

# **G7 EQUITY INDEX REACTION TO THE 2008 FINANCIAL CRISIS**

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## **ABSTRACT**

*The 2008 global financial crisis had far-reaching effects in the international equity markets. While the crisis had its origins in the US mortgage market, the resulting economic impact was widespread. This paper examines the changes in risk, return and cross-market correlation in the G7 national equity indexes before, during and after the 2008 global financial crisis. We find that daily returns of G7 equity indexes dropped more than 0.35% and risk measures more than doubled during the crisis period. Index returns recovered and standard deviations dropped after the crisis, but risk remained above pre-crisis levels. Cross-market correlations indicate consistently lower correlations between the Japanese market and the remaining G7 countries suggesting a persistent diversification benefit in global portfolios.*

## **INTRODUCTION**

Shocks to financial markets come in all forms from oil price shocks to monetary tightening. Since the late 1980s, there have been several significant shocks to select markets which were transmitted to other capital markets, the most recent of which started in the 2008 in the US mortgage market. The first signs of the crisis became evident in early 2007 with the Federal Home Loan Mortgage Corporation (Freddie Mac) announcement that it would no longer buy the most risky subprime mortgages and mortgage-related securities. Throughout the rest of 2007 and early 2008, the US Federal Reserve implemented a series of rate cuts and extraordinary liquidity measures to support the markets and cushion the effects of the growing mortgage crisis. On September 7, 2008 the Federal Housing Finance Agency (FHFA) placed Fannie Mae and Freddie Mac into government conservatorship. At the same time, the U.S. Treasury announced the purchase of preferred stock, a secured lending facility and a temporary program to purchase mortgage backed securities (Federal Reserve 2010). One week later, Bank of America announced its \$50 billion purchase of Merrill Lynch & Co. and Lehman Brothers filed bankruptcy. The 2008 crisis was similar to the 1997 Asian crisis with its roots in excessive risk in the debt markets (Chatterjee, Ayadi, and Maniam, 2003).

Although the origins of the 2008 financial crisis arguably are based in the US mortgage markets, the results have been far reaching. Each of the G7 countries exhibit negative average daily returns and risk increases during the crisis period. The purpose of this paper is to investigate the changes in risk and return measures for each of the G7 national equity indexes

from January 2006 through March 2010. Additionally, the differences in cross country correlations are used to identify changes in market interactions.

The next section reviews some of the literature relevant to the reaction of global equity markets to financial shocks and the transmission of financial information between world markets. Section 3 describes the objectives of this study and Section 4 describes the G7 data and methodology used. The next section presents the empirical results. Conclusions and suggestions for further research are given in the final section.

## **LITERATURE**

The integration of financial markets and the transmission of economic shocks across markets has been the focus of considerable research for many years. The occurrence of a series of financial crises has provided frequent opportunity to evaluate the reactions of markets to shocks. Much of the previous research stems from an underlying assumption of market efficiency between similar markets. The absence of market integration is interpreted to suggest the availability of a diversification benefit in a global portfolio (Gonzalez-Rozada and Yeyati (2008); Phengpis, Apilado and Swanson (2004)). Changes in market integration during times of crisis provide insight into the pricing of new information across related markets (Caporale, Pittis, and Spagnolo (2006)).

## **OBJECTIVES**

The purpose of this paper is to evaluate changes in market risk, return and cross market correlations before, during and after the 2008 financial crisis. The paper describes return and risk characteristics for the G7 national equity markets for the period January 1, 2006 through March 31, 2010. The 2008 financial crisis period is defined from failure of Fannie Mae and Freddie Mac (September 7, 2008) through the first repayment of the Troubled Asset Relief Program (TARP) (March 31, 2009). The pre-crisis period covers January 2006 through September 6, 2008. Although the financial crisis cannot be considered ended in March 2009, the first redemptions of preferred shares under the Capital Purchase Program of TARP signaled an initial movement toward recovery. The paper utilizes a differences between means model to identify the impact of financial crises on national equity markets risk, return and correlations.

