

Risks, Returns, and Portfolio Diversification Benefits of Country Index Funds in Bear and Bull Markets

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Abstract: In this paper, we study the risk-return performance of 23 Ishares country index funds in the U.S. during the May 19, 2008-March 9, 2009 bear market and the March 9, 2009-January 19, 2010 bull market. Our findings with the Sharpe and Treynor portfolio performance measures indicate that the Malaysia, Japan, U.S., and Switzerland country index funds had the best performance in both markets. The statistics indicate that, in terms of loss recovery from the bear market to the bull market, the Malaysia, Singapore, South Africa, and Australia funds had the best performance and the Belgium, Austria, Italy, and Germany funds had the worst performance. Exchange-traded country index funds make it easy for investors to achieve global diversification. Our findings with the PCA (Principal Components Analysis) methodology indicate that investors had more global diversification opportunities in the March 9, 2009-January 19, 2010 bull market than in the May 19, 2008-March 9, 2009 bear market.

Keywords: Risk and return, Portfolio diversification, Country index funds, Bear and bull markets

JEL Classification: G11, G12, G15

1. Introduction

The U.S. stock market experienced one of the worst bear markets in its history from May 19, 2008 to March 9, 2009. U.S. stocks lost about 52.6% of their value during this period. The S&P 500 Index decreased from 1,426.63 on May 19, 2008 to 676.53 on March 9, 2009. This bear market was followed by one of the strongest bull markets in U.S. history from March 9, 2009 to January 19, 2010. The S&P 500 Index reached the level of 1,150.23 on January 19, 2010. U.S. stock prices increased by about 70% during this bull market recovering about 33.2% of the loss in the preceding bear market.

Exchange-Traded-Index-Funds (ETFs) have become a popular investment vehicle for investors. They generally have lower management fees and tax advantages for investors compared with mutual funds. Exchange-traded country index funds make it easy for investors to achieve global diversification (see: Meric et al., 2008). The first objective of this paper is to study and compare the risk-return performance of 23 Ishares country index funds during the May 19, 2008-March 9, 2009 bear market and the March 9, 2009-January 19, 2010 bull market. Daily index returns are used in the analysis. The S&P 500 Index reached its lowest level in the bear market on March 9,

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2009 and it is also the lowest starting point for the bull market. Therefore, the March 9, 2009 index is included in both periods in the calculation of the index returns.

Domestic investments are more closely correlated than global investments. Therefore, global investments are recommended to achieve greater portfolio diversification benefit. Empirical studies show that global stock markets are more closely correlated in bear markets than in bull markets (See: Meric et al., 2002). Therefore, investors are likely to obtain less global diversification benefit in bear markets than in bull markets. The second objective of the paper is to test this hypothesis with data for the May 19, 2008-March 9, 2009 bear market and the March 9, 2009-January 19, 2010 bull market.

2. Data and Methodology

The study examines all 23 Ishares country index funds that traded between May 19, 2008 and January 19, 2010. Several country index funds that were initiated after the 2008 stock market crash such as the Chile (ECH), Indonesia (IDX), Peru (EPU), and Turkey (TUR) funds are not included in the study. The list of the funds included in the study, their ticker symbols and total asset levels are presented in Table 1. The fund with the largest asset size is the U.S S&P 500 index fund (IVV). The Brazil (EWZ) and China (FXI) funds also have a considerable size. The Netherlands (EWN) and Belgium (EWK) funds are the smallest funds in the sample in terms of asset size. The average asset size of the 23 funds in the sample is 2.969 billion dollars.

Table 1. Ishares Country Index Funds Included in the Study

Index Funds	Ticker Symbol	Asset Size (Millions of U.S. dollars)
U.S	IVV	21,800
Brazil	EWZ	11,200
China	FXI	10,090
Japan	EWJ	4,780
Taiwan	EWT	3,400
South Korea	EWY	2,830
Canada	EWC	2,790
Australia	EWA	2,420
Hong Kong	EWH	1,890
Singapore	EWS	1,430
Germany	EWG	983
Mexico	EWW	976
U.K.	EWU	896
South Africa	EZA	579
Malaysia	EWM	552
Spain	EWP	320
France	EWQ	313
Switzerland	EWL	294
Sweden	EWD	220
Austria	EWO	214
Italy	EWI	147
Netherlands	EWN	93
Belgium	EWK	66
Average		2,969

Daily returns data are used in the study. The daily closing share prices of the funds, adjusted for dividends and splits, were downloaded from the “Yahoo/Finance” web site. The daily returns were computed as the natural log difference in the share prices, $\ln (P_{i,t}/P_{i,t-1})$. The S&P 500 index fund (IVV) is used as the market proxy for the U.S. stock market. The market risk contribution of a foreign country index fund to a well-diversified portfolio is measured by the fund’s beta computed by regressing the fund’s daily returns against the U.S stock market daily returns.

