

EVIDENCE ON THE PERFORMANCE OF COUNTRY INDEX FUNDS IN GLOBAL FINANCIAL CRISIS

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ABSTRACT

During the October 9, 2007-March 9, 2009 period, the U.S. stock market experienced the worst bear market in its history since the Great Depression. Empirical studies show that exchange-traded country index funds can provide portfolio diversification benefits to investors in bull markets. However, they may not be good investment opportunities in bear markets. In this paper, we demonstrate that most country index funds had worse performance than the U.S. S&P 500 Index and they provided little or no diversification benefits to U.S. investors during the October 9, 2007-March 9, 2009 bear market.

JEL: G11; G15; G21; G28

KEYWORDS: Financial crisis, bear market, country index funds, Sharpe and Treynor portfolio performance measures, principal components analysis, portfolio diversification

INTRODUCTION

Studying the risks and returns of global stock markets is a popular research topic in finance. Meric and Meric (2001) compare the risks and returns of the world's major stock markets and conclude that the U.S. stock market is one of the world's best investment opportunities for global investors.

Empirical studies show that global diversification can help reduce portfolio risk. Exchange-traded country index funds have become an attractive global investment vehicle in recent years. They make it easy for investors to achieve global diversification. In a recent paper, G. Meric et al. (2008) study global portfolio diversification in a bull market and they conclude that investing in country index funds can provide high returns and significant portfolio diversification benefits to U.S. investors.

Several recent empirical studies demonstrate that investment returns behave differently in bull and bear markets. I. Meric et al. (2008) study and compare the portfolio diversification implications of the co-movements of global sector indexes in bull and bear markets. Meric et al. (2002) find that global investments do not provide significant diversification benefits to investors in global bear markets.

All countries of the world experienced a severe financial crisis in 2008. It resulted in a recession and a severe meltdown in global stock markets. The causes and consequences of the 2008 crisis are being studied extensively in the current literature (see, e.g., Wang et al., 2010).

The movements in the stock market tend to lead the movements in the economy. The stock market return statistics indicate that the bear market in the U.S. started on October 9, 2007, well before the financial crisis and recession, and ended on March 9, 2009, again well before economic recovery. The first objective of our study is to compare the risks and returns of country index funds during the October 9, 2007-March 9, 2009 bear market.

Meric et al. (2002) find that correlation between national stock markets increases and the benefits of global portfolio diversification decreases in bear markets. Therefore, although the G. Meric et al. (2008) study finds that country index funds can provide significant portfolio diversification benefits in a bull market, it is likely that they provided little or no portfolio diversification benefits to investors during the October 9, 2007-March 9, 2009 bear market. Testing this hypothesis is the second objective of our study with a sample of 23 Ishares country index funds.

The paper is organized as follows. In the next section, we review the literature on the portfolio diversification implications of the co-movements of global stock markets, stock market crashes, and the 2008 financial crisis. In the section titled “data and methodology,” we explain the data used in the study and the methodology employed to test the hypothesis. In the section titled “results,” we present the empirical findings of our study. In the last section, we present our concluding comments, explain the limitations of our study, and offer suggestions for future research.

LITERATURE REVIEW

The benefits of global portfolio diversification are extensively studied in the literature. Empirical studies show that returns on stocks are more closely correlated within a country than between countries. Therefore, global diversification is recommended to reduce portfolio risk (see, e.g., Solnik, 1974; Lessard, 1976; Watson, 1978; and Meric and Meric, 1989).

Studying the impact of stock market crashes on stock returns has long been a popular research topic in finance. Seyhun (1990) studies investor overreaction in the 1987 stock market crash. Wang et al. (2009) study the determinants of stock returns in several stock market crashes. In a forthcoming study, Wang et al. (2010) examine and compare the determinants of stock returns in the 1987 and 2008 stock market crashes and they find that, although liquidity shortage and technical insolvency risk were not important factors effecting stock returns in the 1987 crash, they were significant determinants of stock returns in the 2008 crash.

