 10% in Chile, 25% in South Korea, and 10% in Taiwan. In Brazil, international institutional investors cannot own more than 49% of voting share. In Switzerland, corporations are likely to issue international investors special shares that are traded at a premium over the same stocks available exclusively to Swiss nationals.

13.2 Overview of International Portfolio Management

International diversification has been a strong trend for investors in all countries after the mid-1990s. For European investors, such as ones in the Netherlands and the U.K., overseas portfolios play an important role in asset management. However, this is a relatively newer option in the portfolio for investors in the U.S. and most emerging markets. The enormous growth of financial markets outside North America after the mid-1980s is one of major reasons that trigger global diversification. Table 13.1 presents the average growth rates of market value in major 34 countries from 1993 to 2005 and the weights of world market capitalization as of the end of 2005. These sample countries are also grouped into seven regions: East Asia, North America, Latin America, North Europe, West/Central Europe, South Europe, and Oceania. The global value-weighted average annual growth rate is 10.5% during the period. The countries with the largest growth in market value were Finland, Turkey, and Greece, in which the increase rates are twice more than the world average. The variation in the growth of market value within each group of countries at a given developmental stage and in various areas is considerable. The fact that the equity markets in developing countries experienced a larger increase in value indicates the significance of international diversification for the U.S. investor.

The magnitude of foreign markets also validates the trend toward international diversification. In the early 1970s, the New York Stock Exchange represented more than 60% of the world market value of less than $1 trillion in total. As shown in Figure 13.1, the size of the world market multiplied significantly in the next three decades and at the end of 2005, the stock market value in the above 34 countries was about 38 trillion. The shares among various regions varied drastically. The percentage of the U.S. equity market varies from more than 50% to less than 40% in the early 1990s and back to 43% by the end of 2005. The East Asia and Oceania region, which made up more than one-third of the market capitalization in the world in the early 1990s, reduced to about one-fifth at the end of 2005. Europe represents about one-third of the global market value. The stock markets in developed countries consistently represented more than 90% of the world capitalization. On the other hand, the capitalization of the emerging markets is small, and only Brazil, South Korea, and Taiwan were of a share greater than 1% in the world market as of the end of 2005.

International diversification is inspired by two desired characteristics in portfolio management: a low global correlation to decrease the portfolio volatility and the expansion of investment targets to allow investors to allocate asset toward the markets with higher expected return. The above attributes eventually lead to a superior mean-variance

Table 13.1 Capitalization and performance of markets

Panel A: Developed countries

Country	Cap growth	Cap weight	Mean return	Region	Sharpe ratio					
					Median	St. Dev.	Max	Time	Min	Time
Australia	14.81%	2.08%	0.113	Oceania	0.001	0.069	0.201	Dec-05	−0.122	Oct-01
Austria	15.14%	0.33%	0.087	C/W Europe	−0.091	0.134	0.392	Dec-05	−0.172	Jun-00
Belgium	12.72%	0.78%	0.081	C/W Europe	0.020	0.127	0.376	Aug-98	−0.196	Apr-03
Canada	14.96%	3.83%	0.107	N. America	0.024	0.093	0.219	Sep-00	−0.169	Aug-94
Switzerland	13.09%	2.41%	0.124	C/W Europe	0.117	0.151	0.411	Mar-98	−0.197	Apr-03
Germany	10.16%	3.15%	0.096	C/W Europe	0.046	0.111	0.309	Jul-98	−0.199	Apr-03
Denmark	14.28%	0.48%	0.137	C/W Europe	0.060	0.093	0.312	Apr-98	−0.142	Apr-03
Spain	19.11%	2.48%	0.105	C/W Europe	0.005	0.116	0.295	Aug-98	−0.145	Aug-93
Finland	24.37%	0.54%	0.114	N. Europe	0.081	0.162	0.375	Jan-93	−0.261	Apr-00
France	13.13%	4.20%	0.111	C/W Europe	0.057	0.091	0.254	Jan-00	−0.139	Apr-03
U.K.	9.60%	7.89%	0.093	C/W Europe	0.025	0.133	0.291	Mar-98	−0.293	Apr-03
Hong Kong	14.97%	2.72%	0.125	E. Asia	−0.002	0.115	0.251	Sep-94	−0.145	Oct-02
Ireland	16.12%	0.29%	0.099	C/W Europe	0.002	0.140	0.372	May-98	−0.200	Mar-03
Italy	15.04%	2.06%	0.077	S. Europe	−0.010	0.083	0.179	Apr-98	−0.163	Apr-03
Japan	5.36%	11.80%	0.009	E. Asia	−0.089	0.060	0.048	Jul-97	−0.240	Sep-98
Netherlands	10.24%	1.23%	0.117	C/W Europe	0.122	0.158	0.360	Jun-98	−0.213	Apr-03
Norway	20.00%	0.49%	0.116	N. Europe	−0.015	0.090	0.241	Jan-98	−0.183	Oct-02
New Zealand	8.14%	0.10%	0.067	Oceania	−0.034	0.136	0.254	Nov-05	−0.249	Dec-00
Singapore	13.62%	0.66%	0.084	E. Asia	−0.023	0.107	0.223	Feb-96	−0.190	Sep-98
Sweden	14.39%	1.14%	0.136	N. Europe	0.013	0.128	0.341	Mar-00	−0.139	Oct-02
U.S.A.	10.75%	43.88%	0.114	N. America	0.114	0.171	0.393	Jan-00	−0.147	Apr-05
Average	10.47%	4.41%	0.097		0.021	0.079	0.192	Apr-98	-0.145	Apr-03

Panel B: Emerging markets

Country	Cap growth	Cap weight	Mean return	Region	Sharpe ratio					
					Median	St. dev.	Max	Month-Year	Min	Month-Year
Argentina	7.48%	0.12%	0.185	L. America	−0.019	0.101	0.165	Mar-94	−0.235	Jun-02
Brazil	19.78%	1.23%	0.193	L. America	0.024	0.089	0.230	Jul-97	−0.181	Oct-02
Chile	12.48%	0.35%	0.182	L. America	0.046	0.173	0.368	Nov-94	−0.217	Oct-02
Greece	22.19%	0.37%	0.133	S. Europe	0.009	0.105	0.229	Oct-99	−0.180	Jul-95
Indonesia	15.84%	0.21%	0.082	E. Asia	−0.064	0.108	0.149	Dec-05	−0.279	Oct-98
Korea, S.	15.72%	1.85%	0.077	E. Asia	−0.042	0.079	0.206	Dec-05	−0.239	Jan-98
Malaysia	5.37%	0.47%	0.064	E. Asia	0.013	0.126	0.233	Jan-94	−0.272	Nov-98
Mexico	4.28%	0.62%	0.223	L. America	0.045	0.133	0.437	Feb-94	−0.131	Feb-99
Philippines	7.62%	0.10%	0.029	E. Asia	−0.104	0.171	0.266	Oct-95	−0.269	Nov-01
Portugal	16.08%	0.17%	0.045	C/W Europe	−0.041	0.127	0.283	May-98	−0.242	May-03
Thailand	6.11%	0.32%	0.060	E. Asia	−0.002	0.141	0.213	Jan-94	−0.273	Sep-98
Turkey	24.10%	0.42%	0.129	S. Europe	−0.004	0.064	0.143	Jan-94	−0.136	Feb-95
Taiwan	12.74%	1.23%	0.062	E. Asia	−0.040	0.065	0.122	Sep-97	−0.174	Oct-02
Average	12.21%	0.57%	0.108		−0.002	0.066	0.129	Feb-94	−0.137	Oct-02

The growth rate of capitalization during the period of 1992:12–2005:12 and the world capitalization weight as of the end of 2005 in each country are reported. The mean of raw return for each market from 1988:01 to 2005:12 is annualized. The mean, median, standard deviation, maximum, and minimum of the time series of the monthly Sharpe ratio for each market are also presented. The averages for developed countries and emerging markets are calculated by their value-weighted portfolios.

efficiency of holding portfolio. However, several impediments to global diversification in recent years are discussed. The first criticism of global diversification is that consistently higher returns in domestic markets in certain countries challenge the need of overseas investment. It is questionable to claim greater expected return in the future by using the past superior performance. Table 13.1 summarizes the value-weighted average performance and the dynamics of the monthly Sharpe ratio for each market. The raw return in developing countries, on average, is higher than the stock markets in developed countries. However, the Sharpe ratios in developed countries are higher than the ones in the emerging markets. The countries of the maximum mean-variance efficient domestic portfolio are the U.S., Switzerland, the Netherlands, and Finland. It is consistent with previous findings that the mean-variance efficiency of equity prices in emerging markets is lower due to higher volatility (Bekaert and Harvey 2003). Furthermore, the cross-area disparity of equity returns among emerging markets is considerable. Specifically, the stock return in Latin America outperformed the ones in other regions, while the equities in East Asian countries performed worse than the rest of the world.

