

# AN EMPIRICAL STUDY OF REGIONAL MUTUAL FUNDS' DIVERSIFICATION VALUE

JAVIER RODRÍGUEZ <sup>1\*</sup>

1. University of Puerto Rico, Río Piedras Campus, San Juan

\* Corresponding Author: Javier Rodríguez, Graduate School of Business Administration, University of Puerto Rico, Río Piedras Campus, PO Box 23332, San Juan, PR 00931  
☎ +00 (7) 8 776 4000 ✉ [javier.rodriguez19@upr.edu](mailto:javier.rodriguez19@upr.edu)

**Abstract:** This article studies three samples of United States-based regional mutual funds from the Asia-Pacific, Europe, and Latin America, to assess whether higher fund diversification translates into higher diversification values to fund shareholders. To measure mutual funds' portfolio diversification, we implement a modified Herfindahl index. To assess diversification values we employ a methodology that considers the Sharpe ratio of funds and its correlation with existent portfolios. We find that Asian-Pacific funds are the most diversified, whereas European funds provide the highest diversification value to fund shareholders. The correlation between fund diversification and diversification value is positive only in the case of Asian-Pacific funds.

**Keywords:** regional mutual funds; diversification value; portfolio diversification; Herfindahl index

## 1. Introduction

Business literature praises international diversification. Early studies show that United States (US) investors can attain a high diversification value by investing in emerging markets (Harvey, 1995), multinational firms (Rowland & Tesar, 1998), country funds, and American Depository Receipts ("ADRs") (Errunza, Hogan & Hung, 1999). Despite higher market integration and a reduction of investment barriers, international diversification values are still significant. Driessen and Laeven (2007) report that there exist significant diversification benefits for investors in both, developed and developing countries. However, these benefits are larger for investors in developing countries. Chiou (2009) demonstrates that even after monitoring portfolio constraints, international investments could generate economic value.

In their quest for international diversification, US investors may use securities issued by foreign corporations. However, this practice may not be cost-effective due to the capital required to adequately diversify their portfolios across many investments in the region. Additionally, some foreign markets are not even accessible to individual investors. Investors may also indirectly invest in foreign markets through investment companies. The four most common types of investment companies in the United States are open-end mutual funds, exchange traded funds, closed-end mutual funds, and unit investment trusts; where open-end mutual funds are the most widespread.

In its 2014 annual report, the Investment Company Institute ("ICI") stated that total net assets in mutual funds amounted to over \$15 trillion. Whereas assets in exchange traded

funds, closed-end mutual funds, and unit investment trusts totaled \$1.7 trillion, \$279 billion, and \$87 billion respectively. In fact, 46.3 percent of all US households own an US-based open-end mutual fund, which suggests that they are the main vehicle where investors gain access to international markets. In 2013, international mutual funds' assets reached \$2.1 trillion or 14 percent of the US mutual funds industry's total assets.

US-based international mutual funds include geographically speaking, well-diversified funds, as well as strictly constrained funds. For instance, foreign funds primarily invest in foreign securities while maintaining a limited amount of assets in the US, whereas regional funds manage portfolios with securities from a particular geographical region. Regional mutual funds usually invest in at least 80 percent of their portfolios in securities from a certain geographical area.

An under-researched issue that is central to this investigation is the analysis of regional funds' diversification value to fund shareholders. In addition to good performance, investors may benefit from adding mutual funds to their portfolios if new funds increase investors' overall diversification. The higher the diversification, the smoother or less volatile investors' overall investment portfolio returns will be.

In this study, we examine the diversification value of US-based regional mutual funds that invest in Asia-Pacific, Europe, and Latin America (the "Study Regions"). We study the funds' diversification value by analyzing their exposure across countries in their region and determining whether these funds' diversification benefits fund shareholders. Specifically, we ask the following question: does higher portfolio fund diversification translate into better diversification to fund shareholders? To the best of our knowledge, this issue has not yet been addressed in the literature pertaining to US-based regional mutual funds.