Roll (1988), King and Wadhvani (1990), Malliaris and Urrutia (1992), and Meric and Meric (1998) study the impact of the 1987 stock market crash on the co-movements of national stock markets. Meric and Meric (2000), Pan et al. (2001), and Yang et al. (2003) examine the effects of the 1997 and 1998 emerging stock market crashes on the stock returns in developed countries. Hon et al. (2004), Wang et al. (2008), Fernandez (2008), and Nikkinen et al. (2008) investigate the impact of the September 11, 2001 terrorist attacks in the U.S. on the world’s stock markets.

During the October 9, 2007-March 9, 2009 period, the U.S. stock market experienced the worst stock market meltdown in its history since the Great Depression. The S&P 500 Index lost 56 percent of its value during this period. The bear market in the U.S. also effected the stock markets of all other countries. The market value of stocks traded on the world’s major stock exchanges lost about 61.3 percent of their value from October 9, 2007 to March 9, 2009.

The October 9, 2007-March 9, 2009 stock market meltdown was triggered by a financial crisis in the U.S. in the fall of 2008. While there were many antecedents that contributed to the 2008 financial crisis, the economists of the Federal Reserve Bank of St. Louis conclude that analysts blame the crisis on three interrelated causes. 1) The rapid growth in house prices and subsequent collapse of U.S. house prices. 2) A decline in mortgage underwriting standards highlighted by a plethora of subprime mortgages being issued. 3) Laxity in risk management by financial firms engaged in originating, distributing, and investing in mortgages, mortgage backed securities, and derivative financial instruments. (Federal Reserve Bank of St. Louis, 2009)

Banks created off-balance-sheet affiliated entities such as Structured Investment Vehicles (SIV) to purchase mortgage-related assets that were not subject to regulatory capital requirements. They also turned to short-term "collateralized borrowing" like repurchase agreements, so much so that investment banks were on average rolling over a quarter of their balance sheet every night. (Berly et al., 2008)

In the fall of 2008, financial markets worldwide went into a tailspin. Governments held emergency meetings trying to determine a corrective course of action to mitigate the impact of the financial meltdown on their economy. Governments devised stimulus packages to infuse money into shaky economies, trying to preserve jobs, create jobs, fund shovel ready projects which focused mostly on infrastructure projects, invest in green technology and jobs, and so forth. The impact of the financial meltdown in the U.S had devastating consequences for wealthy nations (the G20), and for emerging markets.

Countries in the E.U. faced similar economic downturns (Charlemagne, 2009). Japan faced its worst economic crisis since the end of World War II. Unemployment in Japan increased sharply contributed to in part by the deteriorating export sector, especially in cars and electronics. Hong Kong, Singapore, South Korea, and Taiwan faced serious economic problems. Export expansions and investment into international services, such as finance, helped make Hong Kong, Singapore, South Korea, and Taiwan, modern, dynamic economies. Their fortunes seem to be in reverse as they battle the worse downturn since the 1997-1998 emerging markets crisis. Singapore faced its worse economic recession since its independence from Malaysia in 1965. In an interview for, the *New York Times*, President of Taiwan stated: "The financial tsunami makes it possible to rethink economic development strategy as to whether we should rely so much on exports." (Bradsher, 2009).

DATA AND METHODOLOGY

The study examines 23 Ishares country index funds that traded between October 9, 2007 and March 9, 2009. The list of the funds included in the study, their ticker symbols, total asset levels, expense ratios, and dividend yields 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) index funds also have considerable size. The Netherlands (EWN) and Belgium (EWK) funds are the smallest index funds in the sample in terms of asset size. The average asset size of the 23 funds in the sample is about 2.97 billion dollars. The U.S. S&P 500 index fund (IVV) has the lowest and the China index fund (FXI) has the highest expense ratios (0.09% and 0.73%, respectively). The average expense ratio for all funds in the sample is 0.55%. The Taiwan index fund has the highest and the South Korea index fund has the lowest dividend yields (4.91% and 0.88%, respectively). The average dividend yield for all funds in the sample is 2.74%.

