

International Equity Market: Returns, Risks and Correlations Before and During the 2008 Global Financial Crisis

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ABSTRACT

This paper examines and compares the returns, risks and correlation between international stock markets and the S&P 500 for the period before and during the 2008 global financial crisis. The study seeks to assist in determining whether or not diversification into international equity markets reduces risk while increasing returns during periods of financial crises or turmoil. It follows on from the findings of previous studies that demonstrate that correlations between international stock markets are much more closely related during financial crises than during good times. This increased correlation has been shown to reduce the benefits of diversification into international markets. China was found to be very lowly correlated with the S&P 500 during the crisis period and it may offer investors an option to reduce the levels of risk in their portfolios by increasing their international investments in the Chinese market thereby taking advantage of international diversification during this crisis period.

INTRODUCTION

Diversification into international equity markets has become a favored trend by global money managers in the past few decades as a method to reduce portfolio risk and to increase returns. However, during periods of market crisis, crashes or turmoil the benefits of this diversification have been observed to be significantly reduced if not eliminated altogether. Many studies have been done in this area of research examining the correlation and volatility of returns of international stock market indices during periods of financial crisis. One such study was performed in the mid 1990s by Solnik, Boucelle and Le Fur titled "International Market Correlation and Volatility". It was demonstrated that volatility is "contagious" during crisis periods. The researchers noted that due to this contagious nature of volatility that international correlation increases in periods of high market volatility. Since low international correlation across markets is at the root of global portfolio diversification this link between correlation and market volatility is bad news for global money managers. Another study was done by Ilhan Meric and Gulser Meric titled "Co-Movements of European Equity Markets Before and After the 1987 Crash" which also put forth the idea that low correlations among national equity markets are often presented as evidence in support of the benefits of international portfolio diversification.

The financial crisis in the U.S. has many causes: the lack of checks within the mortgage industry itself, rising oil prices, high food and transport prices and inflationary pressures. The bankruptcy of Lehman Brothers in September of 2008 and the rescue of AIG were two critical factors that intensified the U.S. financial crisis in September of 2008 and acted as catalysts to infect the rest of the world markets. The effects of the mortgage crisis, resulting bankruptcies and the effects of failed financial giants has been painfully felt throughout the world and is now reflected in the stock market indices of each country. Governments have had to step in to provide liquidity to get credit markets moving and so far have not had the expected positive results that these moves were intended to create. Investor fear and panic have created a reluctance to invest and many have simply liquidated their assets and are sitting on the sidelines until the market volatility lessens. The panic and government intervention has created an incredibly volatile market worldwide and the risks stemming from this crisis are reflected in the recent

volatility of international indices. The threat of long term negative consequences has increased threatening the returns of all international markets especially those most highly correlated to the US market.

HYPOTHESIS

This study is being done to examine the returns, risks and the correlation between the U.S. stock market and international stock markets during the 2008 global financial crisis. The data will be examined to determine whether the following hypothesis is supported or not: The major industrialized nations and the other developed nations in this study will be seen to be more closely correlated with the S&P 500 index due to the high level of risk that the 2008 U.S. financial crisis has induced into the world economic system of which these economies are heavily intertwined. The emerging market indices will continue to offer opportunities for diversification as they will have a lower correlation to the U.S. market with which they are being compared.

THE DATA & METHODOLOGIES

For this study the following assumptions are necessary and must be defined before the data and methodologies can be discussed in detail.

1. Each country's stock market index is represented in this study by an ETF (exchange traded fund) and its corresponding returns. The ETF that represents each country will be discussed as the country's index throughout this paper.
2. The period before the 2008 financial crisis is defined as the three year period from January 2005 through December 2007.
3. The 2008 financial crisis, for the purposes of this study, is defined as the period from January 1, 2008 to November 30, 2008. The returns for December 2008 are not yet available and therefore a cut-off date of the last day of November 2008 has been used. The U.S. recession was officially determined to have begun in December of 2007 as of November 2008.
4. Monthly returns are being used to analyze both periods even though they are of differing durations.

The daily return data that was collected to calculate the monthly return for each country's index was gathered from YahooFinance.com.

RESULTS

In general, positive returns for the emerging markets were higher than the major industrialized nations and the other developed nations during the period before the crisis. The negative returns were also much higher for the emerging markets than the other two groups during the crisis period. The monthly returns for all indices were positive prior to the 2008 financial crisis and ranged from .56% in the U.S. to 3.99% in Brazil during this three year period. However, the monthly returns for the indices for the period during the 2008 financial crisis were negative across the board. The results for the average monthly returns for the two periods are shown in the enclosed Table. Risk increased across the world in all markets by a significant proportion due to the problems in the U.S. financial crisis and the data is shown

in the enclosed Table. The correlations between each index and the S&P 500 have produced the most interesting results from this analysis. All countries with the exception of Japan had correlation levels from .500 to .835 showing that the markets were, in general, moderately correlated with the U.S. market prior to the financial crisis. However, everything changed drastically during the financial crisis. After examining the results of the correlation analysis all of the indices with the exception of China were much more strongly correlated with the U.S. market. The opportunities for diversification in these indices are now almost non-existent due to how highly correlate the indices are as a result of the many negative factors introduced into the world markets by the financial crisis in the U.S. market. The results of the correlation analysis can be reviewed in the enclosed Table.