## 2. Literature Review

The literature on US-based regional mutual funds is quite limited. Some studies on United international mutual funds' risk-adjusted performance include regional funds as a sample (Babalos, Mamatzakis & Matousek, 2015; Basu & Huang-Jones, 2015; Tkac, 2001). Regarding European funds, the literature is constrained to a few studies that are solely devoted to these funds (Engstrom, 2003; Pushner, Rainish & Coogan, 2001; Papadamou & Stephanides, 2004; Rodriguez, 2008). For instance, Engstrom (2003) addresses European mutual funds' diversification value for international investors. Pushner, Rainish, & Coogan (2001) study European funds' performance during 1986 to 1998, finding that their sample underperformed when benchmarked with the MSCI European Index. Papadamou and Stephanides (2004) examine European mutual funds from a risk management perspective. Implementing various versions of Value at Risk ("VAR") and expected tail loss models, they find that either models' efficacy primarily depends on funds' investing style. Rodriguez (2007), however, focus on European mutual funds' forecasting ability by examining attribution returns, finding evidence of positive performance and good forecasting skill.

Many studies on emerging markets' mutual funds include Latin American funds as part of their samples (Borensztein & Gelos, 2003; Kaminsky, Lyons & Schumukler, 2001). Kaminsky, Lyons, and Schumukler (2001) is one of the few studies which are solely devoted to these mutual funds. They analyze a sample of open-end Latin American mutual funds and present momentum trading by both investors and fund managers. They also find contagion trading, like the systematic selling (or buying) of stocks in one country when the stock market falls (or rises) in another. Rodriguez (2007) study Latin

American funds' forecasting abilities during 1999 to 2003, to find good forecasting ability and positive risk-adjusted performance; which are saved for crises wherein forecasting ability is quite poor.

Only a few studies focus on Asia-Pacific mutual funds. For instance, DeMasky, Dellva, and Heck (2003) study the efficiency and effect of hedging currency risk by United States-based Asia-Pacific funds, showing that hedging improves these funds' risk-adjusted performance.

### 3. Data and Methodology

#### 3.1 Data

This study focuses on United States-based Asia-Pacific, European, and Latin American mutual funds' diversification value during 2004 to 2014 (the "Study Period"). The samples include US-based Asian-Pacific, European, and Latin American mutual funds as identified in the Center for Research in Security Prices Survivorship-Bias-Free U.S. Mutual Fund Database ("CRSP"). We extracted funds' data as well as monthly returns from CRSP. For fund families with multiple classes of the same fund, that is, the same portfolio, we only include the fund class with the longest history in the sample. To be included in the study, a fund must have had at least 36 consecutive months of return data. To avoid the survivorship bias problems presented in Elton, Gruber, and Blake (1996), we include surviving and non-surviving funds in all analyses.

Table 1 provides the samples' descriptive statistics. The samples are 21 Asian-Pacific, 31 European, and 11 Latin American funds (each referred to as the "Asian-Pacific Sample," the "European Sample," and the "Latin American Sample," respectively, and collectively as the "Samples"). Based on median values, the European Sample contains the most total net assets (107.7 million), followed by the Asian-Pacific (36.43 million) and Latin American (27.14 million) Samples. Concerning expense ratio, the Latin American Sample exhibits the largest median value (1.64 percent), followed by the Asian-Pacific (1.58 Percent) and European (1.49 percent) Samples. Comparing Samples' median turnover ratio, the European Sample has the highest (88.3 percent), followed by the Asian-Pacific (74.2 percent) and Latin American (53.6 percent) Samples.