Daily returns data are used in the study for the October 9, 2007-March 9, 2009 period. 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, $\ln(P_{i,t}/P_{i,t-1})$. Daily return observations used in the analysis is 355 for each fund for the October 9, 2007-March 9, 2009 period. These observations are used in the calculation of average daily returns, the standard deviation of returns, and the correlation with the U.S. market. The daily return matrix used in the principal components analysis to analyze the portfolio diversification implications of the co-movements of fund daily returns has $355 \times 23 = 8165$ observations.

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 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.

Table 1: Ishares Country Index Funds Included in the Study^a

Index Funds	Ticker Symbol	Asset Size in Millions of U.S. Dollars	Expense Ratio (%)	Dividend Yield (%)
U.S	IVV	21,800	0.09	2.02
Brazil	EWZ	11,200	0.65	2.61
China	FXI	10,090	0.73	1.23
Japan	EWJ	4,780	0.56	1.29
Taiwan	EWT	3,400	0.52	4.91
South Korea	EWY	2,830	0.65	0.88
Canada	EWC	2,790	0.55	1.61
Australia	EWA	2,420	0.55	4.01
Hong Kong	EWH	1,890	0.55	3.44
Singapore	EWS	1,430	0.55	3.14
Germany	EWG	983	0.55	2.77
Mexico	EWX	976	0.55	1.27
U.K.	EWU	896	0.55	3.54
South Africa	EZA	579	0.66	3.43
Malaysia	EWM	552	0.56	2.59
Spain	EWP	320	0.56	4.66
France	EWQ	313	0.55	3.71
Switzerland	EWL	294	0.56	1.48
Sweden	EWD	220	0.55	1.93
Austria	EWO	214	0.55	3.42
Italy	EWI	147	0.59	3.28
Netherlands	EWN	93	0.55	3.28
Belgium	EWK	66	0.56	2.57
Average		2,969	0.55	2.74

^aThe study covers the October 9, 2007-March 9, 2009 period. Daily index returns of the funds are used in the analysis. Daily return observations for each fund for the study period is 355. These return observation are used in comparing the average returns and risk levels of the funds. To assess the portfolio diversification benefit of each fund, the correlation between its daily returns and the S&P 500 index fund returns was calculated. To evaluate the portfolio diversification implications of the co-movements of the fund returns, the principal components analysis (PCA) technique is used. The analysis is applied to a data matrix of 355x23=8,165, daily return observations for the 23 funds.

The market risk of an investor’s portfolio is:

$$\beta_p = \sum_{i=1}^N w_i \beta_i \tag{1}$$

where β_p is the portfolio’s market risk, w_i are the weights of the investments in the portfolio, and β_i are the betas of the country fund investments. Therefore, 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 funds with the Treynor (1965) and Sharpe (1966) performance measures (see Reilly and Brown, 2008) during the October 9, 2008-March 9, 2009 period. In the Treynor method, a higher Treynor ratio (TR) statistic indicates a better performance. The TR statistic is calculated as follows:

$$TR_i = (R_i - R_{rf}) / \beta_i \tag{2}$$

where TR_i is the Treynor ratio for country fund i , R_i is the realized return from the fund, R_{rf} is the risk-free rate, $(R_i - R_{rf})$ is the excess return for the fund, and β_i is the beta of the fund.

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

$$SR_i = (R_i - R_{rf}) / \sigma_i \tag{3}$$

where SR_i is the Sharpe ratio for country index fund i , R_i is the realized return from the fund, R_{rf} is the risk-free rate, $(R_i - R_{rf})$ is the excess return for the fund, and σ_i is the standard deviation of the fund's returns.