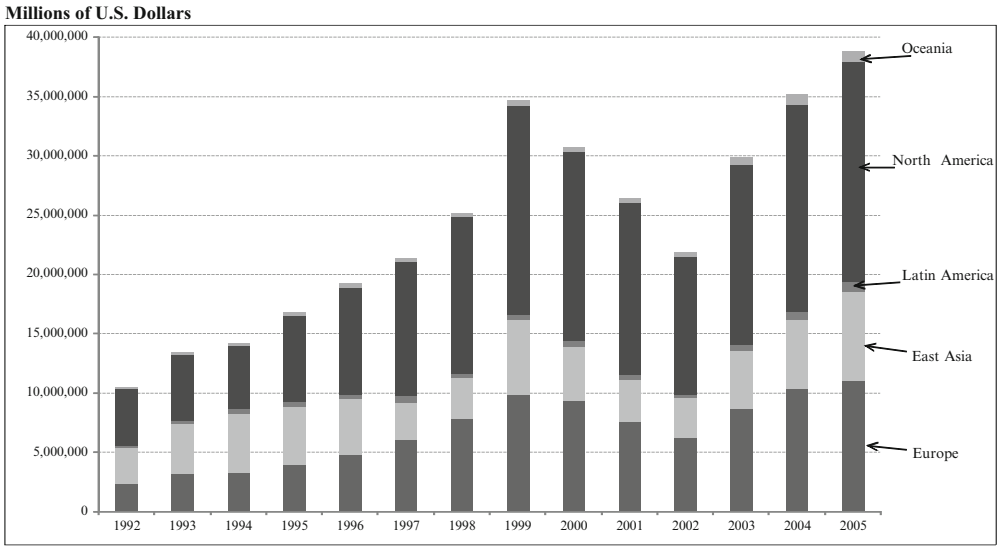

Fig. 13.1 Stock market capitalization in the world. The equity market capitalization in different regions from 1992 to 2005 is demonstrated

Table 13.1 also indicates significant time-variation of risk-adjusted performance in each stock market. Compared to the means of the Sharpe ratio, the time variation, which is measured by standard deviation, of the Sharpe ratio for each market is substantial. For the developed countries, the maximum domestic Sharpe ratio most likely occurred in 1998 and 2005, while for most emerging markets this occurred before 1998. The local investors in the majority of emerging markets generated the worst risk-adjusted performance in 1998 due to financial crises. On the other hand, investors in developed countries experienced the largest loss in 2002 and 2003 because of the evaporation of high-tech bubbles after 2000 and the economic recession worsened by the terrorist attack in 2001. Furthermore, there are nonsynchronous movements of mean-variance efficiency across countries, which imply the potential gains to domestic investors if they diversify their portfolios globally. For instance, there are ten markets of the best mean-variance efficiency and six markets of the worst in 1998. Similarly, four countries had the highest Sharpe ratio, and three countries had the lowest in 2000. This suggests that cross-market performances can differ drastically in the same year and that local investors may avoid losses in their home markets by allocating their funds *optimally* in other countries.

Second, it has been observed that international correlations have trended aloft over the past decades. As shown in Table 13.2, the intertemporal comparison provides evidence of enhancement of correlation in the international financial market. The means of correlation of each market with all other countries in the second period is persistently greater than the ones in the first period. In the first period, some markets are negatively correlated or almost uncorrelated with certain areas. The enhancement of correlation is particularly considerable for the emerging markets with the countries that are in the different regions. All means of correlation coefficient in the second period are increasing and positive. This finding is consistent with the enhancement of integration of the world financial market over the past two decades.

Table 13.2 also shows the means of the correlation coefficients of each country with other countries grouped by regions in two sub-periods. The developed countries, in general, demonstrate higher correlations with other markets than the emerging markets do. Most countries also have the highest coefficients of correlation with the other countries in their home region and with the ones in North America. Although the magnitude of correlations increases over time, the phenomena that the emerging markets are less correlated with other countries can be constantly observed in the two sample periods. The fact that most markets are less correlated with the countries from other regions indicates possible diversification benefits from inter-continent investments. In addition, the stock markets in the rest of the world tend to have considerable co-movements with the U.S. markets.

Third, the existence of home bias in international asset allocation suggests investors consider the barriers to overseas investments costly. The factors such familiarity with financial markets in other countries, political risk, market liquidity and efficiency, regulation on foreign ownership of domestic corporations, transaction costs, levies and taxes, and exchange rate risk, rationalize why an investor would want to overweigh his or her local portfolio compared with the weights of asset in the rest of the world. However, previous research suggests that the costs related to the previous variables are smaller than the improvement of mean-variance brought by international diversification. This implies that overseas asset allocation should not be avoided entirely.

Table 13.2 Coefficients of correlation among markets

Panel A: Developed countries

	World average		Latin America		North America		East Asia		Central/West Europe		North Europe		South Europe		Oceania	
	88–96	97–05	88–96	97–05	88–96	97–05	88–96	97–05	88–96	97–05	88–96	97–05	88–96	97–05	88–96	97–05
Australia	0.28	0.55	0.14	0.58	0.43	0.66	0.25	0.53	0.29	0.54	0.43	0.57	0.04	0.40	0.66	0.70
Austria	0.31	0.43	0.07	0.39	0.17	0.41	0.30	0.31	0.42	0.56	0.34	0.39	0.34	0.34	0.22	0.52
Belgium	0.32	0.45	0.06	0.32	0.41	0.48	0.26	0.23	0.51	0.68	0.35	0.47	0.16	0.37	0.15	0.42
Canada	0.31	0.56	0.13	0.61	0.65	0.79	0.34	0.47	0.33	0.58	0.39	0.67	0.02	0.45	0.42	0.63
Switzerland	0.32	0.51	0.02	0.40	0.39	0.58	0.25	0.33	0.50	0.69	0.38	0.55	0.17	0.40	0.27	0.52
Germany	0.35	0.57	-0.01	0.52	0.33	0.71	0.26	0.36	0.58	0.73	0.42	0.69	0.19	0.52	0.22	0.54
Denmark	0.30	0.50	0.01	0.47	0.27	0.65	0.20	0.31	0.49	0.65	0.45	0.59	0.15	0.38	0.19	0.46
Spain	0.39	0.57	0.22	0.56	0.40	0.66	0.29	0.38	0.51	0.71	0.55	0.63	0.18	0.51	0.42	0.58
Finland	0.28	0.40	0.12	0.37	0.33	0.60	0.27	0.25	0.32	0.46	0.55	0.55	0.03	0.43	0.38	0.41
France	0.33	0.59	0.10	0.50	0.40	0.72	0.24	0.35	0.53	0.76	0.35	0.73	0.17	0.53	0.23	0.55
U.K.	0.38	0.56	0.06	0.51	0.51	0.70	0.29	0.38	0.54	0.70	0.54	0.63	0.10	0.48	0.45	0.57
Hong Kong	0.33	0.47	0.17	0.55	0.49	0.57	0.41	0.54	0.34	0.40	0.35	0.43	0.10	0.26	0.30	0.55
Ireland	0.37	0.48	0.09	0.43	0.40	0.58	0.33	0.32	0.51	0.61	0.50	0.51	0.22	0.43	0.34	0.53
Italy	0.28	0.49	0.05	0.46	0.29	0.56	0.25	0.26	0.38	0.66	0.40	0.59	0.15	0.49	0.19	0.46
Japan	0.27	0.38	0.06	0.34	0.26	0.50	0.21	0.40	0.40	0.36	0.38	0.40	0.06	0.24	0.26	0.52
Netherlands	0.40	0.58	0.02	0.49	0.51	0.68	0.30	0.38	0.61	0.76	0.51	0.65	0.16	0.47	0.39	0.55
Norway	0.34	0.54	0.14	0.58	0.41	0.66	0.24	0.39	0.46	0.63	0.55	0.54	0.10	0.49	0.38	0.61
New Zealand	0.25	0.48	0.06	0.44	0.28	0.51	0.22	0.48	0.27	0.48	0.39	0.47	0.12	0.39	0.66	0.70
Singapore	0.40	0.47	0.15	0.55	0.48	0.57	0.52	0.57	0.44	0.37	0.45	0.42	0.17	0.31	0.37	0.60
Sweden	0.38	0.55	0.13	0.52	0.44	0.71	0.31	0.39	0.50	0.66	0.57	0.65	0.19	0.53	0.47	0.55
U.S.A.	0.32	0.56	0.19	0.57	0.65	0.79	0.29	0.45	0.39	0.62	0.40	0.65	0.00	0.46	0.29	0.54