The market risk of an investor’s portfolio is:

$$\beta_p = \sum_{i=1}^N w_i \beta_i \quad (1)$$

where β_p is the portfolio’s market risk, w_i are the weights of the country index fund investments in the portfolio, and β_i are the betas of the country index funds. The contribution of a country index fund to a well-diversified portfolio is measured by the fund’s beta.

We compare the performance of the country index fund portfolios with the Treynor (1965) and Sharpe (1966) portfolio performance measures (see: Reilly and Brown, 2008) during the May 19, 2008-March 9, 2009 bear market and the March 9, 2009-January 19, 2010 bull market. In the Treynor method, a higher Treynor Ratio (TR_p) statistic indicates a better portfolio performance. The TR_p statistic is calculated as follows:

$$TR_p = (R_p - R_{rf}) / \beta_p \quad (2)$$

where TR_p is the Treynor Ratio for the country index fund portfolio, R_p is the realized return from the portfolio, R_{rf} is the risk-free rate, $(R_p - R_{rf})$ is the excess return for the portfolio, and β_p is the beta of the portfolio.

In the Sharpe method, a higher Sharpe Ratio (SR_p) statistic indicates a better portfolio performance. The SR_p statistic is calculated as follows:

$$SR_p = (R_p - R_{rf}) / \sigma_p \quad (3)$$

where SR_p is the Sharpe Ratio for the country index fund portfolio, R_p is the return from the portfolio, R_{rf} is the risk-free rate, $(R_p - R_{rf})$ is the excess return for the portfolio, and σ_p is the standard deviation of the portfolio returns.

Principal components analysis (PCA) is a multivariate statistical analysis technique widely used in evaluating the portfolio diversification benefits of global investments. We use the PCA technique to study the portfolio diversification benefits of country index funds during the May 19, 2008-March 9, 2009 bear market and the March 9, 2009-January 19, 2010 bull market.

In the PCA technique, the correlation matrix of country index funds are used as input in a PCA computer program and several statistically significant principal components with eigen values greater than one are extracted. The technique clusters country index funds into principal components in terms of the similarities of their return movements. Country index funds clustered in the same principal component are closely correlated and investing in these funds would provide minimal portfolio diversification benefit to global investors. Global investors should invest in country index funds with the highest factor loadings in different principal components to maximize portfolio diversification benefit.

A detailed description of the PCA methodology can be found in Mardia et al. (1979), Marascuilo and Levin (1983), and Meric and Meric (1989). Consider a set of variables (e.g., country index funds) X_1, X_2, \dots, X_p measured on n observational units (e.g., daily returns). Assume that the X variables can be put together to form a linear combination:

$$Y_1 = a_1^{(1)}X_1 + a_2^{(1)}X_2 + \dots + a_p^{(1)}X_p \quad (4)$$

which is referred to as the first principal component of the P variables. The coefficients of $A'_1 = [a_1^{(1)}, a_2^{(1)}, \dots, a_p^{(1)}]$ are selected so as to maximize the variance of Y_1 :

$$\text{Var}(Y_1) = A'_1 \Sigma_{xx} A_1 \quad (5)$$

The A_p can be determined from the sample variance-covariance matrix (Σ_{xx}) by solving the following characteristic equation:

$$|\Sigma_{xx} - \lambda I| = 0 \quad (6)$$

This equation has p ordered roots, the eigenvalues:

$$\lambda_1 \geq \lambda_2 \geq \dots \geq \lambda_p \geq 0 \quad (7)$$

λ_1 is equal to $\text{Var}(Y_1)$, λ_2 is equal to $\text{Var}(Y_2)$, etc. The sum of the eigenvalues is given by

$$\lambda_1 + \lambda_2 + \dots + \lambda_p = P \quad (8)$$

so that the variance explained by the first principal component is given by λ_1/P , the variance explained by the second principal component is given by λ_2/P , etc. With Kaiser's significance rule, n principal components are significant so that

$$\lambda_1 \geq \lambda_2 \geq \dots \geq \lambda_n \geq 1. \quad (9)$$

To be able to compare the co-movement patterns of the twenty-three country index funds during the May 19, 2008-March 9, 2009 bear market and the March 9, 2009-January 19, 2010 bull market, we extract the statistically significant principal components for each period with eigen values greater than one.