Principal components analysis (PCA) is a multivariate statistical analysis technique widely used in evaluating the portfolio diversification prospects of global stock markets (see, e.g., Meric and Meric, 1989). We use the PCA technique to study the portfolio diversification benefits of country index funds during the October 9, 2007-March 9, 2009 period. In this technique, the correlation matrix of the country index funds is 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 the country index funds into principal components in terms of the similarities of their return movements. The country index funds clustered in the same principal component are closely correlated and investing in those funds would provide minimal portfolio diversification benefit to global investors. Global investors should invest in the index funds with the highest factor loadings in different principal components to maximize the portfolio diversification benefit.

RESULTS

All country index funds had substantial losses during the October 9, 2007-March 9, 2009 bear market. The percentage loss of each fund is presented in the second column of Table 2. The U.S. S&P 500 index fund lost 56% of its value during this period. The Malaysian (-42.5%), Japanese (-51.6%), Swiss (-51.6%), Brazilian (-55.5%), and Taiwanese (-55.9%) funds had the smallest losses. The Belgium (-74.6%), Austrian (-74.4%), Italian (-71.1%), South Korean (-69.1%), Swedish (-68.1%), and Dutch (-65.9%) funds had the largest losses. It is interesting to note that five of the six funds with the largest losses are European funds. The average loss for all 23 funds is 61.3%.

The standard deviation of daily returns representing the funds' total risk is presented in the third column of Table 2. The funds with the lowest daily return volatility are the Malaysian (2.25%), Swiss (2.26%), U.S. (2.31%), Japanese (2.53%), and Canadian (2.75%) funds. The funds with the highest daily return volatility are the Chinese (4.69%), Brazilian (4.49%), South African (4.15%), South Korean (4.15%), and Swedish (3.56%) funds. The average daily return volatility for all funds is 3.16%.

Country fund betas are calculated by regressing each fund's returns against the S&P 500 index fund returns. The beta figures are presented in the fourth column of Table 2. By definition, the beta of the S&P 500 index fund is 1.0. The Malaysian (0.69), Swiss (0.85), Japanese (0.94), and Canadian (0.96) funds have the lowest betas. The Chinese (1.71), Brazilian (1.64), South African (1.57), and South Korean (1.47) funds have the highest betas. The average beta for all funds is 1.17.

Exchange-traded country index funds are good opportunities for high returns and portfolio diversification benefits in a bull market (see Meric et al., 2008). However, they are not good investments in bear markets. Since they generally have high betas, their returns tend to fall more than the S&P 500 index returns (a proxy for the U.S. stock market) in bear markets. Furthermore, the U.S. stock market and foreign stock markets move closer together in bear markets and the correlation between them increases. Therefore, foreign portfolio investments are not good diversification prospects for U.S. investors in bear markets (see Meric et al., 2002).

Table 2: Country Index Fund Returns, Risks, and Correlation with the U.S. Stock Market in the October 9, 2007-March 9, 2009 Bear Market

Index Funds ^a	Total Return ^b	Risk		Correlation with the U.S. Stock Market ^e
		Std. Deviation of Daily Returns ^c		
			Beta ^d	
Malaysia	-42.5 %	2.25 %	0.69	0.708
Japan	-51.6 %	2.53 %	0.94	0.858
Switzerland	-51.6 %	2.26 %	0.85	0.866
Brazil	-55.5 %	4.49 %	1.64	0.845
Taiwan	-55.9 %	3.19 %	1.13	0.816
U.S.	-56.0 %	2.31 %	1.00	1.000
Spain	-57.6 %	2.91 %	1.11	0.881
Canada	-57.6 %	2.75 %	0.96	0.803
South Africa	-58.0 %	4.15 %	1.57	0.870
Hong Kong	-58.0 %	3.36 %	1.27	0.872
China	-61.8 %	4.69 %	1.71	0.844
France	-62.0 %	2.83 %	1.11	0.906
Germany	-63.0 %	2.91 %	1.12	0.887
U.K.	-63.7 %	2.92 %	1.14	0.897
Mexico	-63.8 %	3.17 %	1.20	0.876
Singapore	-64.2 %	3.12 %	1.16	0.857
Australia	-64.4 %	3.49 %	1.29	0.850
Netherlands	-65.9 %	2.84 %	1.09	0.887
Sweden	-68.1 %	3.56 %	1.35	0.874
South Korea	-69.1 %	4.15 %	1.47	0.819
Italy	-71.1 %	2.77 %	1.04	0.870
Austria	-74.4 %	3.24 %	1.10	0.786
Belgium	-74.6 %	2.83 %	1.02	0.836
Average	-61.3 %	3.16 %	1.17	0.850