CONCLUSIONS

The hypothesis that all of major industrialized nations and the other developed nations in this study will be seen to be more closely correlated with the S&P 500 index during the financial crisis was shown to be true. Each of the indices was more closely correlated to the S&P 500 index after the financial crisis began. However, the hypothesis that the emerging market indices would continue to offer opportunities for diversification due to continued lower correlations with the S&P 500 was proven to be incorrect. In each emerging market, with the exception of China, the correlation increased to be more closely correlated with the S&P 500 index and in some cases exceeded the correlation between major industrialized nations and the other developed nations with the S&P 500. Ultimately, the information that resulted from this analysis supports the idea that international markets are much more closely related or correlated during times of financial crisis. These results help to show that the benefits of diversification into international markets during times of crisis are much more difficult to achieve and cannot necessarily be relied upon.

TABLE 1: RETURNS AND SUMMARY STATISTICS 2005-2007

Date	S&P 500	Japan	Germany	UK	France	Italy	Canada	Spain	South Korea	Australia	Sweden	Switzerland	China	Brazil	India	Mexico
1/31/2005	-0.02240	-0.03022	-0.04724	-0.02432	-0.01549	-0.01836	-0.04569	-0.01615	0.05880	0.00778	-0.05010	-0.03721	-0.02326	-0.03147	-0.08404	-0.00278
2/28/2005	0.02080	0.02077	0.04113	0.05269	0.05019	0.02825	0.06667	0.02908	0.10849	0.05407	0.05726	0.06280	0.06681	0.16342	0.04458	0.07055
3/31/2005	-0.02427	-0.02960	-0.02165	-0.02422	-0.02066	-0.00193	0.01420	-0.03553	-0.07341	-0.04397	-0.03325	-0.04148	-0.05536	-0.09098	-0.04162	-0.10164
4/29/2005	-0.01799	-0.02288	-0.04314	-0.01213	-0.03350	-0.04963	-0.06106	-0.02959	-0.03049	-0.00708	-0.01376	-0.00711	0.01319	-0.04083	-0.05668	-0.02404
5/31/2005	0.03146	-0.01268	0.02139	-0.00782	0.01926	-0.00857	0.02745	0.00209	0.04248	-0.00534	0.01694	0.00358	-0.01229	0.08879	0.06906	0.09851
6/30/2005	-0.00193	0.00198	0.00396	0.01125	0.00924	0.01358	0.05401	0.01730	-0.00467	0.05552	-0.01029	-0.01130	0.04520	0.04330	0.08942	0.04677
7/29/2005	0.03854	0.01085	0.06764	0.00723	0.04950	0.03776	0.05840	0.04311	0.12469	0.01867	0.05891	0.04934	0.08142	0.02216	0.19263	0.08678
8/31/2005	-0.00970	0.08585	0.01901	0.03978	0.01348	0.01487	0.06195	0.01040	-0.02473	0.02665	0.02010	0.01950	0.00049	0.10721	0.01966	-0.00646
9/30/2005	0.00408	0.09524	0.00725	0.00744	0.01525	0.01426	0.05735	0.05008	0.12393	0.06057	0.03254	0.02137	0.03965	0.18619	0.09642	0.12038
10/31/2005	-0.02146	-0.06656	-0.02778	-0.02426	-0.03891	-0.06119	-0.07279	-0.03233	-0.05577	-0.05609	-0.05371	0.01267	-0.10321	-0.05222	-0.08744	-0.02106
11/30/2005	0.04163	0.02890	0.02963	0.00162	0.01403	0.01134	0.05250	-0.00876	0.09503	0.01837	0.00797	0.02773	0.05815	0.07030	0.06470	0.07889
12/30/2005	-0.00558	0.08507	0.04368	0.00270	0.02688	0.02402	0.04038	-0.00083	0.09708	-0.00212	0.05631	0.02169	0.01083	-0.01272	0.02741	0.03208
1/31/2006	0.02471	0.03698	0.08075	0.06082	0.07968	0.05356	0.09041	0.06387	0.07732	0.08453	0.05727	0.05852	0.16439	0.23884	0.22955	0.08765
2/28/2006	0.00532	-0.01569	0.00456	-0.00558	-0.01497	0.01076	-0.02261	0.03378	-0.03734	-0.02647	-0.00875	-0.00832	0.01185	-0.00314	0.00328	-0.01416
3/31/2006	0.01160	0.04348	0.04535	0.02857	0.05718	0.02423	0.01243	0.02514	0.00517	0.00806	0.08281	0.03256	0.02314	-0.03058	0.03040	0.00131
