

## The Best Market Mixtures for Portfolio Diversification across Markets

**Md Nazmul Hasan Bhuyan**

MBA Candidate

Lamar University

4400 S. Martin Luther King Jr. Parkway, Beaumont, TX 77710

United States of America

**Ruthi Reza**

Economic Section Officer, Embassy of Japan

Plot # 5 & 7 Dutabash Road, Baridhara, Dhaka-1212

Bangladesh

**James Slaydon Ph.D**

Associate Professor of Finance

Department of Economics and Finance

Lamar University

4400 S. Martin Luther King Jr. Parkway, PO Box 10045, Beaumont, TX 77710

United States of America

### Abstract

---

*Choosing the right market mixtures is important for deriving maximum outcome from international diversification. Our research indentified a mixture of emerging and developed markets would provide the maximum diversification benefits for developed market investors based on reward to risk ratio. In addition, domestic frontier market investors should diversify outside the frontier markets to get maximum risk adjusted return. Surprisingly, emerging market investors should include emerging markets only in their portfolio as diversification outside emerging markets would not yield any benefit for the investor group.*

---

**Keywords:** Minimum Variance Portfolio; Reward to Risk Ratio; Risk Parity Portfolio; Equally Weighted Portfolio; and Portfolio Diversification

### 1. Introduction

Portfolio diversification across political boundaries reduces portfolio risk and provides stability in the portfolio performance. Due to globalization, national economies are becoming highly dependent. As a result, national securities markets are increasingly getting highly positively correlated. However, geographical, demographic, technological, political and economic differences among others are still keeping scope for diversification benefit from investing across national boundaries. Accordingly, research on the diversification benefit from international investment got particular interest from different quarters of academic researchers in the past. Harry Markowitz first introduced the concept of portfolio diversification in his modern portfolio theory in 1952. Markowitz demonstrated that higher risk adjusted returns can be achieved from portfolio diversification. DevrajBasu, RoelOomen and Alexander Stremme (2006) found out that presence of predictive information, the use of country specific indicators and dynamically efficient information can make international diversification fruitful. Trevor Thabang and Mokoena (2008) found out that diversification benefits differ depending on the weights of particular markets in the portfolio. Clifford S. Asness, Roni Israelov, and John M. Liew (2011) showed that international diversification rewards in the long run, not in the short run. Clifford S. Asness, Roni Israelov and John M. Liew (2010) also found out that international diversification is beneficial in the long run, not in the short run.

Our research started with the assumption that international diversification will be beneficial in the long run. As shown by previous research, our focus was on which international markets investors should target to get the most diversification benefits.

Our research divided investor groups in three subgroups: emerging market investors, frontier market investors and developed market investors. The authors studied the best mixture of markets for each of the investor groups to get the most diversification benefits.

## 2. Literature Review

Several studies have been carried out to find out diversification benefit from international investments. Previous researches have concluded that international diversification provides superior portfolio performance in the long run.

The concept of portfolio diversification was pioneered by the novel laureate Harry Markowitz in 1952. Markowitz in his “Portfolio Selection” introduced the idea that a diversified portfolio would provide the best possible expected return at its levels of risk. Markowitz named the portfolio as minimum variance portfolio (Markowitz, 1952).

Afterward researchers applied this basic portfolio diversification concept in different areas of securities investment such as different asset categories diversification, regional diversification and international diversification, among others. The authors will discuss some studies carried out in the field of international diversification.

The first research that will be discussed here was done by Devraj Basu, Roel Oomen and Alexander Stremme (2006). Basu, Oomen, and Alexander (2006) in their “International Diversification and Return Predictability: Optimal Dynamic Asset Allocation” used lagged global and local economic indicators to develop optimally diversified international portfolios and studied their performances. Their paper concluded that international diversification can produce large economic benefit in the presence of predictive information. The use of country specific indications in addition to global indicators can improve performance of an optimally diversified international portfolio. In addition, dynamically efficient strategies in contrast to traditional myopically optimal strategies provide better performance at lower costs.

Trevor Thabang Mokoena (2008) in his “To Assess the Diversification Performance of Emerging Market Equity Portfolios” studied diversification benefit of combining United Kingdom and United States equity indices with emerging market indices. The results were that emerging markets provide significant diversification opportunity for United Kingdom and United States equity index concentrated investments and that the extent of diversification benefit depends on the relative weights of developed market (USA and UK) and emerging markets within a portfolio.