Panel B: Emerging markets

	World average		Latin America		North America		East Asia		Central/West Europe		North Europe		South Europe		Oceania	
	88–96	97–05	88–96	97–05	88–96	97–05	88–96	97–05	88–96	97–05	88–96	97–05	88–96	97–05	88–96	97–05
Argentina	0.06	0.36	0.18	0.57	0.16	0.42	0.05	0.33	0.02	0.31	0.02	0.36	0.14	0.36	0.17	0.37
Brazil	0.10	0.52	0.12	0.67	0.08	0.63	0.08	0.42	0.08	0.56	0.22	0.53	0.16	0.41	0.13	0.54
Chile	0.08	0.51	0.14	0.66	0.14	0.61	0.14	0.50	0.04	0.46	0.08	0.52	0.01	0.48	−0.03	0.56
Greece	0.19	0.39	0.09	0.38	0.06	0.40	0.11	0.23	0.29	0.50	0.18	0.45	0.35	0.33	0.15	0.38
Indonesia	0.14	0.34	0.05	0.36	0.20	0.35	0.20	0.48	0.11	0.26	0.14	0.25	0.13	0.19	0.20	0.42
Korea, S.	0.15	0.38	0.06	0.33	0.19	0.42	0.22	0.45	0.13	0.32	0.23	0.39	−0.07	0.27	0.16	0.53
Malaysia	0.33	0.34	0.10	0.38	0.41	0.36	0.46	0.49	0.33	0.26	0.37	0.26	0.16	0.20	0.30	0.36
Mexico	0.16	0.52	0.22	0.65	0.25	0.69	0.21	0.48	0.12	0.48	0.20	0.55	0.00	0.45	0.14	0.57
Philippines	0.27	0.37	0.15	0.41	0.34	0.43	0.39	0.51	0.24	0.29	0.20	0.26	0.16	0.20	0.29	0.48
Portugal	0.28	0.46	0.09	0.36	0.20	0.50	0.18	0.26	0.40	0.64	0.32	0.57	0.41	0.40	0.28	0.42
Thailand	0.28	0.41	0.17	0.42	0.36	0.46	0.41	0.57	0.26	0.31	0.21	0.31	0.21	0.18	0.20	0.62
Turkey	0.09	0.38	0.06	0.48	−0.05	0.52	0.11	0.25	0.11	0.38	0.03	0.51	0.35	0.33	0.01	0.41
Taiwan	0.15	0.40	0.14	0.54	0.12	0.49	0.25	0.47	0.13	0.32	0.14	0.36	0.05	0.28	0.06	0.45

The averages of unconditional coefficients of correlation of each country with other countries of different regions during two periods, 1988:01–1996:12 and 1997:01–2005:12 are reported.

13.3 Literature Review

Previous empirical evidence suggests that investment constraints may not completely eliminate the benefits brought about by international diversification. Bekaert and Urias (1996), Chiou (2008), Chiou et al. (2009), De Roon et al. (2001), Driessen and Laeven (2007), Harvey (1995), Li et al. (2003), Pástor and Stambaugh (2000), and Wang (1998) confirm the benefits of international diversification even when short-sales are not allowed. Cosset and Suret (1995) find that including securities from high political-risk countries into the portfolio can increase mean-variance efficiency. Considering geographical restrictions, De Roon et al. (2001) find that investors in East Asia can still generate benefits from diversifying their portfolios by investing in other countries in Latin America. Green and Hollifield (1992) and Jagannathan and Ma (2003), on the other hand, investigate the impacts of imposing short-sales and upper-bound investment constraints on mean-variance efficiency and portfolio risk. Errunza et al. (1999) find that U.S. investors can utilize domestically traded American Depositary Receipts (ADRs) to duplicate the benefits of international diversification.

The degree of international market integration is critical to the effectiveness of international diversification. Bekaert and Harvey (1995), Bekaert et al. (2005), De Jong and De Roon (2005), and Errunza et al. (1992) suggest that the world market is mildly segmented and that the degree of global market integration varies throughout time. The integration of international financial markets, in general, has gradually increased, but the emerging markets are still more segmented than those in developed countries. Bekaert et al. (2005) find that the correlations among individual stock price do not necessarily increase when the international financial market is more integrated, while the idiosyncratic risk does not show a particular time trend. Given the change in the world financial market, an intertemporal study in international diversification benefits would be useful.

The institutional and cultural heterogeneities among countries are key factors determining nonsynchronous movement of security prices among markets. Beck et al. (2003) and Demirgüç-Kunt and Maksimovic (1998) suggest that the international differences of financial markets can be explained by natural endowments and legal tradition. La Porta et al. (1998, 2000), Djankov et al. (2003, 2008) show how law affects the protection to investors. Stulz and Williamson (2003) document that liberalization and development of financial markets relate to cultural background such as major religion and language. Bekaert and Harvey (2003) report the major characteristics of emerging markets and their chronological innovations. The differences in cultural background, natural endowments, institutional systems, and legal tradition deter integration of international financial markets so that investors may generate gains from overseas diversification.

In sum, previous studies document the benefits of global diversification with constraints such as short-sales. The increase in correlations of international financial markets does not completely eliminate the benefits because of the dispersion of returns among countries. The difference of cultures, natural endowments, and institutional systems among markets cause the dispersion of returns among markets. The gap of understanding regarding the time-series of the benefits of constrained international diversifications needs to be filled.

13.4 Forming the Optimal Global Portfolio

Suppose a representative investor desires to minimize the volatility of her portfolio, given the same return, by allocating funds among international markets. The expected returns in excess of the risk-free interest rate and the variance-covariance of N international asset returns can be expressed as a vector $\boldsymbol{\mu}^{\mathrm{T}} = [\mu_1, \mu_2, \ldots, \mu_N]$ and a positive definite matrix $\mathbf{V}$, respectively. Let $\boldsymbol{\Omega}$ be the set of all real vectors of weighting $\mathbf{w}^{\mathrm{T}}$ such that $\mathbf{w}^{\mathrm{T}}\mathbf{1} = w_1 + w_2 + \ldots + w_N = 1$, where $\mathbf{1}$ is an N-vector of ones. We further assume that the best predictors of means, variances, and covariances are their historical averages. The investor thus follows the method of Markowitz (1952) to form the global efficient frontier. The problem of the optimal portfolio selection is then expressed as a Lagrange's equation:

$$\min_{\{\mathrm{w},\phi,\eta\}} \Xi = \frac{1}{2}\mathrm{w}^{\mathrm{T}}\mathrm{V}\mathrm{w} + \phi\left(\mu_p - \mathrm{w}^{\mathrm{T}}\mu\right) + \eta\left(1 - \mathrm{w}^{\mathrm{T}}1\right), \tag{13.1}$$

where μ_p denotes the expected return on the portfolio, and the shadow prices ϕ and η are two positive constants. The quadratic programming solution for asset spanning without investment constraints is:

$$\mathbf{w_p} = \phi\left(\mathbf{V}^{-1}\,\mu\right) + \eta\left(\mathbf{V}^{-1}\,\mathbf{1}\right). \tag{13.2}$$