The correlation matrixes of the twenty-three country index funds are used as inputs for the PCA computer program to extract the principal components. The Varimax rotation is used to maximize the factor loadings of the country index funds in each principal component with similar movement patterns.

3. Performance of the Economies of the Countries Included in the Study during the May 19, 2008 - January 19, 2010 Period

Data from the International Monetary Fund World Outlook Database were used to evaluate the economic conditions prevailing in the countries included in the study. The three measures of economic performance chosen and presented in Table 2 are the percentage change in real gross domestic product, the percentage change in consumer prices, and the unemployment rate for the years 2008 and 2009. In addition, we included IMF estimates for these measures for the year 2010.

The data are only available on an annual basis unlike the financial market data used in the analysis. However, given that the U.S. bear market covered a 10-month period lasting from May 19, 2008 until March 9, 2009, annual economic data for 2008 would effectively conform to this time period. Likewise, since the U.S. bull market covered a 10-month period from March 9, 2009 through January 19, 2010, annual economic performance data for 2009 would correspond to this second period. The IMF forecast data for 2010 were included for reasons explained below.

Table 2. Performance of the Economies of the Countries Included in the Study

Countries	GDP Constant Price Percentage Change			Inflation, Consumer Prices ¹			Unemployment Rate ²		
	2008	2009	2010 ⁴	2008	2009	2010 ⁴	2008	2009	2010 ⁴
Australia ³	2.377	1.325	2.963	3.685	2.108	2.269	4.263	5.6	5.3
Austria	2.048	-3.613	1.329	1.474	1.08	1.3	3.9	4.975	5.4
Belgium	0.832	-3.006	1.153	2.711	0.073	1.173	7	7.975	9.302
Brazil ³	5.137	-0.185	5.496	5.902	4.312	5.3	NA	NA	NA
Canada	0.414	-2.643	3.142	1.901	0.816	1.818	6.158	8.283	7.881
China ³	9.554	8.735	10.04	2.5	0.7	3.122	NA	NA	NA
France	0.32	-2.186	1.522	3.159	0.103	1.203	7.882	9.385	9.982
Germany	1.248	-4.973	1.21	1.133	0.84	0.918	7.242	7.442	8.621
Hong Kong	2.146	-2.664	5.016	2.048	-2.606	2	3.508	5.127	4.827
Italy	-1.319	-5.038	0.843	2.354	0.951	1.526	6.775	7.75	8.7
Japan	-1.193	-5.197	1.896	0.396	-1.678	-1.126	3.99	5.076	5.078
Korea	2.298	0.196	4.514	4.139	2.8	3	3.175	3.65	3.5
Malaysia	4.633	-1.721	4.716	4.3	1.207	2	NA	NA	NA
Mexico	1.49	-6.538	4.16	6.528	3.574	5.315	NA	NA	NA
Netherlands	1.996	-3.983	1.302	2.21	0.974	1.101	2.75	3.521	4.888
Singapore	1.392	-2.02	5.678	5.406	-0.339	2.268	2.225	3	2.845
South Africa	3.679	-1.789	2.592	9.5	6.329	5.85	NA	NA	NA
Spain	0.858	-3.639	-0.41	1.455	0.866	1.124	11.33	18.01	19.4
Sweden ³	-0.155	-4.397	1.23	2.139	3.104	2.21	6.167	8.497	8.197
Switzerland ³	1.78	-1.454	1.533	0.701	-0.446	0.657	2.661	4.146	5.039
Taiwan	0.731	-1.868	6.496	4.18	-6.381	1.491	4.14	5.85	5.385
U.K.	0.548	-4.92	1.337	3.879	2.095	2	5.552	7.456	8.253
U. S.	0.439	-2.44	3.101	0.697	1.973	1.675	5.817	9.275	9.412

Source: International Monetary Fund, World Economic Outlook Database, April 2010.

¹ End of period, annual percent change

² Percent of total labor force

³ IMF Staff Estimates for 2009

⁴ IMF Staff Estimates

The data are only available on an annual basis unlike the financial market data used in the analysis. However, given that the U.S. bear market covered a 10-month period lasting from May 19, 2008 until March 9, 2009, annual economic data for 2008 would effectively conform to this time period. Likewise, since the U.S. bull market covered a 10-month period from March 9, 2009 through January 19, 2010, annual economic performance data for 2009 would correspond to this second period. The IMF forecast data for 2010 were included for reasons explained below.