## **DATA AND METHODOLOGY**

The data used consists of daily MSCI index levels for the G7 national equity indices (Canada, France, Germany, Italy, Japan, UK & US) for the period January 1, 2006 through March 31, 2010. The daily returns are calculated as the difference in the natural logs at time  $t$  and  $t-1$ . A 2-day average return is evaluated. January 2006 through early September 2007, the pre-

crisis period, was a time of increasing uncertainty in the financial markets. During this period, four of the G7 countries had negative average daily returns: USA, UK, Italy, and Japan. During the crisis period, all seven indexes had negative returns and each index showed positive returns in the recovery period. The US exhibits the lowest standard deviation of returns of the individual countries studied. This is seen in the pre-crisis and crisis recovery periods. During the crisis period, Japanese returns showed the lowest risk, even though Japan had the highest standard deviation in the pre-crisis period. Canadian returns were riskiest in the crisis and recovery periods. The average returns of all indexes are normally distributed (Jarque-Bera) over the full period and each subperiod.

<b>Table 1: Descriptive statistics for each series and time period</b>								
This table details the descriptive statistics for the G7 national equity indexes.								
	<b>Full Period (N=1171)</b>		<b>Pre-crisis (N=698)</b>		<b>Crisis (N=147)</b>		<b>Post-crisis (N=261)</b>	
<b>Index</b>	<b>Mean</b>	<b>Std Dev.</b>	<b>Mean</b>	<b>Std Dev.</b>	<b>Mean</b>	<b>Std Dev.</b>	<b>Mean</b>	<b>Std Dev.</b>
Canada	0.0101	1.4171	0.0344	0.8750	-0.3655	2.9588	0.2010	1.2557
France	-0.0227	1.3370	0.0106	0.8678	-0.3439	2.6171	0.1520	1.1454
Germany	-0.0074	1.3191	0.0336	0.8553	-0.3814	2.6050	0.1518	1.1964
Italy	-0.0531	1.3970	-0.0151	0.7804	-0.4265	2.8047	0.1460	1.2317
Japan	-0.0310	1.0983	-0.0285	0.9176	-0.2367	2.0174	0.1103	0.8243
United Kingdom	-0.0250	1.2807	-0.0070	0.8116	-0.3681	2.6577	0.1728	1.0651
USA	-0.0162	1.0547	-0.0015	0.6417	-0.3031	2.2726	0.1497	0.8117

Differences between national means are calculated for the periods before, during and after the financial crisis. T-tests based on equal variances and unequal variances are calculated to determine the statistical significance of the differences. An F-test evaluates the equality of the variances. The results shown are based on equal variances where appropriate and unequal variance otherwise. Additionally, the correlations of the returns for each country pair are calculated for each time period. The Fischer r to z transformation is used to calculate the differences and significances between the correlations.

## EMPIRICAL RESULTS

Table 2 shows the mean daily returns and differences between the means for each of the G7 countries in the period before, during and after the 2008 financial crisis. The difference between means represents the chronological difference between means. In particular, the average daily US return in the crisis period was  $-0.3031$  and the average pre-crisis return was  $-0.0015$ . The difference between these means, crisis period minus pre-crisis period is  $-0.3015$ . This difference indicates that average daily returns fell 0.3015% from the pre-crisis period to the crisis

period. The US mean daily return increased 0.4528% in the crisis recovery period. The third column of differences shows the change from the pre-crisis period to the crisis recovery period. In the case of the US, returns increased 0.151% from pre-crisis to recovery.

	<b>Pre-crisis</b>	<b>Crisis</b>	<b>Post-Crisis</b>	<b>Crisis minus Pre-crisis</b>		<b>Post-Crisis minus Crisis</b>		<b>Post-Crisis minus Pre-Crisis</b>	
<b>Variable</b>	(N=698)	(N=147)	(N=261)						
Canada	0.0344	-0.3655	0.2010	-0.3999	a	0.5665	a	0.1666	b
France	0.0106	-0.3439	0.1520	-0.3545	a	0.4959	a	0.1414	b
Germany	0.0336	-0.3814	0.1518	-0.4150	a	0.5331	a	0.1181	c
Italy	-0.0151	-0.4265	0.1460	-0.4114	a	0.5725	a	0.1612	b
Japan	-0.0285	-0.2367	0.1103	-0.2082	c	0.3470	b	0.1388	b
UK	-0.0070	-0.3681	0.1728	-0.3611	a	0.5409	a	0.1798	a
United States	-0.0015	-0.3031	0.1497	-0.3015	a	0.4528	a	0.1513	a

The global nature of the 2008 financial crisis is evident in the differences between means shown in *Crisis minus Pre-Crisis*. Average daily returns for all of the indexes studied declined during the crisis period. The average decrease in returns was 0.35%, with Germany and Italy exhibiting the greatest drops. All indexes showed sharp increases from crisis to recovery with 4 of 7 posting gains in excess of 0.5%. Returns on the Japanese market were least effected in the crisis period (-0.208) and showed the smallest increase during the recovery period (0.347). Over the entire period, all equity indexes showed increases in daily returns.