Clifford S. Asness, Roni Israelov, and John M. Liew (2011) in their “International Diversification Works (Eventually)” tried to find out the factors that make the difference between short term and long term performance of international diversification. Asness, Israelov and Liew (2011) decomposed the international portfolio returns arising from multiple expansion (or contraction) and returns arising from economic performance. Their paper concluded that in the short run global diversification may disappoint investors because markets tend to crash at the same time period. But over the long run, investors will get significant benefits from international diversification because markets do not tend to crash at the same time.

Clifford S. Asness, Roni Israelov and John M. Liew (2010) in their “International Diversification Works (in the Long Run)” got the same conclusion as Clifford S. Asness, Roni Israelov, and John M. Liew did. Clifford S. Asness, Roni Israelov and John M. Liew concluded that international diversification may not save investors during short term panic or market crashes, but investors will obviously get benefit from international diversification in the long run when economic fundamentals matter for portfolio performance.

R. Clayton Webb (2015) in his “Global Diversification: Is the Only “Free Lunch” in Investing Still Worth It?” compared the performance of US equities with international equities over the last several decades, The paper concluded that investors should make long term global investment to get diversification benefit.

Christopher B. Philips (2014) in his “Global equities: Balancing home bias and diversification” found out non-US equities on average diversified the returns of US equities over time. The paper concluded that a reasonable starting point for globally diversified portfolio is 20% allocation to non-US equities.

Vivek Bhargava; Daniel K. Konku; and D. K. Malhotra (2004) in their “Does International Diversification Pay?” analyzed the returns of Standard & Poor’s Composite 500 (S&P 500); Morgan Stanley Capital International (MSCI) World Index; Europe, Australia, and Far East (EAFE) Index; and the MSCI Europe Index for 22-year period, from 1978 to 2000. The paper concluded that diversification benefits are decreasing because of increasing global financial market integration. They said that investors are still better off making international diversification.

**3. Methodology**

*Data*

In our research, data were for all emerging, developed and frontier countries from the period November 2006 to September 2015. Standard size data as reported by Morgan Stanley Capital International (MSCI) are considered in this analysis. The indices also considered exchange rate issue by converting all the country index data in dollar term. The authors used MSCI country classification standard as at March 6, 2014 for developed, frontier and emerging market lists. Australia and Canada; and Bangladesh, Lithuania, Serbia and Argentina from developed and frontier markets respectively were excluded from the analysis as data for the period stated above were not available. A total of 23 emerging markets, 28 frontier countries and 21 developed countries were identified for the analysis.

*Portfolio Type*

Three basic types of portfolios were formed for the study: emerging market, developed market and frontier market. Different combinations of possible portfolios from the three basic portfolios were also formed. Then, the performances of three basic portfolios and their different combinations are compared and analyzed. The limitation of the portfolio construction is market integration and free movement of capital across different political boundaries, among others. Our study assumes that all markets are fully integrated and capital movement across markets is free.

*Portfolio Construction and Performance Measurement*

The authors constructed portfolios under different portfolio management strategies and compared the performance of each portfolio with other portfolios to identify the most rewarding portfolio diversification.

*1) Minimum Variance Portfolio.* Harry Markowitz (1952) in his “Portfolio Selection” article discussed the benefits of portfolio diversification. In his modern portfolio theory, Markowitz introduced the idea of minimum variance portfolio emphasizing on the correlations among all the constituents securities in a portfolio. The authors used the concept of minimum variance portfolio to form minimum risk portfolio for all the market combinations.

To calculate minimum variance portfolio, the authors used four variables: historical return of each market, standard deviation of each market, correlation between each market pair and covariance’s of each market pair. Holding period return of all the markets was calculated from the historical monthly data.

Holding period return of individual market,  $r_i = \frac{P_1 - P_0}{P_0}$ ..... (i)

Where,

$P_1$  =Index level at the end of the period and

$P_0$  = Index level at the beginning of the period.

Portfolio return is the weighted average holding period return of all the constituents markets.

Portfolio return  $r_p = \sum w_i r_i$ .....(ii)

Where,

$w_i$  =Weight of the market i in the portfolio and

$r_i$  = Holding period return of the individual market in the portfolio.