The data suggest that the real economic performance of our selected countries reflect the impact of the global recession, which for the U.S. began in December 2007 according to the Business Cycle Dating Committee of the National Bureau of Economic Research (NBER). The NBER has not identified a lower turning point for the U.S. recession. Annual growth in real GDP for all of the countries used in the study was higher for the 2008 bear market period than it was for the 2009 bull market period. Moreover, the forecast real GDP growth for 2010 for all of the study countries is higher than the rate of growth experienced in 2009. Annual rates of inflation for all but two of the study countries (Sweden and the U.S.) were lower for the 2009 bull market period than they were for the 2008 bear market period, while 2010 inflation rate forecasts are higher for all but 4 of the study countries (South Africa, Sweden, the U.K., and the U.S.).

IMF unemployment rate data are available for all but five of our 23 study countries. Those five countries are Brazil, China, Malaysia, Mexico, and South Africa. Here again the pattern is consistent with what we observed for the other two measures. In all of the 18 study countries for which data were available, unemployment rates were higher in 2009 than they were in 2008. The forecast unemployment rates for 2010 however display a different behavior with ten forecast increases, 7 forecast decreases, and one country with no change in the unemployment rate. This behavior is not surprising given the fact that unemployment rates often lag an economic recovery as firms seek to expand output by paying existing workers overtime and adding new workers only after they are convinced that the expansion is likely to continue.

The pattern described above, a fall in both the rates of growth in real GDP and inflation rates along with higher unemployment rates for the 2008-2009 years followed by forecast increases in real GDP, higher rates of inflation and mixed results for unemployment rates are consistent with the notion that U.S. financial market performance, a bear market followed by a bull market, can be viewed as a leading indicator of changes in the real economic environment of output, prices, and employment.

4. Return Performance of the Country Index Funds

The return performance of the 23 country index funds in the May 19, 2008-March 9, 2009 bear market and the March 9, 2009-January 19, 2010 bull market is shown in Table 3. The statistics in the second column indicate that the Austria (-75.1%), Belgium (-72.1%), Italy (-69.0%), Brazil (-65.2%), and Mexico (-64.7%) funds have the largest losses and the Malaysia (-42.3%), Japan (-48.8%), Switzerland (-50.3%), U.S. (-51.8%), and Hong Kong (-53.5%) funds have the smallest losses in the May 19, 2008-March 9, 2009 bear-market.

The recovery percentages in the fourth column of the table are calculated by dividing the gain in the fund share price in the March 9, 2009-January 19, 2010 bull market by the fund share price at the beginning of the May 19, 2008-March 9, 2009 bear market. The Singapore (52.6%), Australia (50.4%), Mexico (48.5%), South Korea (48.3%), and Brazil (47.0%) funds have the largest recovery percentages and the Japan (27.9%), Belgium (28.8%), Germany (31.2%), Austria (33.7%), and Italy (33.7%) funds have the smallest recovery percentages in the March 9, 2009-January 19, 2010 bull market.

The remaining percentage loss figures in the sixth column of the table are calculated by subtracting the percentage recovery figure in the fourth column from the percentage loss figure in the second column. The results indicate that the country index funds that have the best performance with the smallest remaining loss at the end of the bull market are the Malaysia (-0.1%), Singapore (-7.5%), South Africa (-10.5%), Switzerland (-10.9%), and Australia (-12.4%) funds. The country index funds with the largest remaining losses at the end of the bull market are the Belgium (-43.3%), Austria (-41.4%), Italy (-35.3%), Germany (-31.3%), and Japan (-30.9%) funds.

The recovery ratios in the eighth column for the March 9, 2009-January 19, 2010 bull market are calculated by dividing the remaining loss percentages in the sixth column by the total loss percentages in the second column. The results show that the country index funds that have the best recovery performance in the bull market are the Malaysia (99.8%), Singapore (87.5%), South Africa (81.6%), Australia (80.3%), and Switzerland (78.3%) funds. The country index funds with the worst recovery ratios are

the Belgium (39.9%), Austria (44.9%), Italy (48.8%), Germany (49.9%), and Japan (57.2%) funds. In general, the European country index funds appear to have had considerably worse recovery performance compared with the country index funds in the other parts of the world during the May 19, 2008-January 19, 2010 bull-market period.