Various weighting constraints are considered. It is well-known that short-selling is not allowed for foreign investors in many countries, particularly in less developed nations (see De Roon et al. 2001; Harvey 1995; Li et al. 2003; Pástor and Stambaugh 2000). Furthermore, the investor considers the liquidity of portfolio when global asset allocation is determined. To reflect the argument by Green and Hollifield (1992) and Jagannathan and Ma (2003), the relative magnitude of market value in each country is considered when the upper boundaries of weighting are characterized. The subset of portfolio weights P_U with short-sale and over-weighting investment constraints (SS + OW(U)) can be described as:

$$P_U = \{\mathbf{w_p} \in \Omega\colon\ 0 \le w_i \le Uw(Cap)_i \le 1,$$
$$i = 1, 2 \ldots, N\},\ U > 1, \tag{13.3}$$

where $w(Cap)_i$ is the proportion of the market value of each country i in the world, and U is any real number. The restriction of weights is then incorporated in Lagrange's Equation (13.1). Since the incentives of diversification are not only to seek higher yields but also to reduce volatility, the Maximum Sharpe ratio (MSR) represents the highest mean-variance efficiency that can be achieved by the international efficient frontier. Specifically,

$$\mathrm{MSR_J} = \max_{\{\mathbf{w_p}\}} \left\{ \left(\mathbf{w}_\mathrm{p}^\mathrm{T}\boldsymbol{\mu}\right) / \left(\mathbf{w}_\mathrm{p}^\mathrm{T}\mathbf{V}\mathbf{w}_\mathrm{p}\right)^{\frac{1}{2}} \left| \mathbf{w}_\mathrm{p}^\mathrm{T} \in P_J \right. \right\}. \tag{13.4}$$

For domestic investor in country i, the greatest increase in unit-risk return brought by global diversification is

$$\delta_{i,\mathrm{J}} = \mathrm{MSR_J} - \mathrm{SR}_i, \tag{13.5}$$

where $\mathrm{SR}_i = \mu_i / V_i^{\frac{1}{2}}$ is the Sharpe ratio, and V_i is the variance of the domestic portfolio in country i.

The other measure of benefits of diversification is the maximum reduction in volatility as a result of international diversification. Elton et al. (2007) suggest that investors may seek to minimize the variance of a portfolio because of the lack of predictability of expected returns. In this case, an investor may want to construct a minimum-variance portfolio (MVP). The weighting of the MVP can be characterized as:

$$w_{MVP} = \left\{ \mathbf{w_p} : \min_{\{w_p\}} \left[w_p^T V w_p \left| w_p^T \in P_J \right. \right] \right\}. \tag{13.6}$$

The maximum decline in volatility by diversifying internationally with various investment constraints is

$$\varepsilon_{i,\mathrm{J}} = 1 - \left[\mathbf{w}_{\mathrm{MVP,J}}^\mathrm{T}\mathbf{V}\mathbf{w}_{\mathrm{MVP,J}}/\mathrm{V}_i\right]^{\frac{1}{2}}. \tag{13.7}$$

In this chapter, the global efficient frontiers and the Sharpe ratio are estimated by using monthly returns in the previous 5 years. The time-series of $\delta_{i,J}$ and $\varepsilon_{i,J}$ with various investment constraints are generated by time-rolling efficient frontiers. The weights for the MSR portfolio and the MVP under various investment constraints in each month are also calculated.

13.5 The Benefits of International Diversification Around the World

Figure 13.2 exhibits the efficient frontiers of the global portfolio at the end of each year from 1993 to 2005. Because of the time-variations in mean-variance efficiency and correlations among markets, the shape and size of efficient frontiers vary noticeably from 1993 to 2005. The movement of efficient frontiers also does not follow a consistent direction or pattern. The efficient frontier first shifts to the northwest from 1993 to 1994 but then moves to the southeast (reduction in mean-variance efficiency) from 1994 to 1997. The positions of optimal portfolios hover around the same general area from 1998 to 1999. In 2000, the frontier moves northwest, consistent with the U.S. market dot-com boom. Then, from 2001 to 2003, the frontier moves noticeably to the southeast, seemingly reflective of the U.S. market crash. The period from 2002 to 2003 is by far the least mean-variance efficient of our sample period. Then the frontier moves northwest again in 2004 and 2005. The movement of the efficient frontiers seems to reflect the world markets and business cycles.

Figure 13.3 graphically demonstrates the time-series of potential diversification benefits to the domestic investors. Graph A shows that the average improvement of mean-variance efficiency to the local investor was at its peak from 1993 to 1994 when only short-sales constraint is considered. On the other hand, when the limit of over-weighting investment is taken into account, δ is at its maximum during 1996 and 2000. In Graph B, ε with various restrictions was slightly lower from 1996 to 1998 and from 2003 to 2005. The intertemporal change of the benefit of risk reduction is not as considerable as that of the one of mean-variance efficiency improvement.

The cross-strategy comparison shows that the benefits under various constraints are not proportional. In Graph A, for instance, the divergence of the Sharpe ratio benefits among various trading limits is significant when the Sharpe ratio benefit of the no-short-selling portfolio is high. A similar pattern can be found in Graph B. This suggests that the effectiveness of the less restrictive diversifying strategies is more sensitive to the variants of asset returns in the menu. Consideration of these constraints eliminates uncertainty in portfolio performance since some portion of investment shifts to the second-best alternatives, which generally are the national indices representing larger markets with high mean-variance efficiency.

Table 13.3 reports means of δ and ε of each country over the sample period. The gains of international diversification to local investors in emerging markets, both the improvement of mean-variance efficiency and the decrease in volatility, are greater than the ones in developed countries. This result holds for the various scenarios of weighting constraints. The diversification benefits to the investors in emerging markets are eroded considerably by restrictive upper bounds, especially δ. The domestic investors in developed countries still can increase mean-variance efficiency of their portfolios by approximately 0.136 and reduce volatility by 2.5% via the global diversification with constraints of SS + OW(3).

Table 13.3 also shows that the comparative advantages vary from region to region. The local investors in East Asia,

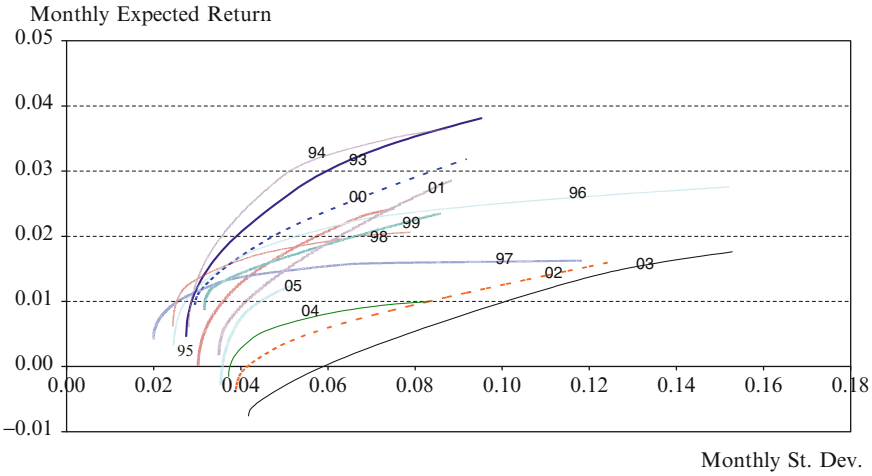

Fig. 13.2 Mean-variance efficient frontiers: 1993–2005. This figure shows the short-sale constrained international efficient frontiers at the beginning of each year from 1993 to 2005. The efficient frontiers are constructed by the monthly returns in previous 5 years