4/28/2006	0.01293	0.02778	0.04859	0.06399	0.03732	0.05341	0.05205	0.04806	0.06324	0.09590	0.05784	0.06307	0.05816	0.10763	0.09505	0.05634
5/31/2006	-0.02926	-0.05405	-0.04386	-0.02657	-0.02046	-0.01157	-0.02253	-0.02925	-0.08669	-0.05196	-0.07046	-0.04180	-0.06781	-0.16497	-0.12297	-0.11185
6/30/2006	-0.00157	-0.02571	-0.00736	0.00814	0.00910	0.00688	-0.02263	0.01976	-0.00397	-0.00240	-0.00118	-0.00235	0.04818	0.05873	-0.04763	0.03281
7/31/2006	0.00392	-0.00513	-0.00131	0.02613	0.00835	0.00581	0.00126	0.02813	0.00066	0.01012	-0.01107	0.03479	0.02409	0.00895	-0.11583	0.07214
8/31/2006	0.02202	0.01032	0.03710	0.02176	0.03609	0.04113	0.04079	0.03333	0.01573	0.02767	0.03517	0.02908	0.00737	-0.00760	-0.02791	0.03866
9/29/2006	0.02201	-0.01240	0.01136	-0.00816	0.00735	-0.00490	-0.03030	0.04739	0.00850	-0.01578	0.04865	0.01722	0.02676	-0.01787	0.11209	0.04448
10/31/2006	0.03207	0.01994	0.04702	0.04614	0.02126	0.03510	0.04750	0.07328	0.02141	0.08585	0.06222	0.02344	0.05212	0.09124	0.07135	0.07545
11/30/2006	0.01963	0.00000	0.04849	0.02838	0.04536	0.05864	0.02506	0.05086	0.04784	0.04344	0.04263	0.03817	0.11286	0.05669	-0.00106	0.03830
12/29/2006	0.00888	0.02896	0.01971	-0.00594	0.01724	-0.00569	-0.01746	0.00942	-0.00202	-0.02165	0.07314	0.01716	0.17008	0.05613	-0.02857	0.06218
1/31/2007	0.01430	0.00704	0.02454	0.00683	0.00351	0.01174	0.00079	0.02799	-0.04231	0.01787	0.01580	0.02369	-0.06846	0.00854	-0.03137	0.02302
2/28/2007	-0.01895	0.03145	0.00145	-0.01485	-0.00757	-0.01696	0.00592	-0.01724	0.03551	0.02843	-0.04148	-0.02511	-0.04546	-0.03026	-0.12056	-0.03719
3/30/2007	0.00736	-0.01287	0.04457	0.03661	0.03197	0.02271	0.02589	0.04192	0.03225	0.05488	0.06713	0.02535	0.03360	0.07420	-0.02455	0.07032
4/30/2007	0.04314	-0.01990	0.08914	0.03241	0.07590	0.06602	0.06119	0.00443	0.04924	0.04393	0.10555	0.06672	0.02792	0.06786	0.04431	0.02443
5/31/2007	0.03415	0.02241	0.05318	0.02133	0.02827	-0.00583	0.08468	0.05541	0.09499	0.02990	-0.01268	-0.00074	0.06705	0.12804	0.08687	0.13568
6/29/2007	-0.01980	-0.00616	0.00181	0.00670	-0.01336	-0.02486	-0.00797	-0.02792	0.03787	0.02043	-0.01475	-0.02725	0.14686	0.03593	0.00832	-0.01591
7/31/2007	-0.03189	-0.00551	-0.03743	-0.03366	-0.03984	-0.03695	0.00000	0.00447	0.09403	-0.01510	-0.00859	-0.02422	0.08584	0.03549	0.04811	-0.04963
8/31/2007	0.01311	-0.02495	0.01129	0.00203	-0.00705	0.00595	0.00134	-0.00462	-0.02835	-0.00357	-0.03244	-0.00272	0.07433	-0.03223	0.01530	-0.00578
9/28/2007	0.03624	0.01919	0.07225	0.04002	0.05053	0.03016	0.09465	0.04593	0.06178	0.13780	0.06879	0.04629	0.19753	0.19496	0.16900	0.00582
10/31/2007	0.01412	0.00139	0.04916	0.05791	0.03718	0.03846	0.10235	0.11299	0.09844	0.09185	-0.02569	0.02416	0.21394	0.16383	0.19245	0.05256
11/30/2007	-0.04113	-0.02019	-0.01847	-0.05878	-0.02206	-0.02211	-0.11558	0.00236	-0.11276	-0.08845	-0.08326	-0.00690	-0.14210	-0.05432	-0.05869	-0.06222
12/31/2007	-0.01351	-0.05544	-0.00477	-0.06011	-0.02512	-0.06897	0.00658	-0.06162	-0.02457	-0.08913	-0.06994	-0.05007	-0.09074	-0.00309	0.02149	-0.03498
Summary Statistics																
Average Monthly Return	0.00563	0.00605	0.01864	0.00845	0.01347	0.00753	0.01853	0.01713	0.02409	0.01648	0.01182	0.01201	0.03481	0.03989	0.02451	0.02409
Standard Deviation (σ)	0.02293	0.03476	0.03588	0.03114	0.03117	0.03214	0.04924	0.03610	0.06118	0.05014	0.04873	0.03142	0.08172	0.08600	0.08864	0.05794
Correlation	1	0.25741	0.83548	0.63964	0.77961	0.67423	0.67384	0.59705	0.52895	0.59483	0.70541	0.72456	0.50096	0.57891	0.62224	0.75142