^a The twenty-three Ishares country index funds included in the study.

^b Total returns of the twenty-three index funds during the October 9, 2007-March 9, 2009 period.

^c The standard deviation of the daily returns of the index funds during the October 9, 2007- March 9, 2009 period.

^d The Capital Asset Pricing Model (CAPM) betas of the index funds. The beta is calculated by regressing the returns of each index fund against the S&P 500 Index returns for the October 9, 2007-March 9, 2009 period.

^e The Pearson correlation coefficients between the returns of the country index funds and the S&P 500 Index returns during the October 9, 2007-March 9, 2009 period. All correlation coefficients are statistically significant at the 1-percent level.

The Pearson correlation coefficients between the S&P 500 index fund (IVV) and the country index funds during the October 9, 2007-March 9, 2009 period are presented in the fifth column of Table 2. All correlation coefficients are statistically significant at the 1-percent level. A high correlation coefficient with a country index fund indicates that the fund is not a good portfolio diversification prospect for U.S. investors.

The correlation statistics indicate that all country index funds were highly correlated with the S&P 500 index fund (IVV) during the October 9, 2007-March 9, 2009 period (i.e., none of the country index funds was a good portfolio diversification prospect for U.S. investors during this period). Among the country index funds, the Malaysian (0.708) and Austrian (0.786) funds were the best portfolio diversification opportunities and the French (0.906), U.K. (0.897), German (0.887), and Dutch (0.887) index funds were the worst portfolio diversification prospects for U.S. investors during the October 9, 2007-March 9, 2009 period.

The regional average loss, daily return volatility, beta, and correlation figures are presented in Table 3. The European country index funds appear to have had the most losses during the October 9, 2007-March 9, 2009 bear market. The country index funds in the other parts of the world appear to have had similar average losses during this period. In terms of riskiness as measured by daily return volatility and beta, the South African Index Fund is riskier compared with the funds in the other parts of the world. The European country index funds have a lower average daily return volatility and beta compared with the

Table 3: Regional Returns, Risks, and Correlation with the U.S. Stock Market during the October 9, 2007-March 9, 2009 Bear Market

Regions	Total Return	Risk		Correlation with the U.S. Stock Market
		Std. Deviation	Beta	
Europe (10 funds)	-65.2 %	2.90 %	1.09	0.869
Asia (8 funds)	-58.4 %	3.34 %	1.21	0.827
Americas (4 funds)	-58.2 %	3.18 %	1.20	0.841
Africa (1 fund)	-58.0 %	4.15 %	1.57	0.870

funds in the other parts of the world. The average correlation coefficient figures imply that country index funds in different parts of the world were all highly correlated with the U.S. stock market and they provided little diversification benefit to U.S. investors during the October 9, 2007-March 9, 2009 bear market.

The performance rankings of the country index funds with the Treynor and Sharpe methods during the October 9, 2007-March 9, 2009 period are presented in Table 4. The Malaysian and Swiss index funds have the best performance with both methods. The U.S. S&P 500 index fund (IVV) is ranked #3 with the Treynor method and #5 with the Sharpe method. The county index funds with the worst performance are the Austrian, Belgium, South Korean, Swedish, Australian, and Italian funds with both methods. It is interesting to note that four of the six funds with the worst performance are European funds.