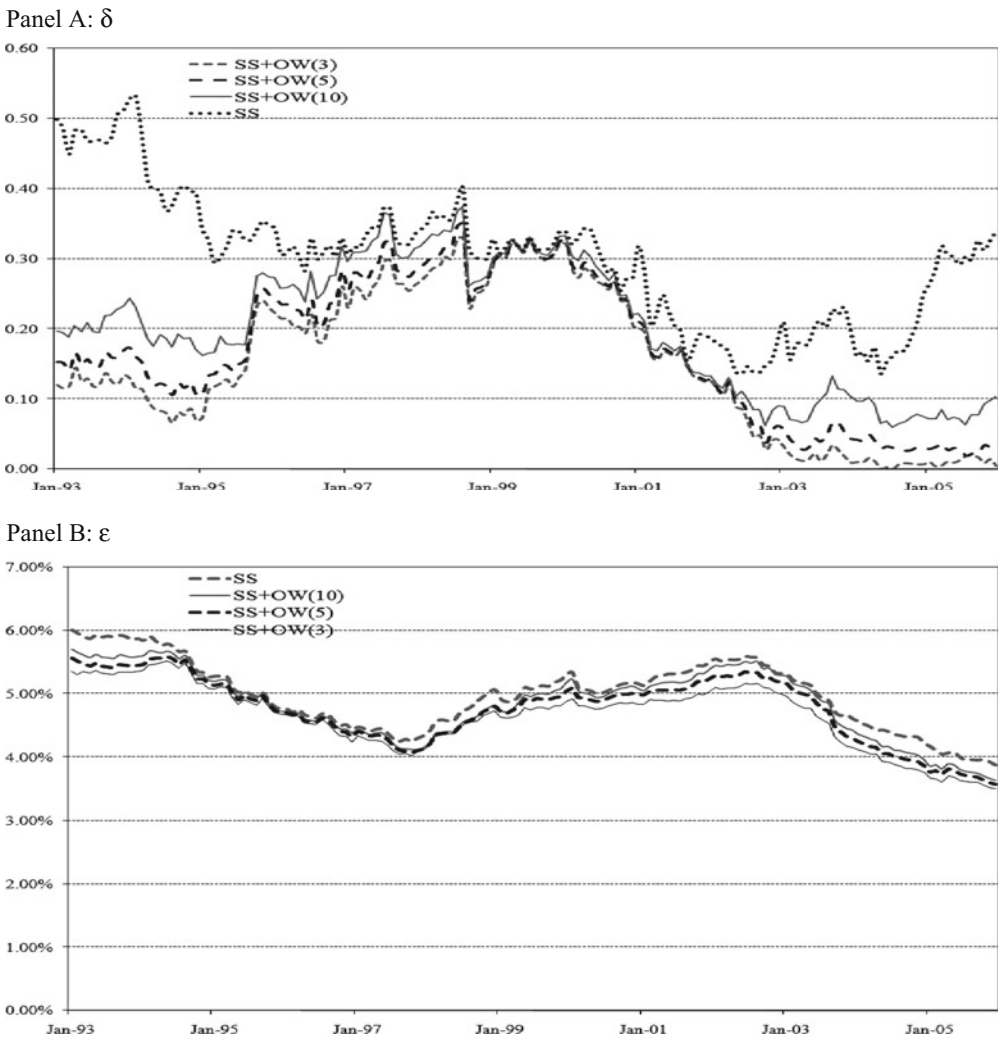

Fig. 13.3 The benefits of international diversification. The time-series of the means of the benefits of international diversification for all sample countries are presented. The increase in the risk-adjusted premium and the decrease in volatility of domestic portfolio by international diversification are $\delta_{i,\mathrm{J}} = \mathrm{MSR}_{\mathrm{J}} - \mathrm{SR}_i$ and $\varepsilon_{i,\mathrm{J}} = 1 - \left[\mathbf{w}_{MVP,\mathrm{J}}^T \mathbf{V} \mathbf{w}_{MVP,\mathrm{J}} / \mathrm{V}_i\right]^{\frac{1}{2}}$, respectively

on average, enjoy superior increments in the risk-adjusted premium and the greatest shrinkages in volatility from global diversification. For home investors in Latin America, the benefits of incorporating overseas stocks in their portfolios primarily are to reduce risk. The benefits for investors in Europe and North America are relatively trivial compared to the ones

Table 13.3 The benefits of international diversification to domestic investors

Panel A: Developed countries

	SS		SS + OW(10)		SS + OW(5)		SS + OW(3)	
	$\delta_{i,J}$	$\varepsilon_{i,J}$	$\delta_{i,J}$	$\varepsilon_{i,J}$	$\delta_{i,J}$	$\varepsilon_{i,J}$	$\delta_{i,J}$	$\varepsilon_{i,J}$
Australia	0.3472	2.03%	0.2475	1.94%	0.2196	1.78%	0.1993	1.64%
Austria	0.4358	2.27%	0.2693	2.18%	0.2506	2.07%	0.2351	1.94%
Belgium	0.2563	1.49%	0.1937	1.42%	0.1584	1.31%	0.1318	1.18%
Canada	0.2954	2.28%	0.2614	2.13%	0.2444	2.08%	0.2293	1.99%
Switzerland	0.1908	1.90%	0.0953	1.82%	0.0603	1.76%	0.0395	1.67%
Germany	0.2588	2.77%	0.1803	2.68%	0.1375	2.52%	0.1206	2.33%
Denmark	0.2221	2.09%	0.1609	1.91%	0.1187	1.80%	0.0956	1.67%
Spain	0.2403	3.21%	0.1575	3.08%	0.1467	3.04%	0.1387	2.89%
Finland	0.1875	6.04%	0.1217	5.98%	0.0965	5.93%	0.0862	5.84%
France	0.2776	2.19%	0.1645	2.15%	0.1156	2.06%	0.0837	1.95%
U.K.	0.2938	0.85%	0.1813	0.60%	0.1487	0.51%	0.1311	0.39%
Hong Kong	0.2726	5.21%	0.1450	5.16%	0.1094	5.14%	0.0876	5.11%
Ireland	0.2639	2.38%	0.1950	2.22%	0.1553	2.12%	0.1316	1.95%
Italy	0.3044	3.75%	0.2413	3.63%	0.2063	3.54%	0.1806	3.39%
Japan	0.4308	3.05%	0.3196	2.97%	0.2835	2.87%	0.2669	2.75%
Netherlands	0.1968	1.51%	0.1307	1.42%	0.0975	1.33%	0.0783	1.25%
Norway	0.3253	3.55%	0.2500	3.49%	0.1966	3.39%	0.1810	3.24%
New Zealand	0.3248	3.52%	0.2549	3.45%	0.2167	3.34%	0.1974	3.21%
Singapore	0.3175	3.69%	0.1434	3.47%	0.1073	3.42%	0.0859	3.36%
Sweden	0.2028	4.47%	0.1520	4.29%	0.1188	4.18%	0.1007	4.09%
U.S.A.	0.1617	1.01%	0.0995	0.81%	0.0707	0.76%	0.0474	0.63%
Average	0.2765	2.82%	0.1888	2.70%	0.1552	2.62%	0.1356	2.50%

Panel B: Emerging markets

	SS		SS + OW(10)		SS + OW(5)		SS + OW(3)	
	$\delta_{i,J}$	$\varepsilon_{i,J}$	$\delta_{i,J}$	$\varepsilon_{i,J}$	$\delta_{i,J}$	$\varepsilon_{i,J}$	$\delta_{i,J}$	$\varepsilon_{i,J}$
Argentina	0.3163	9.32%	0.1914	9.11%	0.1814	8.99%	0.1699	8.88%
Brazil	0.2756	9.64%	0.1778	9.51%	0.1508	9.42%	0.1307	9.28%
Chile	0.2344	4.40%	0.1511	4.21%	0.1195	4.10%	0.1025	3.97%
Greece	0.3178	5.63%	0.1884	5.54%	0.1532	5.44%	0.1223	5.31%
Indonesia	0.4113	11.18%	0.2806	11.00%	0.2534	10.92%	0.2396	10.83%
Korea, S.	0.3924	7.14%	0.2927	6.89%	0.2469	6.78%	0.2286	6.65%
Malaysia	0.3113	4.93%	0.1750	4.86%	0.1452	4.80%	0.1285	4.73%
Mexico	0.2054	6.82%	0.0725	6.75%	0.0687	6.58%	0.0617	6.39%
Philippines	0.3538	6.59%	0.2136	6.52%	0.1796	6.46%	0.1570	6.39%
Portugal	0.2951	2.96%	0.2185	2.86%	0.1926	2.74%	0.1799	2.61%
Thailand	0.3116	8.46%	0.1881	8.26%	0.1688	8.13%	0.1517	8.02%
Turkey	0.3426	14.80%	0.2240	14.61%	0.1676	14.54%	0.1515	14.43%
Taiwan	0.3754	6.89%	0.2739	6.71%	0.2386	6.66%	0.2175	6.49%
Average	0.3187	7.60%	0.2037	7.45%	0.1743	7.35%	0.1570	7.23%