Markowitz used total risk in his minimum variance portfolio. Total risk includes both systematic and non-systematic risk. Standard deviation is a measure of total risk.

Variance of each market,  $\sigma^2_i = \sum_{i=1}^n \frac{(r_i - \bar{r})^2}{n-1}$ .....(iii)

Where,

$r_i$  = Holding period return of each market;

$\bar{r}$  = Average monthly return of each market;

$n$  =Number of periods in the data set.

Standard deviation of each market,  $\delta_i = \sqrt{\sigma_i^2}$ .

Overall portfolio risk is a function of standard deviation of each market and covariance between each market pair.

Standard deviation of a portfolio:

$$\sigma_p = \sqrt{\sum_{i=1}^n \sigma_i^2 w_i^2 + \sum_{i=1}^n \sum_{j=1}^n w_i w_j \sigma_i \sigma_j \text{Corr}(r_i r_j)} \dots \dots \dots \quad (\text{iv})$$

Where,

$w$ = weight of individual market,

$\sigma$  = standard deviation of individual market and

$\text{Corr}(r_i r_j)$  = Correlation between market  $i$  and market  $j$ .

2) *Maximum Reward Portfolio*. The reward to risk ratio to measure and compare the relative risk adjusted performance of all portfolio was employed. The concept to form maximum reward per unit of risk portfolios was used. Reward to risk ratio is the percentage of return per unit of risk taken in a specific time period.

Reward to risk ratio =  $\frac{r_p}{\sigma_p}$ .....(v)

3) *Risk Parity Portfolio*. Dr. Edward Qian, CFA first introduced the concept of risk parity portfolio in 2005. Risk parity focuses on risk allocation rather than capital allocation. Risk parity portfolio adjusts asset allocations to the same level of risk. This kind of portfolio provides better cushion in market downturn than the traditional portfolio. The authors used the strategy to form portfolios for all the market combinations in the study.

Two factors are important in forming a risk parity portfolio: the first is contribution to portfolio risk and the second is risk weight. The authors used standard deviation as a measure of risk. Contribution to total risk is the contribution of market  $i$  to the total risk of the portfolio. Risk weight is the weight of the contribution of risk of each market in respect with overall portfolio risk.

Contribution to portfolio risk =  $W_i \times \frac{\Delta\delta_p}{\Delta W_i}$ .....(vi)

Where,

$W_i$  = Weight of each market;

$\Delta\delta_p$  = change in total portfolio risk; and

$\Delta W_i$  = change in the weight of each market.

4) *Equal Weighted Portfolio*. Equal weighted portfolio allocates capital equally for all markets under a portfolio in this study. Equally weighted portfolio is a contrarian strategy which performs well in market reversal.

**4. Research Outcome and Interpretation**

*Minimum variance portfolio performance*

From table 1, we can see that emerging portfolio generated 0.08 units of return per unit of risk, the highest among all portfolios. Developed portfolio underperformed emerging markets during the same time period, generating only 0.04 units of reward per unit of risk. The combined portfolio of developed and emerging markets yielded almost the same reward per unit of risk as developed portfolio did. Frontier market portfolio was the most losing portfolio generating negative reward per unit of risk. Diversifying frontier market portfolio with either of emerging markets and developed markets increased reward per unit of risk for frontier market investors. International portfolio had the lowest risk among all the portfolios, but it generated negative return over the same time period.

*Maximum reward to risk portfolio performance*

As shown in table 2, developed and frontier market investors generated higher return with the lower level of risk by including emerging markets in their portfolios. However, emerging market portfolio generated almost the same reward per unit of risk as combined portfolio of emerging and developed market did. The combined portfolio of emerging and developed market generated reward to risk ratio of 0.164 vs. 0.161 of its most nearest portfolio (emerging market). Frontier market portfolio once again the worst performer among the three standalone market portfolios. Frontier market investors gained the most by diversifying their portfolios outside frontier markets.