Table 3. Return Performance in the May 19, 2008-March 9, 2009 Bear Market and the March 9, 2009-January 19, 2010 Bull Market

Index Funds	5/19/2008-3/9/2009 Bear Market		3/9/2009-1/19/2010 Bull Market		Performance Comparison			
	% Loss	Loss Rank	Recov. %	Recov. Rank	Remain. % Loss	Rank	Recov. Ratio	Rank
Austria	- 75.1%	1	+ 33.7%	20	- 41.4%	22	44.9%	22
Belgium	- 72.1%	2	+ 28.8%	22	- 43.3%	23	39.9%	23
Italy	- 69.0%	3	+ 33.7%	19	- 35.3%	21	48.8%	21
Brazil	- 65.2%	4	+ 47.0%	5	- 18.2%	13	72.1%	10
Mexico	- 64.7%	5	+ 48.5%	3	- 16.2%	9	75.0%	7
Sweden	- 64.5%	6	+ 42.2%	9	- 22.3%	15	65.4%	14
Netherlands	- 64.3%	7	+ 38.5%	13	- 25.8%	18	60.0%	17
South Korea	- 63.1%	8	+ 48.3%	4	- 14.8%	7	76.5%	6
Australia	- 62.8%	9	+ 50.4%	2	- 12.4%	5	80.3%	4
Germany	- 62.5%	10	+ 31.2%	21	- 31.3%	20	49.9%	20
France	- 60.8%	11	+ 35.4%	17	- 25.4%	17	58.2%	18
U.K.	- 60.6%	12	+ 37.0%	16	- 23.6%	16	61.1%	16
Spain	- 60.4%	13	+ 43.5%	7	- 16.9%	12	72.0%	11
Canada	- 60.2%	14	+ 38.4%	14	- 21.8%	14	63.8%	15
Singapore	- 60.1%	15	+ 52.6%	1	- 7.5%	2	87.5%	2
South Africa	- 57.0%	16	+ 46.5%	6	- 10.5%	3	81.6%	3
Taiwan	- 55.7%	17	+ 40.8%	10	- 14.9%	8	73.2%	9
China	- 54.4%	18	+ 37.9%	15	- 16.5%	11	69.7%	12
Hong Kong	- 53.5%	19	+ 40.0%	11	- 13.5%	6	74.8%	8
U.S.	- 51.8%	20	+ 35.3%	18	- 16.5%	10	68.1%	13
Switzerland	- 50.3%	21	+ 39.4%	12	- 10.9%	4	78.3%	5
Japan	- 48.8%	22	+ 27.9%	23	- 30.9%	19	57.2%	19
Malaysia	- 42.3%	23	+ 42.2%	8	- 0.1%	1	99.8%	1
Average:	- 60.4%		+ 40.0%		- 20.4%		66.2%	

The recovery ratios in the eighth column for the March 9, 2009-January 19, 2010 bull market are calculated by dividing the remaining loss percentages in the sixth column by the total loss percentages in the second column. The results show that the country index funds that have the best recovery performance in the bull market are the Malaysia (99.8%), Singapore (87.5%), South Africa (81.6%), Australia (80.3%), and Switzerland (78.3%) funds. The country index funds with the worst recovery ratios are the Belgium (39.9%), Austria (44.9%), Italy (48.8%), Germany (49.9%), and Japan (57.2%) funds. In general, the European country index funds appear to have had considerably worse recovery performance compared with the country index funds in the other parts of the world during the May 19, 2008-January 19, 2010 bull-market period.

5. Comparing the Risk-Return Performance of the Country Index Funds with the Sharpe and Treynor Methods

5.1. May 19, 2008-March 9, 2009 Bear Market

The performance ranking of the country index funds with the Sharpe and Treynor methods during the May 19, 2008-March 9, 2009 Bear Market is presented in Table 4. The country index funds with the least volatility, as measured by the standard deviation of daily returns, are the Malaysia (0.0105), Switzerland (0.012), U.S. (0.0123), Japan (0.0133), and Canada (0.0145) funds. The country index funds with the most volatility during this period are the Brazil (0.0233), China (0.0233), South Korea (0.0222), South Africa (0.0218), and Sweden (0.0192) funds.