Table 4: Rank Ordering the Country Index Funds with the Sharpe and Treynor Portfolio Performance Measures: October 9, 2007-March 9, 2009

Index Funds ^a	Sharpe Ratio Rank ^b	Treynor Ratio Rank ^c
Malaysia	1	1
Switzerland	2	2
U.S.	3	5
Japan	4	3
Canada	5	4
France	6	8
Spain	7	6
Taiwan	8	7
Germany	9	9
Brazil	10	10
Hong Kong	11	11
U.K.	12	13
South Africa	13	14
Netherlands	14	12
Mexico	15	16
Singapore	16	17
China	17	15
Italy	18	18
Australia	19	19
Sweden	20	20
South Korea	21	22
Belgium	22	23
Austria	23	21

^a The twenty-three country index funds included in the study.

^b The performance rank of the funds with the Sharpe Ratio: $SR_i = (R_i - R_{rf}) / \sigma_i$

^c The performance rank of the funds with the Treynor Ratio: $TR_i = (R_i - R_{rf}) / \beta_i$

We use the correlation matrix of the country index funds as input in the principal components analysis (PCA) computer program to extract the statistically significant principal components with eigen values

greater than one for the October 9, 2007-March 9, 2009 period. The analysis yields only one statistically significant principal component (i.e., all country index funds are clustered in only one principal component because they are highly correlated). The factor loadings of the principal component extracted are presented in Table 5.

Table 5: Principal Components Analysis: October 9, 2007-March 9, 2009 Period

Index Funds ^a	Factor Loadings of the Principal Component ^b
France	0.965
U.S.	0.948
U.K.	0.945
Spain	0.944
Germany	0.942
Netherlands	0.941
Italy	0.939
Sweden	0.926
Australia	0.919
Switzerland	0.910
Brazil	0.906
South Africa	0.905
Hong Kong	0.904
Japan	0.903
Singapore	0.896
Mexico	0.894
Belgium	0.890
China	0.887
South Korea	0.877
Austria	0.873
Taiwan	0.863
Canada	0.855
Malaysia	0.761

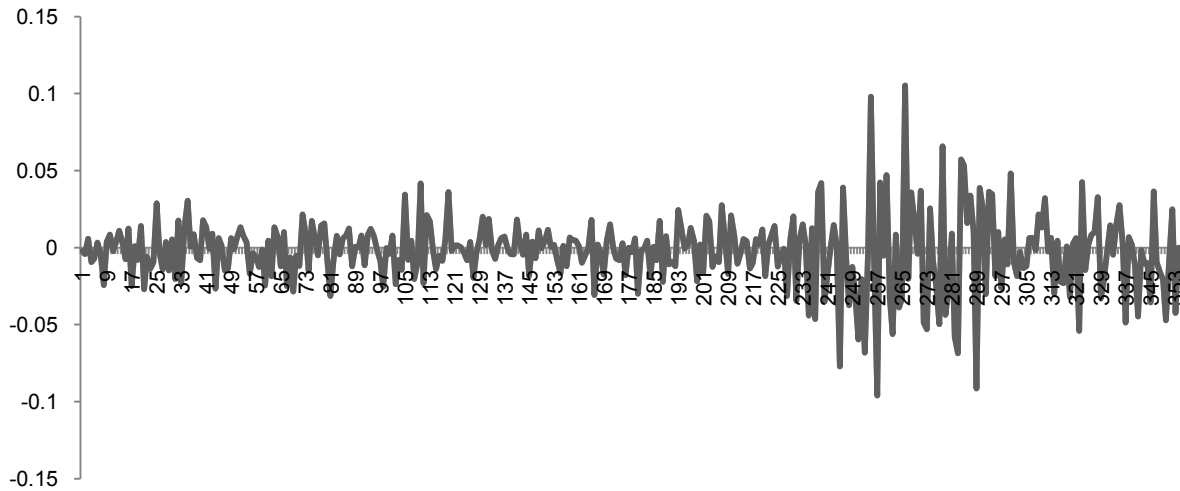
^a The twenty-three country index funds included in the study.