The medians of benefits of international diversification with short-sales (SS) and various sets of short-sale plus over-weighting (SS + OW(U)) investment constraints to domestic investor in different countries are reported. The increase in the risk-adjusted premium and the decrease in volatility of domestic portfolio by international diversification are $\delta_{i,\mathrm{J}} = \mathrm{MSR}_{\mathrm{J}} - \mathrm{SR}_i$ and $\varepsilon_{i,\mathrm{J}} = 1 - \left[\mathbf{w}_{MVP,\mathrm{J}}^T \mathbf{V} \mathbf{w}_{MVP,\mathrm{J}} / \mathrm{V}_i\right]^{\frac{1}{2}}$, respectively.

in the rest of world. The relations of the more constrained diversification benefits among regions are similar to the results of the less constrained portfolios.

In the long term, the international diversification benefits are time-varying and do not fall significantly. The more restrictive upper bounds of portfolio weights shrink the benefits of international diversification and their temporal variation. The optimal global diversifying strategies indeed generate benefits to the local investors, even though the short-sale and over-weighting constraints are increasingly restrictive. In general, local investors in emerging markets, particularly in East Asia and Latin America, benefit more from international diversification. This result holds for global portfolios with various investment restrictions.

13.6 The Optimal Portfolio Components

Table 13.4 shows the average weight of each country for the maximum Sharpe Ratio (MSR) portfolio and the MVP over the period. The comparison of components in the optimal portfolios under various investment constraints indicates the infeasibility of less restrictive diversifying strategies. For the portfolio with short-sale restrictions, weighting in emerging markets is disproportionate to its distribution in the world capital market value. On average, the investors who wish to maximize portfolio mean-variance efficiency should place 31.41% of wealth in emerging markets, which represent merely 7.4% of total market value of all countries at the end of 2005. Among them, although the Chilean equity

Table 13.4 Means of portfolio weights

Panel A: Developed countries

	MSR Portfolio				MVP			
	SS	SS + OW(10)	SS + OW(5)	SS + OW(3)	SS	SS + OW(10)	SS + OW(5)	SS + OW(3)
Australia	0.0010	0.0404	0.0211	0.0131	0.0180	0.0351	0.0503	0.0356
Austria	0.1196	0.0025	0.0018	0.0013	0.0530	0.0105	0.0061	0.0043
Belgium	0.0256	0.0026	0.0017	0.0012	0.1197	0.0093	0.0049	0.0033
Canada	0.0040	0.0493	0.0324	0.0194	0.0496	0.0578	0.0361	0.0235
Switzerland	0.1120	0.1282	0.0742	0.0476	0.0441	0.0690	0.0888	0.0658
Germany	0.0002	0.0034	0.0128	0.0144	0.0072	0.0273	0.0258	0.0233
Denmark	0.0278	0.0137	0.0098	0.0059	0.0264	0.0265	0.0145	0.0094
Spain	0.0011	0.0221	0.0244	0.0182	0.0000	0.0000	0.0000	0.0000
Finland	0.1640	0.0353	0.0188	0.0118	0.0000	0.0000	0.0010	0.0015
France	0.0017	0.0667	0.0814	0.0794	0.0000	0.0075	0.0153	0.0297
U.K.	0.0043	0.0073	0.0254	0.0421	0.2426	0.3317	0.2435	0.1553
Hong Kong	0.0009	0.0590	0.0426	0.0308	0.0000	0.0001	0.0016	0.0049
Ireland	0.0139	0.0049	0.0031	0.0021	0.0067	0.0051	0.0055	0.0045
Italy	0.0007	0.0125	0.0193	0.0162	0.0059	0.0128	0.0283	0.0427
Japan	0.0000	0.0014	0.0086	0.0217	0.0585	0.0661	0.0855	0.1078
Netherlands	0.0282	0.0191	0.0119	0.0077	0.0353	0.0119	0.0059	0.0066
Norway	0.0000	0.0059	0.0033	0.0020	0.0000	0.0013	0.0007	0.0005
New Zealand	0.0014	0.0021	0.0015	0.0010	0.0062	0.0020	0.0013	0.0011
Singapore	0.0000	0.0104	0.0084	0.0061	0.0000	0.0022	0.0016	0.0011
Sweden	0.0132	0.0095	0.0107	0.0090	0.0000	0.0000	0.0000	0.0000
U.S.A.	0.1663	0.3830	0.5085	0.5963	0.1845	0.2477	0.3273	0.4374
Sum	0.6859	0.8792	0.9218	0.9475	0.8577	0.9239	0.9438	0.9584

Panel B: Emerging markets

	MSR Portfolio				MVP			
	SS	SS + OW(10)	SS + OW(5)	SS + OW(3)	SS	SS + OW(10)	SS + OW(5)	SS + OW(3)
Argentina	0.0011	0.0019	0.0010	0.0006	0.0026	0.0015	0.0010	0.0006
Brazil	0.0055	0.0158	0.0138	0.0093	0.0004	0.0008	0.0006	0.0005
Chile	0.1049	0.0112	0.0058	0.0035	0.0290	0.0094	0.0054	0.0040
Greece	0.0065	0.0060	0.0039	0.0029	0.0008	0.0061	0.0062	0.0062
Indonesia	0.0044	0.0034	0.0020	0.0013	0.0017	0.0016	0.0015	0.0010
Korea, S.	0.0600	0.0241	0.0148	0.0095	0.0249	0.0256	0.0190	0.0120
Malaysia	0.0372	0.0232	0.0145	0.0099	0.0347	0.0120	0.0072	0.0054
Mexico	0.0640	0.0216	0.0122	0.0074	0.0031	0.0015	0.0007	0.0005
Philippines	0.0241	0.0030	0.0015	0.0009	0.0071	0.0014	0.0008	0.0006
Portugal	0.0000	0.0003	0.0008	0.0008	0.0216	0.0044	0.0029	0.0020
Thailand	0.0010	0.0071	0.0045	0.0029	0.0000	0.0001	0.0003	0.0005
Turkey	0.0049	0.0026	0.0018	0.0013	0.0067	0.0042	0.0023	0.0015
Taiwan	0.0006	0.0006	0.0016	0.0023	0.0096	0.0077	0.0084	0.0069
Sum	0.3141	0.1208	0.0782	0.0525	0.1423	0.0761	0.0562	0.0416

The average weights of the MSR portfolio and the MVP with various investment constraints for each country over the sample period are reported.

market represented only about 0.35% of world capitalization, the average weight is 10.49%. The extreme weights also occur in Austria, Finland, Ireland, South Korea, Mexico, and the Philippines. As the overweighting investment constraints are included and become more restrictive, the percentage of the portfolios on the assets in developing countries decreases.

An overwhelming amount of investments also can be found in small-cap areas, such as Latin America, Northern Europe, Southern Europe, and Oceania when only short-selling is considered. On the other hand, the weights for the areas of large market value, such as North America and Central/Western Europe are zero for a number of periods. The more restrictive OW constraints "enforce" portfolio weighting to distribute to other second-best mean-variance-efficient markets of large capitalization. The weightings of those more constrained portfolios are more balanced than the ones of the short-sale-forbidden portfolios.