Table 4. Performance Comparison with the Sharpe and Treynor Measures in the May 19, 2008-March 9, 2009 Bear Market

Index Funds	Return Volatility		Market Risk		Performance Rank	
	Std. Dev.	Rank	Beta	Rank	Sharpe	Treynor
Malaysia	0.0105	1	0.651	1	1	1
Switzerland	0.0120	2	0.867	2	2	2
U.S.	0.0123	3	1.000	5	3	4
Japan	0.0133	4	0.969	3	4	3
Canada	0.0145	5	0.970	4	5	5
France	0.0151	8	1.134	10	6	8
Taiwan	0.0163	13	1.125	9	7	6
Spain	0.0156	10	1.142	12	8	9
Hong Kong	0.0170	15	1.242	16	9	7
U.K.	0.0157	12	1.164	14	10	12
Singapore	0.0170	16	1.242	17	11	10
Germany	0.0156	11	1.157	13	12	14
China	0.0233	22	1.668	23	13	13
South Africa	0.0218	20	1.585	21	14	15
Netherlands	0.0153	9	1.118	8	15	11
Australia	0.0184	18	1.303	18	16	16
Italy	0.0148	6	1.067	7	17	17
South Korea	0.0222	21	1.496	20	18	18
Mexico	0.0165	14	1.182	15	19	19
Sweden	0.0192	19	1.401	19	20	21
Belgium	0.0150	7	1.031	6	21	20
Brazil	0.0233	23	1.649	22	22	22
Austria	0.0175	17	1.135	11	23	23
Average:	0.0166		1.187			

Each country index fund's beta was computed by regressing the fund's daily returns against the S&P 500 Index Fund (IVV) returns. In terms of the market risk, the country index funds with the lowest beta (lowest market risk) are the Malaysia (0.651), Switzerland (0.867), Japan (0.969), Canada (0.97), and U.S. (1.0) funds. The country index funds with the highest beta (highest market risk) are the China (1.668), Brazil (1.649), South Africa (1.585), South Korea (1.496), and Sweden (1.401) funds.

In terms of portfolio performance with the Sharpe Method, the country index funds that rank the highest are the Malaysia, Switzerland, U.S., Japan, and Canada funds. The country index funds that rank the lowest are the Austria, Brazil, Belgium, Sweden,

and Mexico funds. The country index funds that rank the highest with the Treynor portfolio performance measure are the Malaysia, Switzerland, Japan, U.S., and Canada funds. The country index funds that rank the lowest are the Austria, Brazil, Sweden, Belgium, and Mexico funds.

The Malaysia and Switzerland index funds rank the best and the Austria and Brazil index funds rank the worst in both methods. The rankings of the funds are quite similar with the two methods. The Spearman rank correlation between the two rankings is 0.98.

5.2. March 9, 2009 to January 19, 2010 Bull Market

The performance ranking of the county index funds with the Sharpe and Treynor methods during the March 9, 2009 to January 19, 2010 Bull Market is presented in Table 5. The country index funds with the least volatility, as measured by the standard deviation of daily returns, are the Japan (0.0061), Malaysia (0.0062), U.S. (0.0062), Switzerland (0.0069), and U.K. (0.0078) funds. The country index funds with the most volatility during this period are the Sweden (0.0117), Brazil (0.0105), South Korea (0.0105), China (0.0102), and Austria (0.0096) funds.

Table 5. Performance Comparison with the Sharpe and Treynor Measures in the March 9, 2009-January 19, 2010 Bull Market

Index Funds	Return Volatility		Market Risk		Performance Rank	
	Std. Dev.	Rank	Beta	Rank	Sharpe	Treynor
Japan	0.0061	1	0.769	1	1	1
Malaysia	0.0062	2	0.787	2	2	2
U.S.	0.0062	3	1.000	5	3	5
Switzerland	0.0069	4	0.920	3	4	3
Hong Kong	0.0079	6	1.046	6	5	6
U.K.	0.0078	5	1.078	8	6	8
Singapore	0.0079	7	1.046	7	7	7
Taiwan	0.0090	13	0.987	4	8	4
Spain	0.0084	10	1.199	11	9	9
France	0.0084	9	1.215	12	10	12
Canada	0.0090	14	1.258	15	11	11
China	0.0102	20	1.356	20	12	13
South Africa	0.0099	18	1.278	16	13	10
Netherlands	0.0084	8	1.183	10	14	15
Germany	0.0087	12	1.241	13	15	14
Australia	0.0096	17	1.309	18	16	16
South Korea	0.0105	21	1.374	21	17	17
Mexico	0.0093	15	1.249	14	18	18
Sweden	0.0117	23	1.585	23	19	19
Italy	0.0095	16	1.333	19	20	22
Brazil	0.0105	22	1.435	22	21	21
Belgium	0.0085	11	1.106	9	22	20
Austria	0.0101	19	1.293	17	23	23
Average	0.0087		1.176			

In terms of the market risk, the country index funds with the lowest beta (lowest market risk) are the Japan (0.769), Malaysia (0.787), Switzerland (0.920), Taiwan (0.987), and U.S. (1.0) funds. The country index funds with the highest beta (highest market risk) are the Sweden (1.585), Brazil (1.435), South Korea (1.374), China (1.356), and Italy (1.333) funds.