### *Risk parity portfolio performance*

Risk parity portfolio performance showed that emerging market portfolio generated the highest reward (0.04) per unit of risk among all portfolios. Emerging market investors lost reward from diversification with other markets as indicated by lower reward to risk ratio of any combination of emerging markets with other markets. Developed market investors gained from diversification with emerging markets only (0.01 reward to risk ratio of developed market vs. 0.03 reward to risk ratio of combined portfolio of emerging and developed markets). Frontier market investors benefitted from investing across different emerging, frontier and developed markets as indicated by improved reward per unit of risk in any combination of frontier and other markets.

### *Equally Weighted Portfolio*

Equally risk weighted portfolio is contrarian, as it takes advantage of market reversal. Emerging portfolio was the top performer among all the portfolios, yielding 0.33 units of reward per unit of risk. Emerging market investors lost portfolio reward when they included other markets in their core portfolios. Developed market investors failed to generate any reward, using the portfolio management strategy. Even frontier market investors made negative reward from using the strategy. Developed market investors gained from portfolio diversification with emerging markets only. Frontier market investors made increased reward from diversifying outside frontier markets.

### *Market Combinations for Diversification Benefits*

In summary, all the four portfolio management strategies suggested that frontier market investors will be benefited from combining their portfolio with any combination of emerging, developed and international markets. Our research also found out that emerging market investors should limit their portfolio holding within emerging markets to get maximum reward per unit of risk. Developed market investors will be benefited from diversifying their portfolio among developed and emerging markets as indicated by all the four portfolio management strategies. Only minimum variance strategy indicated that developed market investors can confined their portfolios to the developed markets only. As most of the other strategies indicated that developed market investors should diversify their portfolio with emerging markets, our research will accept the best case.

## **5. Conclusion**

Diversification across international markets is highly followed for risk reduction in the securities investment. It is highly assumed that international security markets are not highly correlated. Accordingly, an investor can get risk diversification benefit from international diversification. However, investors would only be tempted to invest internationally, if they get sufficient risk adjusted return. Our research found out that developed market investors should diversify their portfolios with emerging markets only to get maximum diversification benefits. Our research also found out that frontier market investors should diversify their portfolio with any of the emerging, developed and international markets to increase risk adjusted return of their portfolio. However, our study found out that emerging market investors should constrain their portfolio within emerging markets as they will not get any diversification benefits from investing outside emerging markets.

## References

- Asness, C. S., Israelov, R., & Liew, J. M. (2011). International Diversification Works (Eventually). *Financial Analysts Journal*, 67 (3).
- Asness, C. S., Israelov, R., & Liew, J. M. (2010). *International Diversification Works (in the Long Run)*. AQR Capital Management, LLC.
- Basu, D., Oomen, R., & Stremme, A. (2006). *International Diversification and Return Predictability: Optimal Dynamic Asset Allocation*. WARWICK.
- Bhargava, V., Konku, D. K., & Malhotra, D. K. (2004). *Does International Diversification Pay?* Association for Financial Counseling and Planning Education.
- Christopher B. Philips, C. (2014). *Global equities: Balancing home bias and diversification*. Vanguard research.
- Hurst, B., Bryan W. Johnson, C., & Ooi, a. Y. (2010). *Understanding Risk Parity*. Retrieved from AQR Capital Management:  
file:///C:/Users/MdNazmulHasan/Downloads/AQR%20Understanding%20Risk%20Parity.pdf
- Investopedia. (n.d.). *Herfindahl-Hirschman Index - HHI*. Retrieved from Investopedia:  
http://www.investopedia.com/terms/h/hhi.asp
- Markowitz, H. (1952). Portfolio Selection. *The Journal of Finance*, Vol. 7 (1), 77-91.
- Markowitz, H. (1952). Portfolio Selection. *Journal of Finance*, 77-91.
- Mokoena, T. T. (2008). *To Assess the Diversification Performance of Emerging Market Equity Portfolios*. Gordon Institute of Business Science, University of Pretoria.
- MSCI. (2015). *End of the day index data search*. Retrieved from MSCI: <https://www.msci.com/end-of-day-data-search>
- MSCI. (2014, March 6). *MSCI Country Classification Standard*. Retrieved from MSCI:  
<https://www.msci.com/documents/10199/2c8ba380-f990-4efe-8532-500307e046ee>
- PANAGORA. (2015). *PanAgora*. Retrieved from Edward Qian, Ph.D., CFA:  
<https://www.panagora.com/people/edward-qian/>
- R. Clayton Webb, I. C. (2015). *Global Diversification: Is the Only "Free Lunch" in Investing Still Worth It?* US bank.