The percentage of the non-zero-weight month in the testing period is reported in Table 13.5. On the whole, assets in the developed countries were more likely to be selected in the optimal portfolios with restrictive upper bounds. When only short-sale was not allowed, three national

Table 13.5 Percentage of non-zero portfolio weight

Panel A: Developed countries

	MSR portfolio				MVP			
	SS	SS + OW(10)	SS + OW(5) (%)	SS + OW(3)	SS	SS + OW(10)	SS + OW(5) (%)	SS + OW(3)
Australia	2.56	24.36	25.00	25.64	43.59	58.33	64.74	73.08
Austria	14.74	16.67	24.36	29.49	46.79	71.15	82.05	96.15
Belgium	7.05	23.08	29.49	33.33	73.72	78.21	82.05	94.87
Canada	4.49	21.15	25.00	25.00	29.49	30.77	30.77	30.77
Switzerland	42.95	60.26	64.10	67.95	36.54	71.15	89.74	92.31
Germany	0.64	7.05	17.95	23.08	11.54	25.00	29.49	35.90
Denmark	17.31	43.59	59.62	57.69	58.33	81.41	83.33	91.67
Spain	1.92	18.59	26.92	32.05	0.00	0.00	0.00	0.64
Finland	51.28	58.97	60.90	63.46	0.00	0.64	8.33	8.33
France	1.92	19.87	31.41	44.87	0.00	13.46	22.44	39.10
U.K.	5.77	10.26	23.72	33.97	56.41	64.10	65.38	67.31
Hong Kong	5.13	35.26	42.31	51.28	0.00	2.56	8.97	20.51
Ireland	10.26	18.59	23.08	26.28	17.31	21.15	43.59	56.41
Italy	0.64	12.82	24.36	28.21	23.08	50.00	80.77	91.03
Japan	0.00	2.56	4.49	8.33	70.51	78.21	84.62	92.95
Netherlands	25.00	35.90	44.23	46.15	21.15	21.15	21.15	41.67
Norway	0.64	19.23	21.15	21.79	0.00	4.49	5.77	6.41
New Zealand	2.56	21.79	31.41	35.26	19.23	20.51	26.92	36.54
Singapore	0.00	25.64	37.18	44.87	0.00	6.41	7.05	9.62
Sweden	8.97	14.74	28.85	39.74	0.00	0.64	0.00	0.64
U.S.A.	43.59	72.44	82.05	85.26	67.95	75.00	100.00	100.00
Developed Countries	95.51	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Panel B: Emerging markets

	MSR portfolio				MVP			
	SS	SS + OW(10)	SS + OW(5) (%)	SS + OW(3)	SS	SS + OW(10)	SS + OW(5) (%)	SS + OW(3)
Argentina	5.77	25.64	26.28	28.85	22.44	22.44	28.85	32.69
Brazil	18.59	43.59	54.49	55.77	5.13	8.33	7.05	5.77
Chile	30.13	51.28	51.92	52.56	44.87	47.44	50.00	60.26
Greece	13.46	24.36	26.92	32.69	7.69	36.54	51.28	73.72
Indonesia	7.69	25.64	30.13	31.41	14.10	18.59	22.44	25.00
Korea, S.	13.46	28.21	35.26	34.62	44.87	43.59	43.59	44.23
Malaysia	14.10	45.51	54.49	59.62	23.08	25.64	30.77	39.10
Mexico	25.64	49.36	52.56	53.21	8.97	7.69	9.62	8.33
Philippines	30.77	36.54	36.54	37.82	13.46	16.67	19.23	23.08
Portugal	0.00	3.85	16.03	26.28	32.05	46.15	58.33	69.23
Thailand	1.28	35.90	43.59	47.44	0.00	1.92	4.49	8.97
Turkey	12.18	19.23	24.36	28.85	28.21	31.41	31.41	33.97
Taiwan	1.92	2.56	7.05	12.18	33.97	39.74	51.92	51.92
Emerging Markets	67.31	86.54	91.03	92.95	98.08	93.59	94.23	99.36

This table reports the percentages of the months of non-zero portfolio weight for the MSR portfolio and the MVP with various investment constraints for each country during the sample period.

indices (Japan, Singapore, and Portugal) were never selected in the MSR portfolio, and eight national indices (Spain, Finland, France, Hong Kong, Norway, Singapore, Sweden, and Thailand) were never selected in the MVP. Furthermore, only five markets (Switzerland, Finland, U.S.A., Chile, and Portugal) were included in more than 30% of the sample period. As the overweighting investments are increasingly constrained, the securities in any group of countries were more frequently included in the MSR portfolio as well as the MVP. In the most restrictive case, securities in 22 markets were included in the MSR portfolio and 23 markets in the MVP for more than 30% of the sample period, respectively.

Figure 13.4 shows the numbers of national indices selected in the optimal portfolios over the sample period. This cross-strategy comparison supports the essentialness of the upper bounds of portfolio weighting. The time-series average of market indices for the no-short-selling MSR portfolio is 4.2 and implies, overall, that more than

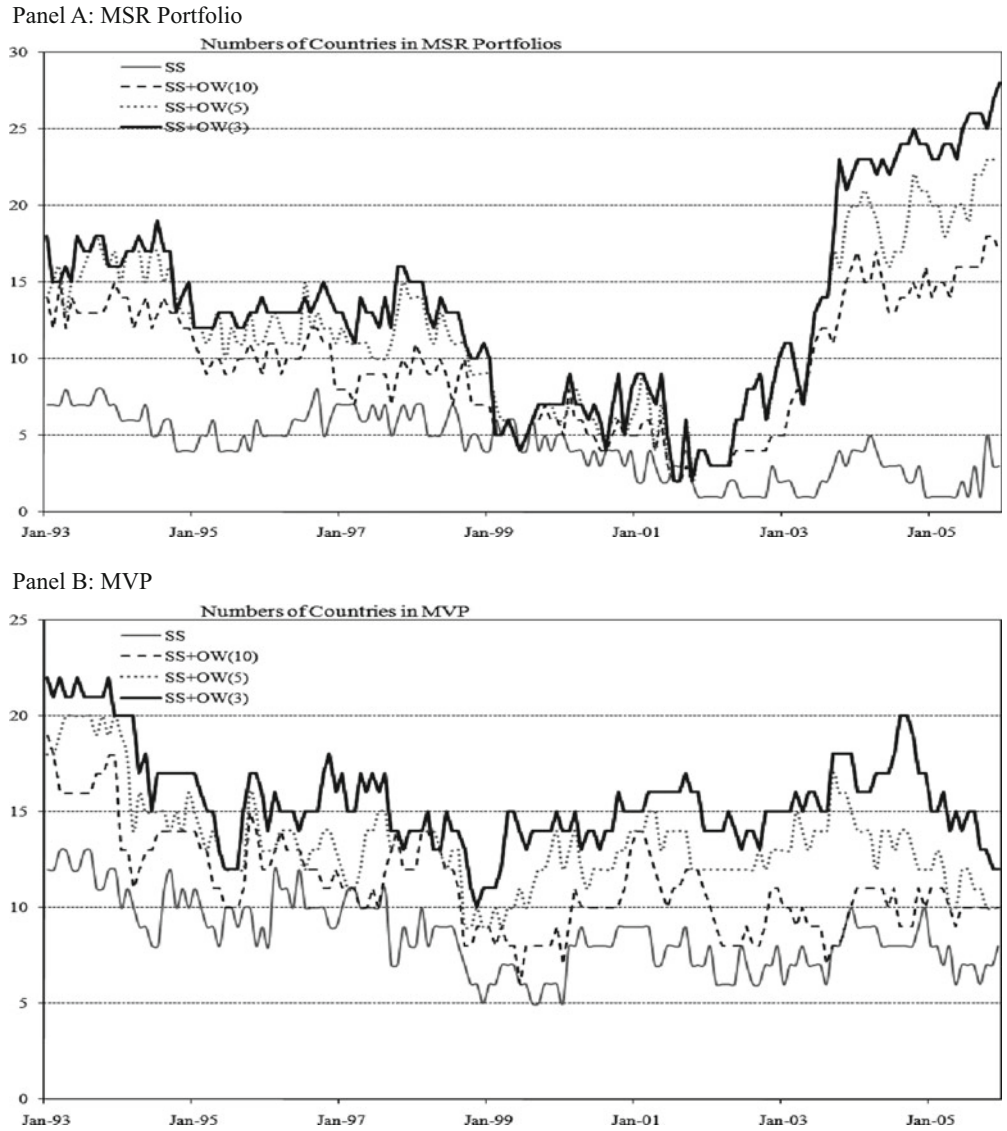

Fig. 13.4 Number of selected national indices in the optimal portfolios

80% of the international portfolios are redundant in the same month. The inclusion of overweighting constraints expands the coverage of the optimal portfolios to 9.6 [SS + OW(10)], 11.8 [SS + OW(5)], and 13.3 [SS + OW(3)]. Although a certain portion of Sharpe ratio benefits are lost due to compulsory diversifications, those strategies also increase the invariance of weighting and benefits, while at the same time expanding the assets chosen in the optimal portfolios. As the upper bounds are increasingly constrained, the variations in the elements of the optimal portfolio diminish. A similar conclusion can also be found in the weighting of the MVP.