**Table 1: Fund Samples Descriptive Statistics**

Panel A: Asia-Pacific (21 funds)					
	Mean	Std. Dev.	Median	Minimum	Maximum
Total net assets	309.3438	606.2064	36.4375	0.675	2423.264
Expense Ratio	0.0164	0.0048	0.0158	0.009	0.0252
Turnover Ratio	0.7584	0.4216	0.7418	0.1763	1.7743

Panel B: Europe (31 funds)					
	Mean	Std. Dev.	Median	Minimum	Maximum
Total net assets	281.0163	447.7072	107.7	2.15	2178.618
Expense Ratio	0.014872	0.0044	0.0149	0.0084	0.0275
Turnover Ratio	1.1082	1.3337	0.8827	0.0563	7.78

Panel C: Latin America (11 funds)					
	Mean	Std. Dev.	Median	Minimum	Maximum
Total net assets	508.214	913.5466	27.14	0.7333	2701.473
Expense Ratio	0.0163	0.003	0.0164	0.0105	0.0221
Turnover Ratio	0.6805	0.5773	0.5364	0.1033	2.27

To estimate the various metrics employed in this study, we extracted country indexes' monthly returns from Morgan Stanley Capital International Index ("MSCI") through Bloomberg. In the end, we included a total of 29 MSCI country indexes in the ensuing analysis. To estimate the cash portion of funds' portfolios, we use the Fama-French risk-free rate.<sup>1</sup> We include the risk-free rate for each Sample as funds' cash holdings.

### 3.2 Methodology

To measure mutual funds' portfolio diversification across countries in the region, we implement a modified Herfindahl index (Woerheide & Persson, 1993). Out of five metrics used by Woerheide and Persson (1993) to measure unevenly distributed stock portfolios' diversification, the Herfindahl index was the most effective. Although mainly applied to measure the concentration of companies within an industry, the Herfindahl index has proved quite versatile. For instance, Hayden, Porath, and Westernhagen (2007) use it to measure portfolio diversification of individual loans of German banks, and more recently Cressy, Malipiero, and Murani (2014) utilize it to study venture capital firms' portfolios. In this study, we define the modified Herfindahl as:

$$DI = 1 - HI = 1 - \sum_{i=1}^n w_i^2$$

Where:

$DI$  = diversification index or a measure of mutual funds' diversification;

$HI$  = Herfindahl index; and

$w$  = exposure to each country in the region where funds invest.

$DI$  ranges between zero and one. The larger the value, the larger funds' diversification.

---

<sup>1</sup> Available at [http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data\\_library.html](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html).

We implement Sharpe's (1992) style analysis to estimate portfolio exposure to countries in each geographical region based on publicly available daily fund returns. To implement Sharpe's style analysis, we express fund returns as:

$$r_i = \sum_{j=1}^n w_{i,j} r_j + e_i \quad (1)$$

Where:

$r_i$  = total return of fund  $i$ ;

$w_{i,j}$  = exposure of fund  $i$  to country index  $j$ ;

$r_j$  = total return of country index  $j$ ; and

$e_i$  = unexplained component of funds' returns.

The portfolio weights are the solution of a quadratic programming problem. These weights represent factor loadings on an index strategy that best explains funds' return:

$$\text{Min} \left[ \text{var} \left( r_i - \sum_{j=1}^n w_{i,j} r_j \right) \right] \quad (2)$$

subject to:

$$1 \leq w_{i,j} \leq 0 \quad \forall j$$

$$\sum_{j=1}^n w_{i,j} = 1$$

Style analysis helps compute active fund managements' value.<sup>2</sup> All countries we include in the style analysis are also included in each MSCI regional index. The Asian-Pacific countries included are: Australia, China, Hong Kong, India, Indonesia, Japan, Malaysia, New Zealand, Singapore, South Africa, South Korea, Taiwan, and Thailand; the European countries are: Austria, Belgium, Denmark, France, Germany, Italy, Spain, Sweden, Switzerland, and the United Kingdom; and the Latin American countries are: Argentina, Brazil, Chile, Colombia, Mexico, and Peru.