Table 1: Minimum Variance Portfolio Performance

	Return	Risk	Reward to Risk Ratio
Emerging Market	0.42%	5.06%	0.08
Developed Market	0.18%	4.10%	0.04
Frontier Market	-0.12%	3.55%	-0.04
International Market	-0.10%	3.26%	-0.03
Emerging + Developed Market	0.18%	4.07%	0.04
Frontier + Developed Market	-0.10%	3.26%	-0.03
Frontier + Emerging Market	-0.08%	3.51%	-0.02

Table 2: Maximum Reward to Risk Portfolio Performance

	Return	Risk	Reward to Risk Ratio
Emerging Market	0.95%	5.87%	0.16
Developed Market	0.83%	6.73%	0.12
Frontier Market	0.62%	6.10%	0.10
International Market	0.92%	6.10%	0.15
Frontier + Developed Market	0.83%	6.73%	0.12
Frontier + Emerging Market	0.98%	6.75%	0.15
Emerging + Developed Market	0.93%	5.68%	0.16

Table 3: Risk Parity Portfolio Performance

	Return	Risk	Reward to Risk Ratio
Emerging Market	0.28%	6.60%	0.04
Developed Market	0.04%	5.76%	0.01
Frontier Market	-0.20%	4.59%	-0.04
International Market	0.01%	5.20%	0.00
Frontier + Developed Market	-0.10%	4.82%	-0.02
Frontier + Emerging Market	0.00%	5.17%	-0.00
Emerging + Developed Market	0.16%	6.02%	0.03

Table 4: Equally Weighted Portfolio Performance

	Return	Risk	Reward to Risk Ratio
Emerging Market	0.22%	6.88%	0.33
Developed Market	0.01%	6.09%	0.00
Frontier Market	-0.24%	5.20%	-0.05
International Market	0.00%	5.80%	-0.00
Emerging + Developed Market	0.12%	6.36%	0.02
Frontier + Developed Market	-0.12%	5.41%	-0.02
Frontier + Emerging Market	-0.01%	5.83%	-0.00

Table 5: Matrix of Best Market Mixtures for Diversification Benefits

	<b>Frontier Market</b>	<b>Emerging Market</b>	<b>Developed Market</b>	<b>International Market</b>
<b>Frontier Market Investors</b>		1.Minimum Variance 2.Maximum Reward to Risk 3. Risk Parity 4.Equally Weighted	1.Minimum Variance 2.Maximum Reward to Risk 3. Risk Parity 4.Equally Weighted	1.Minimum Variance 2.Maximum Reward to Risk 3. Risk Parity 4.Equally Weighted
<b>Emerging Market Investors</b>		1.Minimum Variance 2.Maximum Reward to Risk 3. Risk Parity 4.Equally Weighted		
<b>Developed Market Investors</b>		1.Minimum Variance 2.Maximum Reward to Risk 3. Risk Parity 4.Equally Weighted	1.Minimum Variance	

**Appendix**

## Appendix 1: Emerging, Frontier and Developed Market Lists

<b>Emerging Markets</b>	<b>Frontier Markets</b>	<b>Developed Markets</b>
Brazil	Bahrain	Austria
Chile	Bosnia	Belgium
China	Botswana	Denmark
Colombia	Bulgaria	Finland
Czech Republic	Croatia	France
Egypt	Estonia	Germany
Greece	Ghana	Hong Kong
Hungary	Jamaica	Ireland
India	Jordan	Israel
Indonesia	Kazakhstan	Italy
Korea	Kenya	Japan
Malaysia	Kuwait	Netherlands
Mexico	Lebanon	New Zealand
Peru	Mauritius	Norway
Philippines	Morocco	Portugal
Poland	Nigeria	Singapore
Qatar	Oman	Spain
Russia	Pakistan	Sweden
South Africa	Palestine	Switzerland
Taiwan	Romania	United Kingdom
Thailand	Saudi Arabia	United States
Turkey	Slovenia	
United Arab Emirates	Sri Lanka	
	Trinidad and Tobago	
	Tunisia	
	Ukraine	
	Vietnam	
	Zimbabwe	

*Source: (MSCI, 2014)*