13.7 Conclusion

This chapter adds to the current literature by investigating the impact of weighting bounds on the benefits and asset allocation of the globally diversified portfolio. The empirical results suggest that boundaries of weighting, such as short-sale and overweighting, decrease but not completely eliminate the benefits of global investment. Domestic investors in emerging markets, particularly in East Asia and Latin America, benefit more from international diversification. This finding holds even though the global financial market has become increasingly integrated. In addition, more restrictive

investment constraints enhance the feasibility of the optimal strategies. Specifically, some appealing traits for asset management transpire: a reduction in the temporal deviation of diversification benefits, a decrease in time-variation of components in optimal portfolio, and an expansion in the range of comprising assets.

The findings to the issues discussed in this chapter provide useful insights for international asset management professionals. Future research of the benefits of global diversification strategies may apply dynamic asset pricing theory and take into account the demands of hedging market exposure and exchange rate. Chang et al. (2005) examine the demands of market risk hedge and currency exposure hedge in international asset pricing. Chan et al. (1999) and Fleming et al. (2001) confirm the economic value in modeling a variance-covariance matrix when the efficient frontier is formed. Bekaert and Harvey (1995) and Bekaert et al. (2005) document the time-variation of the integration of international financial markets. The purpose of this chapter, however, is to investigate the time-varying international diversification benefits and their changes caused by various investment constraints over the long term. Due to the time-variation in expected return, volatility, and correlation among the international assets, application of conditional or dynamic asset pricing models to parameterize the optimal international diversification is helpful to professionals of asset management.

References

Bae, K., K. Chan, and A. Ng. 2004. "Investibility and return volatility." *Journal of Financial Economics* 71, 239–263.

Beck, T., A. Demirgüç-Kunt, and R. Levine. 2003. "Law, endowments, and finance." *Journal of Financial Economics* 70, 137–181.

Bekaert, G. and C. R. Harvey. 1995. "Time-varying world market integration." *Journal of Finance* 50, 403–444.

Bekaert, G. and C. R. Harvey. 2003. "Emerging markets finance." *Journal of Empirical Finance* 10, 3–56.

Bekaert, G., C. Harvey, and A. Ng. 2005. "Market integration and contagion." *Journal of Business* 78, 39–70.

Bekaert, G. and M. Urias. 1996. "Diversification, integration and emerging market closed-end funds." *Journal of Finance* 51, 835–869.

Bekaert, G., R. Hodrick, and X. Zhang. 2005. *International stock return comovements*, NBER working paper, Columbia Business School, Columbia.

Chan, L. K., J. Karceski, and J. Lakonishok. 1999. "On portfolio optimization: forecasting covariances and choosing the risk model." *Review of Financial Studies* 12, 937–974.

Chang, J., V. Errunza, K. Hogan, and M. Hung. 2005. "An intertemporal international asset pricing model: theory and empirical evidence." *European Financial Management* 11, 218–233.

Chiou, W. 2008. "Who benefits more from international diversification?" *Journal of International Financial Markets, Institutions, and Money* 18, 466–482.

Chiou, W., A. C. Lee, and C. Chang. 2009. "Do investors still benefit from international diversification with investment constraints?" *Quarterly Review of Economics and Finance* 49(2), 448–483.

Cosset, J. and J. Suret. 1995. "Political risk and the benefit of international portfolio diversification." *Journal of International Business Studies* 26, 3013–18.

De Jong, F. and F. A. De Roon. 2005. "Time-varying market integration and expected returns in emerging markets." *Journal of Financial Economics* 78, 583–613.

Demirgüç-Kunt, A. and V. Maksimovic. 1998. "Law, finance, and firm growth." *Journal of Finance* 53, 2107–2137.

De Roon, F. A., T. E. Nijman, and B. J. Werker. 2001. "Testing for mean-variance spanning with short sales constraints and transaction costs: the case of emerging markets." *Journal of Finance* 56, 721–742.

De Santis, G. and B. Gerard. 1997. "International asset pricing and portfolio diversification with time-varying risk." *Journal of Finance* 52, 1881–1912.

Djankov, S., R. La Porta, F. Lopez-de-Silanes, and A. Shleifer. 2003. "Courts." *Quarterly Journal of Economics* 118, 453–518.

Djankov, S., R. La Porta, F. Lopez-de-Silanes, and A. Shleifer. 2008. "The law and economics of self-dealing." *Journal of Financial Economics* 88, 430–465.

Driessen, J. and L. Laeven. 2007. "International portfolio diversification benefits: cross-country evidence from a local perspective." *Journal of Banking and Finance* 31, 1693–1712.

Elton, E. J., M. J. Gruber, S. J. Brown, and W. N. Goetzmann. 2007. *Modern portfolio theory and investment analysis*. Wiley, NJ.

Errunza, V., K. Hogan, and M. Hung. 1999. "Can the gains from international diversification be achieved without trading abroad?" *Journal of Finance* 54, 2075–2107.

Errunza, V., E. Losq, and P. Padmanabhan. 1992. "Tests of integration, mild segmentation and segmentation hypotheses." *Journal of Banking and Finance* 16, 949–972.

Fleming, J., C. Kirby, and B. Ostdiek. 2001. "The economic value of volatility timing." *Journal of Finance* 56, 329–352.

Fletcher, J. and A. Marshall. 2005. "An empirical examination of the benefits of international diversification." *Journal of International Financial Markets, Institutions and Money* 15, 455–468.

French, K. R. and J. M. Poterba. 1991. "Investor diversification and international equity markets." *American Economic Review* 81, 222–226.

Green, R. C. and B. Hollifield. 1992. "When will mean-variance efficient portfolios be well diversified?" *Journal of Finance* 47, 1785–1809.

Harvey, C. 1995. "Predictable risk and returns in emerging markets." *Review of Financial Studies* 8, 773–816.

Jagannathan, R. and T. S. Ma. 2003. "Risk reduction in large portfolios: why imposing the wrong constraints helps." *Journal of Finance* 58, 1651–1683.

La Porta, R., F. Lopez-de-Silanes, A. Shleifer, and R. Vishny. 1998. "Law and finance." *Journal of Political Economy* 106, 1113–1155.

La Porta, R., F. Lopez-de-Silanes, A. Shleifer, and R. Vishny. 2000. "Investor protection and corporate governance." *Journal of Financial Economics* 58, 3–27.

Li, K., A. Sarkar, and Z. Wang. 2003. "Diversification benefits of emerging markets subject to portfolio constraints." *Journal of Empirical Finance* 10, 57–80.

Markowitz, H. 1952. "Portfolio selection." *Journal of Finance* 7, 77–91.

Novomestky, F. 1997. "A dynamic, globally diversified, index neutral synthetic asset allocation strategy." *Management Science* 43, 998–1016.

Obstfeld, M. 1994. "Risk-taking, global diversification, and growth." *American Economic Review* 84, 1310–1329.

Pástor, L. and R. Stambaugh. 2000. "Comparing asset pricing models: an investment perspective." *Journal of Financial Economics* 56, 335–381.

Stulz, R. M. and R. Williamson. 2003. "Culture, openness, and finance." *Journal of Financial Economics* 70, 313–349.

Wang, Z. 1998. "Efficiency loss and constraints on portfolio holdings." *Journal of Financial Economics* 48, 359–375.