		<b>Pre-Crisis</b>	<b>Crisis</b>	<b>Post-Crisis</b>	<b>Crisis minus Pre-crisis</b>		<b>Post-Crisis minus Crisis</b>		<b>Post-Crisis minus Pre-Crisis</b>	
		(N=698)	(N=147)	(N=261)						
FRA	CAN	0.567	0.708	0.761	0.140	a	0.053		0.193	a
GER	CAN	0.543	0.686	0.781	0.143	a	0.095	b	0.238	a
IT	CAN	0.524	0.682	0.757	0.159	a	0.075	c	0.234	a
JP	CAN	0.113	0.324	0.043	0.211	a	-0.281	a	-0.070	
UK	CAN	0.588	0.724	0.751	0.136	a	0.027		0.163	a
USA	CAN	0.562	0.753	0.780	0.191	a	0.027		0.218	a

**Table 3: Cross market correlations, differences and significance**

		<i>Pre-Crisis</i>	<i>Crisis</i>	<i>Post-Crisis</i>	<i>Crisis</i>		<i>Post-Crisis</i>		<i>Post-Crisis</i>	
GER	FRA	0.953	0.926	0.969	-0.027	a	0.043	a	0.016	a
IT	FRA	0.918	0.959	0.961	0.041	a	0.002		0.042	a
JP	FRA	0.198	0.350	0.073	0.152	b	-0.278	a	-0.126	b
UK	FRA	0.917	0.949	0.925	0.032	a	-0.024	b	0.008	
USA	FRA	0.426	0.544	0.680	0.118	b	0.136	b	0.254	a
IT	GER	0.905	0.880	0.933	-0.025	c	0.053	a	0.029	a
JP	GER	0.208	0.307	0.054	0.099		-0.253	a	-0.154	b
UK	GER	0.881	0.875	0.916	-0.007		0.042	b	0.035	a
USA	GER	0.400	0.620	0.682	0.220	a	0.062		0.282	a
JP	IT	0.169	0.365	0.076	0.196	a	-0.288	a	-0.093	c
UK	IT	0.854	0.913	0.886	0.059	a	-0.028	c	0.032	b
USA	IT	0.388	0.495	0.681	0.107	c	0.186	a	0.293	a
UK	JP	0.166	0.355	0.080	0.189	b	-0.275	a	-0.086	
USA	JP	-0.023	0.006	-0.067	0.028		-0.072		-0.044	
USA	UK	0.426	0.542	0.643	0.115	b	0.101	c	0.217	a

Significance levels are: a=1% , b=5% , c=10%; Differences between means represent chronological change

Cross market correlations and the differences between these correlations are shown in Table 3. The results show evidence of high correlations among European countries and consistently lower correlations between Japan and the remaining G7 members. This persistent relationship may support the availability of a diversification benefit in a global portfolio, even in times of crisis ((Gonzalez-Rozada and Yeyati (2008), Phengpis, Apilado and Swanson (2004)). In the crisis period, cross market correlations generally increased, except between Italy/Germany and France/Germany. Even though these correlations declined slightly, the overall level of correlation remained high. In the crisis recovery period, correlations increased in 14 of 21 pairs and declined in 7 pairs. Interestingly, Japanese pairs accounted for five of the seven drops (Canada, France, Germany, Italy and UK) and the UK was a partner in the remaining two (Italy, France). Over the entire period, all seven Japanese pairs exhibited lower correlations in contrast to all other pairs which reported increased correlations. The largest gains are seen in the US/Italy, US/Germany, and US/France pairs.

## CONCLUSIONS

While the 2008 financial crisis may trace its origins to the US mortgage market, the effects have been significant and widespread. The average daily returns of the G7 equity markets demonstrate the far-reaching and consistent impact of the crisis. Equity returns dropped sharply and risk increased for each G7 member during the crisis period. Returns improved and risk declined in the post-crisis period, but risk measures remained elevated above pre-crisis levels in the sample studied. Cross-market correlations for the Japanese market demonstrated a lower level of market integration which reduced even further during this period. One avenue of further research will be to expand this investigation to all G20 nations to evaluate the crisis response in a larger sample of countries.

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