After estimating portfolios' fund diversification, we gauge diversification values provided to fund shareholders. To that end, we employ a methodology first introduced by Elton, Gruber, and Rentzler (1987). The underlying assumption for their approach is that a mutual fund should be added to an existing portfolio if its Sharpe ratio exceeds the product of the return correlation of the mutual fund with the existing portfolio and the Sharpe ratio of the existing portfolio. Namely, a mutual fund should be added to an existent portfolio if the following condition holds:

---

<sup>2</sup> Examples include Dor et al. (2003), Comer (2006) and Rodríguez (2008).

$$\frac{\bar{r}_i - r_f}{\sigma_i} > \left( \frac{\bar{r}_P - r_f}{\sigma_P} \right) \rho_{iP} \quad (3)$$

Where:

$\bar{r}_i$  = fund's average monthly return,

$r_f$  = monthly risk-free rate,

$\sigma_i$  = standard deviation of fund  $F$ ,

$\bar{r}_P$  = average monthly return of the existing portfolio,

$\sigma_P$  = standard deviation of portfolio  $P$ ; and

$\rho_{iP}$  = correlation coefficient between fund  $i$  and portfolio  $P$ .

We measure diversification value provided to fund shareholders as the difference between the ratios (left minus right).

Polwitoon and Tawatnuntachai (2006) and Shen, Lu, and Lin (2012) also study mutual funds' diversification value by implementing Elton et al.'s (1987) methodology. The former examined global bond funds, whereas the latter considered international real estate mutual funds. Following Polwitoon and Tawatnuntachai's (2006) approach to examine regional funds' incremental diversification value, we utilize index funds to represent typical portfolios of United States-based mutual fund investors. Index funds rather than index benchmarks, represent a better proxy of investors' portfolios, as funds account for expenses. To measure the portfolio of a typical United States investors we use Vanguard 500 index mutual fund.

#### 4. Empirical Results

First, we estimate funds' exposure to all countries in each study region during the study period. Table 2 shows these results. Panel A of this table shows the Asian-Pacific Sample's average exposure. These funds exhibit the highest exposure to Japan (14.08 percent), followed by Hong Kong (13.93 percent), and Thailand (13.86 percent). Panel B presents the European Sample's average exposure. This Sample is primarily exposed the United Kingdom (23.56 percent), Germany (23.13 percent), and Austria (20.64 percent). Panel C shows the Latin American Sample's exposure. This Sample is mainly exposed to Brazil (48.47 percent), Mexico (28.85 percent), and Colombia (6.16 percent). Table 2 includes the adjusted R2 for the Sharpe estimation, indicating that this estimation was effective for all three Samples as it explains between 92 and 99 percent of regional mutual funds' return variation.

We now turn to the crux of the study. We estimated regional mutual funds' diversification value via a modified Herfindahl index. Table 3 provides descriptive statistics of fund diversification and diversification value provided to fund shareholders. Panel A shows the Asian-Pacific Sample results. The Asian-Pacific Sample's portfolio diversification is high as the average and median DI (diversification index) are 0.8193 and 0.8237, respectively. However, the average diversification value provided to fund shareholders is -0.0359, meaning that, on average the Asian-Pacific Sample failed to provide diversification value to shareholders. Moreover, only nine funds of this Sample

provided diversification value to fund shareholders; that is, only nine funds exhibited a positive Elton et al. diversification measure (Equation 3; the "Diversification Measure"). Finally, we find a low, but positive correlation (0.3214) between funds' diversification and the diversification value provided to Asian-Pacific shareholders during the Study Period, suggesting that higher fund diversification translates to a higher diversification value to fund shareholders.

**Table 2: Mutual Funds Country Exposure**

Panel A: Asia-Pacific		Panel B: Europe		Panel C: Latin America	
Country	Exposure	Country	Exposure	Country	Exposure
Australia	6.44%	Austria	20.64%	Argentina	1.01%
China	11.46%	Belgium	4.93%	Brazil	48.47%
Hong Kong	13.93%	Denmark	1.00%	Chile	5.87%
India	4.29%	France	3.40%	Colombia	6.16%
Indonesia	6.95%	Germany	23.13%	Mexico	28.85%
Japan	14.08%	Italy	2.18%	Peru	3.59%
Malaysia	0.56%	Spain	12.47%	Cash	6.05%
New Zealand	0.00%	Sweden	6.87%		
Singapore	10.71%	Switzerland	0.00%		
South Africa	6.65%	United Kingdom	23.56%		
South Korea	3.90%	Cash	1.81%		
Taiwan	5.49%				
Thailand	13.86%				
Cash	1.67%				
Ave. Adjusted r2	0.95	Ave. Adjusted r2	0.92	Ave. Adjusted r2	0.99