In terms of portfolio performance with the Sharpe Method, the country index funds that rank the highest are the Japan, Malaysia, U.S., Switzerland, and Hong Kong funds. The country index funds that rank the lowest are the Austria, Belgium, Brazil, Italy, and Sweden funds. The country index funds that rank the highest with the Treynor portfolio performance measure are the Japan, Malaysia, Switzerland, Taiwan, and U.S. funds. The country index funds that rank the lowest are the Austria, Italy, Brazil, Belgium, and Sweden funds.

The Japan and Malaysia index funds rank the best and the Austria fund ranks the worst in both methods. The rankings of the funds are quite similar with the two methods. The Spearman rank correlation between the two rankings is 0.975.

5.3. Performance in the Bear Market vs. the Bull Market

In this section of the paper, we compare the relative performance of the 23 country index funds in the May 19, 2008-March 9, 2009 bear market vs. the March 9, 2009-January 19, 2010 bull market with the Sharpe and Treynor portfolio performance measures. The Spearman correlation coefficient between the rankings of the funds with the Sharpe method in the sixth column of Table 4 and the sixth column of Table 5 is 0.93. The Spearman correlation coefficient between the rankings of the funds with the Treynor method in the seventh column of Table 4 and the seventh column of Table 5 is 0.971.

The results show that there is greater similarity between the rankings in the bear and bull markets with the Treynor method than with the Sharpe method. Since the excess return figure in the numerator of both ratios is the same, these results imply that there are greater changes in the daily return volatility of the funds than in their return covariance with the S&P 500 market index (i.e., their betas) from the bear market to the bull market. Since standard deviation of returns represent total risk versus market risk represented by the fund betas, this result indicates more pronounced changes in the idiosyncratic risks of the funds than in their market risks from the bear market to the bull market.

5.4. Return Volatility and Market Risk in the bear and bull markets

The average daily return volatility figures for the May 19, 2008-March 9, 2009 bear market shown in the second column of Table 4 is 0.0166. The average daily return volatility figures for the March 9, 2009-January 19, 2010 bull market shown in the second column of Table 4 is only 0.0087. These results indicate that country index funds had substantially more daily return volatility in the bear market than in the bull market. The individual daily return volatility figures for all index funds are higher for the bear market than for the bull market. The means t-test applied to the figures in the second columns of Tables 4 and 5 show that daily return volatility is significantly different in the May 19, 2008-March 9, 2009 bear market than in the March 9, 2009-January 19, 2010 bull market at the 1% level.

The beta figures in the fourth column of Table 4 and the fourth column of Table 5 indicate some differences in the market risks of the index funds in the bear and bull markets. However, the differences are not as pronounced as the differences in the daily volatility figures. The average beta for the May 19, 2008-March 9, 2009 bear market is 1.187. The average beta for the March 9, 2009-January 19, 2010 bull market is slightly lower at 1.176. The means t-test indicates that the difference is not statistically significant at the 5% level. The Japan, Taiwan, Hong Kong, U.K., Singapore, China, South Africa, South Korea, and Brazil funds have higher betas in the bear market than in the bull market. The Malaysia, Switzerland, Canada, France, Spain, Germany, Netherlands, Australia, Italy, Mexico, Sweden, Belgium, and Austria funds have higher betas in the bull market than in the bear market.

6. Global Portfolio Diversification Benefit

In this section of the study, we use the Principal Components Analysis (PCA) multivariate technique to study the portfolio diversification benefit of investing in country index funds in the May 19, 2008-March 9, 2009 bear market vs. the March 9, 2009-January 19, 2010 bull market. The PCA technique groups country index funds into principal components in terms of the similarities of their return movement patterns. The Varimax rotation is used to maximize the factor loadings of the funds in each principal component with similar movement patterns.