^b The correlation matrix of the index funds was used as input in the PCA computer program to obtain the factor loadings of the country index funds.

The principal component has an eigen value of 18.8 and it explains 81.9 percent of the variation in the original data matrix. 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.

The returns of the S&P 500 Index in Figure 1 indicate that the October 9, 2007-March 9, 2009 period can be divided into two sub-periods for further analysis. Return volatility was relatively low during the first eleven months and ten days of the bear market until September 19, 2008. The S&P 500 Index lost only about 20 percent of its value during this period. However, after this date, a free fall and extreme volatility in the market started, which continued until March 9, 2009. During this shorter five-month-twenty-day period, the S&P 500 Index lost another 36 percent of its value as of the October 9, 2007 starting point of the bear market.

Figure 1: S&P 500 Index Returns during the October 9, 2007-March 9, 2009 Period



This figure shows the daily returns of the S&P 500 Index during the October 9, 2007-March 9, 2009 period. The first 226 daily return observations correspond to the October 9, 2007-September 19, 2008 period when there was relatively less volatility in returns. The daily return observations between 227-355 correspond to the September 19, 2008-March 9, 2009 period with considerable volatility in returns.

To determine if the co-movements of the country index funds changed significantly from the October 9, 2007-September 19, 2008 period to the September 19, 2008-March 9, 2009 period, in this section of the paper, we apply the PCA technique to these two sub-periods separately. The factor loadings of the country index funds for the October 9, 2007-September 19, 2008 sub-period are presented in Table 6.

Table 6: Factor Loadings of the Principal Components: October 9, 2007-September 19, 2008 Period^a

Index Funds	Prin. Com. #1	Prin. Com. #2
France	0.792	<i>0.391</i>
Italy	0.848	<i>0.402</i>
Germany	0.841	<i>0.444</i>
Netherlands	0.836	<i>0.418</i>
Spain	0.827	<i>0.418</i>
Sweden	0.820	<i>0.412</i>
Belgium	0.812	<i>0.383</i>
Switzerland	0.801	<i>0.416</i>
Austria	0.792	<i>0.391</i>
U.K.	0.749	<i>0.507</i>
South Africa	0.676	<i>0.574</i>
Canada	0.657	<i>0.428</i>
Austria	0.624	<i>0.605</i>
Brazil	0.612	<i>0.569</i>
Hong Kong	<i>0.381</i>	0.840
China	<i>0.383</i>	0.832
South Korea	<i>0.374</i>	0.826
Singapore	<i>0.462</i>	0.803
Taiwan	<i>0.352</i>	0.787
U.S.	<i>0.599</i>	0.683
Mexico	<i>0.541</i>	0.678
Malaysia	<i>0.336</i>	0.654
Japan	<i>0.501</i>	0.644

^a The higher factor loading of each index fund in either principal component is shown in bold. The factor loading of the fund in the other principal component is shown in italics.

There are two statistically significant principal components for this sub-period. It indicates that it was possible to obtain some significant portfolio diversification benefit by investing in country index funds with high factor loadings in two different principal components during the October 9, 2007-September 19,

2008 period. Index funds with high factor loadings in different principal components are less correlated and they can provide greater portfolio diversification benefit.

The highest factor loadings of the country index funds in each principal component are shown in bold. The factor loadings of these funds in the other principal component are shown in italics. The first principal component is dominated by European index funds. These funds all have high factor loadings in the first principal component and including these funds in the same portfolio would provide very little portfolio diversification benefit. Investors who invest in these funds should prefer to invest in the country index funds with high factor loadings in the second principal component for better portfolio diversification. Similarly, the Asian index funds have high factor loadings in the second principal component. Investors who invest in these funds should prefer to invest in European index funds with high factor loadings in the first principal component for greater portfolio diversification benefit.