Table 3, Panel B presents the European Sample results. The average and median fund diversification are 0.737 and 0.7518, respectively. Overall, European funds offered diversification value, as the average diversification value to fund shareholders is 0.0086. Also, 15 out of 31 European funds showed a positive Diversification Measure. However, we find that high fund diversification means lower diversification value to fund shareholders, as the correlation between these two measures is -0.1425.

Finally, Panel C shows the Latin American Sample results. The average fund diversification (DI) is 0.6005, whereas the median is 0.5848. Regarding diversification value to fund shareholders, this sample fell short as its average Diversification Measure is -0.1157, and only five funds provided diversification value to fund shareholders. As in the European Sample, the correlation between fund diversification and diversification value to fund shareholders is negative (-0.612).

**Table 3: Mutual Fund Diversification and Diversification Value To Investors**

Panel A: Asia-Pacific (21 funds)	Mean	Std. Dev.	Median	Minimum	Maximum
Fund Diversification	0.8193	0.0612	0.8237	0.6474	0.8868
Diversification Value	-0.0359	0.1156	-0.0203	-0.2686	0.2359
Correlation	0.3214				

<b>Panel B: Europe (31 funds)</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Median</b>	<b>Minimum</b>	<b>Maximum</b>
Fund Diversification	0.7370	0.0625	0.7518	0.5020	0.8344
Diversification Value	0.0086	0.0985	-0.0051	-0.2011	0.2538
Correlation	-0.1425				

<b>Panel C: Latin America (11 funds)</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Median</b>	<b>Minimum</b>	<b>Maximum</b>
Fund Diversification	0.6005	0.0843	0.5848	0.4916	0.7368
Diversification Value	-0.1157	0.2090	-0.0501	-0.4522	0.2182
Correlation	-0.6120				

## 5. Conclusion

This study examines the diversification level of three Samples of US-based regional mutual funds, and diversification value these funds provided to fund shareholders. To measure fund diversification, we employ a modified Herfindahl index. To determine diversification value provided to fund shareholders we used a methodology based on Elton et al. (1987).

Results show that the Asian-Pacific Sample has the highest portfolio diversification, but does not provide diversification value to fund shareholders. Nevertheless, the correlation between fund diversification and diversification value provided to fund shareholders is positive. In the case of the European Sample, fund diversification is lower than that of the Asia-Pacific Sample, but diversification value provided to fund shareholders is higher. However, the correlation between the two is negative.

Overall, the Latin American Sample was the less diversified, and as the Asia-Pacific Sample, it did not provide diversification value to fund shareholders. However, as in the case of the European Sample, the Latin American Sample's fund diversification is associated with lower diversification value to fund shareholders.<sup>3</sup>

---

## References

Babalos, Vassilios, Emmanuel C. Mamatzakis, and Roman Matousek. "The performance of US equity mutual funds." *Journal of Banking & Finance* 52 (2015): 217-229.

Basu, Anup K., and Jason Huang-Jones. "The performance of diversified emerging market equity funds." *Journal of International Financial Markets, Institutions and Money* 35 (2015): 116-131.

---

<sup>3</sup> The author would like to acknowledge the support provided by the Business Administration Faculty of the University of Puerto Rico, Río Piedras Campus, through the 2015 Summer Research Initiatives Program.