TABLE 2: RETURNS AND SUMMARY STATISTICS 2005-2007

Date	S&P 500	Japan	Germany	UK	France	Italy	Canada	Spain	South Korea	Australia	Sweden	Switzerland	China	Brazil	India	Mexico
1/31/2008	-0.06270	-0.04289	-0.11964	-0.07973	-0.10597	-0.07711	-0.05729	-0.10071	-0.12442	-0.06731	-0.09375	-0.03925	-0.15477	-0.05217	-0.15853	-0.00946
2/29/2008	-0.02756	-0.01494	-0.00705	-0.01173	-0.00206	-0.01908	0.05713	0.00280	0.00512	-0.01265	0.04095	0.01842	0.00805	0.09204	-0.03226	0.00198
3/31/2008	-0.01136	-0.01277	0.01711	-0.01553	0.02977	-0.00905	-0.05311	0.06986	-0.02020	-0.02939	0.03796	0.01770	-0.06948	-0.07782	-0.10316	0.06333
4/30/2008	0.04825	0.07357	0.03713	0.05937	0.04350	0.05854	0.07093	0.02117	0.07761	0.07842	0.04388	-0.00193	0.17500	0.17253	0.10095	-0.01134
5/30/2008	0.01284	0.01958	0.02601	-0.00219	0.02852	0.00895	0.07856	-0.00446	-0.01181	0.05364	0.01911	0.00310	-0.04150	0.09876	-0.08150	0.07787
6/30/2008	-0.08825	-0.07903	-0.12198	-0.09083	-0.14080	-0.14734	-0.05284	-0.13311	-0.14089	-0.09566	-0.19906	-0.08182	-0.14034	-0.10026	-0.23054	-0.09590
7/31/2008	-0.00742	-0.03769	-0.00883	-0.04102	-0.02017	-0.03233	-0.05458	-0.01330	-0.02077	-0.06007	-0.01014	-0.00546	-0.65882	-0.09016	0.05427	-0.04988
8/29/2008	0.01488	-0.04917	-0.06100	-0.03372	-0.03358	-0.04647	-0.03094	-0.06292	-0.13425	-0.04260	-0.04218	-0.03212	-0.05668	-0.09675	0.00322	-0.03494
9/30/2008	-0.09400	-0.06573	-0.12774	-0.13281	-0.12324	-0.13250	-0.13298	-0.07134	-0.08181	-0.13770	-0.15926	-0.08166	-0.18143	-0.23262	-0.12293	-0.10611
10/31/2008	-0.16632	-0.15572	-0.22678	-0.19760	-0.23364	-0.23538	-0.27183	-0.23714	-0.28517	-0.27020	-0.25551	-0.12649	-0.27009	-0.33120	-0.37995	-0.33790
11/28/2008	-0.07465	-0.03778	-0.10227	-0.06437	-0.05610	-0.05768	-0.10792	-0.03329	-0.15739	-0.08873	-0.06246	-0.09309	0.05684	-0.06638	-0.16560	-0.04887
Summary Statistics																
Average Monthly Return	-0.04148	-0.03660	-0.06319	-0.05547	-0.05580	-0.06268	-0.05044	-0.05113	-0.08127	-0.06111	-0.06186	-0.03842	-0.12120	-0.06218	-0.10146	-0.05011
Standard Deviation (σ)	0.06207	0.05777	0.08347	0.06951	0.08652	0.08239	0.10126	0.08428	0.10026	0.09376	0.10400	0.05006	0.21579	0.14491	0.13543	0.11109
Correlation	1	0.88612	0.92801	0.95030	0.93250	0.94383	0.86579	0.81478	0.83342	0.93225	0.89235	0.85661	0.27659	0.80970	0.91168	0.80561

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