The S&P 500 index fund appears to be quite highly correlated with funds with high factor loadings in both principal components. However, it has a higher factor loading in the second principal component than in the first principal component. This result implies that U.S. investors could obtain slightly more portfolio diversification benefit by investing in the country index funds with high factor loadings in the first principal component than in those with high factor loadings in the second principal component.

The factor loadings of the country index funds for the September 19, 2008-March 9, 2009 period are presented in Table 7. There is only one principal component for this period. It indicates that all stock markets went down sharply and the global diversification opportunities were limited during this period. All index funds have very high factor loadings in the principal component. It implies that all country index funds were highly correlated during this period implying limited diversification opportunities for global investors. The Malaysian index fund has the lowest factor loading in the principal component. It indicates that the Malaysian index fund provided somewhat greater diversification opportunity to investors compared with the other funds during the September 19, 2008-March 9, 2009 period.

Table 7: Principal Components Analysis: September 19, 2007-March 9, 2009 period

Index Funds	Factor Loadings of the Principal Component
France	0.973
U.S.	0.964
U.K.	0.960
Spain	0.959
Germany	0.954
Netherlands	0.953
Italy	0.951
Sweden	0.938
Hong Kong	0.937
Japan	0.937
Brazil	0.936
Australia	0.935
China	0.929
South Africa	0.924
Switzerland	0.919
Taiwan	0.912
Mexico	0.902
Singapore	0.906
Belgium	0.903
South Korea	0.892
Canada	0.882
Austria	0.878
Malaysia	0.844

We can derive the following conclusion from the sub-period analysis in this section. There may be some global diversification opportunities to investors during relatively mild bear markets. However, the diversification benefits decrease sharply during strong global bear markets.

CONCLUDING COMMENTS

During the October 9, 2007-March 9, 2009 period, the U.S. stock market experienced the worst bear market in its history since the Great Depression. In this paper, we have studied the risks, returns, and portfolio diversification benefits of investing in country index funds with a sample of 23 Ishares country index funds during this period. We have demonstrated that U.S. investors would lose more and they would obtain limited diversification benefit by investing in most country index funds during the October 9, 2007-March 9, 2009 bear market.

Empirical studies show that global investments can provide significant portfolio diversification benefits to investors in bull markets. However, the benefits of global diversification decrease significantly during bear markets. Our correlation and principal components analysis results in this study indicate that investing in country index funds provided very little diversification benefit to U.S. investors during the October 9, 2007-March 9, 2009 bear market.

The bear market was relatively mild during the October 9, 2007-September 19, 2008 period and relatively strong during the September 19, 2008-March 9, 2009 period. Principal components analysis applied to these two sub-periods separately indicate that there were some significant global portfolio diversification opportunities during the October 9, 2007-September 19, 2008 period. However, there were no significant global portfolio diversification opportunities during the September 19, 2008-March 9, 2009 period. The conclusion that can be derived from our period analysis is that correlation between the world's stock markets increases sharply as they all decline at a rapid pace and the benefits of global portfolio diversification decrease significantly in a severe global bear market.

Ishares is the most important provider of exchange-traded single-country index funds. A limitation of our study is that, for consistency in sampling units, we used only Ishares country index funds in our study. Future research may expand the scope of the analysis by including the country index funds of some other exchange-traded-index-fund providers such as Power Shares, SPDR, Market Vectors, Clamoro/Alpha Shares, Direxion, iPath, Wisdom Three, etc.

Another limitation of our study is that we apply our analysis only to the October 9, 2007-March 9, 2009 bear market. To determine if there is inter-temporal consistency in the results, future research may also apply the analysis to other earlier bear markets. However, exchange-traded country index funds are a relatively new investment vehicle. Studies applied to earlier bear markets may have to use national stock market indexes instead of country index funds.

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