- Borensztein, Eduardo, and R. Gaston Gelos. "A panic-prone pack? The behavior of emerging market mutual funds." *IMF Staff papers* (2003): 43-63.
- Chiou, Wan-Jiun Paul. "Benefits of international diversification with investment constraints: An over-time perspective." *Journal of Multinational Financial Management* 19.2 (2009): 93-110.
- Comer, George. "Hybrid Mutual Funds and Market Timing Performance\*." *The Journal of Business* 79.2 (2006): 771-797.
- Cressy, Robert, Alessandro Malipiero, and Federico Munari. "Does VC fund diversification pay off? An empirical investigation of the effects of VC portfolio diversification on fund performance." *International Entrepreneurship and Management Journal* 10.1 (2014): 139-163.
- Dor, Arik Ben, Ravi Jagannathan, and Iwan Meier. "Understanding mutual fund and hedge fund styles using return-based style analysis." *Journal of Investment Management* 1.1 (2003): 94-134.
- DeMaskey, Andrea L., Wilfred L. Dellva, and Jean L. Heck. "Benefits from Asia-Pacific mutual fund investments with currency hedging." *Review of quantitative finance and accounting* 21.1 (2003): 49-64.
- Driessen, Joost, and Luc Laeven. "International portfolio diversification benefits: Cross-country evidence from a local perspective." *Journal of Banking & Finance* 31.6 (2007): 1693-1712.
- Engström, Stefan. "Costly information, diversification and international mutual fund performance." *Pacific-Basin Finance Journal* 11.4 (2003): 463-482.
- Elton, Edwin J., Martin J. Gruber, and Joel C. Rentzler. "Professionally managed, publicly traded commodity funds." *Journal of Business* (1987): 175-199.
- Elton, Edwin J., Martin Jay Gruber, and Christopher R. Blake. "Survivor bias and mutual fund performance." *Review of Financial Studies* 9.4 (1996): 1097-1120.
- Errunza, Vihang, Ked Hogan, and Mao-Wei Hung. "Can the gains from international diversification be achieved without trading abroad?." *The Journal of Finance* 54.6 (1999): 2075-2107.
- Gelos, Gaston, and Eduardo Borensztein. *A panic-prone pack? The behavior of emerging market mutual funds*. No. 0-198. International Monetary Fund, 2000.
- Harvey, Campbell R. "Predictable risk and returns in emerging markets." *Review of Financial studies* 8.3 (1995): 773-816.
- Hayden, Evelyn, Daniel Porath, and Natalja V. Westernhagen. "Does diversification improve the performance of German banks? Evidence from individual bank loan portfolios." *Journal of Financial Services Research* 32.3 (2007): 123-140.
- Kaminsky, Graciela, Richard Lyons, and Sergio Schmukler. *Mutual fund investment in emerging markets: An overview*. Springer US, 2001.

- Papadamou, Stephanos, and George Stephanides. "Evaluating the style-based risk model for equity mutual funds investing in Europe." *Applied Financial Economics* 14.10 (2004): 751-760.
- Polwitoon, Sirapat, and Oranee Tawatnuntachai. "Diversification benefits and persistence of US-based global bond funds." *Journal of Banking & Finance* 30.10 (2006): 2767-2786.
- Pushner, George, Robert Rainish, and Diane Coogan. "Performance of European focused mutual funds." *American Business Review* 19.1 (2001): 39.
- Rodríguez, Javier. "A Portfolio's Country Exposure Management: The Case of Latin American Mutual Funds." *Emerging Markets Finance and Trade* 43.2 (2007): 5-18.
- Rodríguez, Javier. "European mutual funds and portfolio's country exposure: does active management add value?" *Applied Financial Economics* 18.8 (2008): 683-689.
- Rowland, Patrick F., and Linda L. Tesar. *Multinationals and the gains from international diversification*. No. w6733. National bureau of economic research, 1998.
- Sharpe, William F. "Asset allocation: Management style and performance measurement." *The Journal of Portfolio Management* 18.2 (1992): 7-19.
- Shen, Yang-pin, Chiuling Lu, and Zong-Han Lin. "International real estate mutual fund performance: diversification or costly information?" *The Journal of Real Estate Finance and Economics* 44.3 (2012): 394-413.
- Tkac, Paula A. "The performance of open-end international mutual funds." *Economic Review-Federal Reserve Bank of Atlanta* 86.3 (2001): 1-18.
- Woerheide, Walt, and Don Persson. "An index of portfolio diversification." *Financial Services Review* 2.2 (1993): 73-85.