Country index funds with high factor loadings in the same principal component are highly correlated and, therefore, they provide a limited portfolio diversification benefit. Funds with high factor loadings in different principal components are less correlated and, therefore, they provide greater portfolio diversification benefit. To maximize global portfolio diversification benefit, investors should invest in funds with high factor loadings in different principal components.

The factor loadings of the 23 country index funds for the May 19, 2008-March 9, 2009 bear market are presented in Table 6. There is only one principal component for this period. It indicates that all country index funds were highly correlated as they all went down sharply (i.e., global diversification benefit was limited) during this period.

The country index funds with a high factor loading in the principal component are more correlated with the other country index funds. Therefore, they provide less diversification benefit in global portfolios. The country index funds with a low factor loading in the principal component are less correlated with the other country index funds. Therefore, they provide more diversification benefit. For example, investing in the country index funds of France, Spain, U.K., Germany, the Netherlands, Italy, and Sweden would provide very little global diversification benefit to investors. However, investing in the country index funds of Malaysia, Canada, Austria, South Korea, Taiwan, and Belgium would provide some diversification benefit.

**Table 6. Principal Components Analysis:
May 19, 2008-March 9, 2009 Bear Market**

Index Funds	Factor Loadings of the Principal Component
France	0.971
U.S.	0.957
Spain	0.953
U.K.	0.949
Germany	0.947
Netherlands	0.946
Italy	0.941
Sweden	0.936
Japan	0.929
Australia	0.926
Hong Kong	0.926
Singapore	0.926
China	0.916
Switzerland	0.916
Brazil	0.915
South Africa	0.913
Mexico	0.901
Belgium	0.892
Taiwan	0.891
South Korea	0.877
Austria	0.874
Canada	0.867
Malaysia	0.811

The factor loadings of the 23 country index funds for the March 9, 2009-January 19, 2010 bull market are presented in Table 7. There are two statistically significant principal components for this sub-period. It indicates that it was possible to obtain significant portfolio diversification benefit by investing in country index funds with high factor loadings in the two different principal components during the bull market.

The first principal component is dominated by the European index funds. The South Africa, Canada, U.S., Australia, Brazil, Mexico, and Japan funds also have high factor loadings in this principal component. Most Asian index funds have high factor loadings in the second principal component. These results indicate that the investors of the countries with high factor loadings in the first principal component could obtain significant diversification benefit by investing in the index funds of the countries with high factor loadings in the second principal component. Likewise, the investors of the countries with high factor loadings in the second principal component could obtain significant diversification benefit by investing in the index funds of the countries with high factor loadings in the first principal component.

**Table 7. Principal Components Analysis:
March 9, 2009-January 19, 2010 Bull Market**

Index Funds	Factor Loadings	
	Principal Component #1	Principal Component #2
Netherlands	0.857	
Italy	0.855	
France	0.854	
Spain	0.843	
Switzerland	0.842	
Belgium	0.837	
Germany	0.834	
Austria	0.815	
Sweden	0.780	
South Africa	0.764	
U.K.	0.741	
Canada	0.752	
U.S.	0.709	
Australia	0.687	
Brazil	0.680	
Mexico	0.638	
Japan	0.583	
Hong Kong		0.869
Singapore		0.869
China		0.828
Taiwan		0.787
South Korea		0.724
Malaysia		0.701

7. Summary and Conclusions

The U.S. stock market experienced one of the worst bear markets in its history from May 19, 2008 to March 9, 2009 followed by a strong bull market from March 9, 2009 to January 19, 2010. In this paper, we study the risk-return performance of 23 Ishares country index funds during these periods. Our findings with the Sharpe and Treynor portfolio performance measures indicate that the Malaysia, Japan, U.S., and Switzerland country index funds had the best performance in both periods. The statistics indicate that, in terms of loss recovery from the bear market to the bull market, the Malaysia, Singapore, South Africa, and Australia funds had the best performance and the Belgium, Austria, Italy, and Germany funds had the worst performance.

Since global investments are less correlated than domestic investments, global portfolio diversification can be beneficial to investors. Exchange-traded country index funds make it easy for investors to achieve global diversification. Our findings with the PCA (Principal Components Analysis) methodology indicate that country index funds had closer co-movements and higher correlation during the May 19, 2008-March 9, 2009 bear market than during the March 9, 2009-January 19, 2010 bull market. Therefore, there were more global portfolio diversification opportunities for investors in the March 9, 2009-January 19, 2010 bull market than in the May 19, 2008-March 9, 2009 bear market.

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