

Impact of Global Financial Crises on Developed and Emerging Markets

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The main objective of this study is to examine the financial market endogeneity in Asia by analyzing the impact of the global financial crisis on the long-run integration between India and developed/emerging markets. The data used in this paper comprises of daily close prices of SENSEX (India), USA, UK, France, Germany, Australia, China, Singapore, Malaysia, Thailand and Indonesia. For the period January 01, 2001 to December 31, 2011, we have divided the financial crises period into pre-period (January 01, 2001-october 31, 2007) and post period (November 01, 2007- December 31, 2011). To study the long-run and short-run, we have employed Augmented Dickey-Fuller Test Statistics and the Jarque Beta test to understand the time-series properties. From the evidence of the results we conclude that these markets do not behave in the same manner after the occurrence of the global financial crisis and the market participants should adopt an admonitory approach while playing in these markets.

1. Introduction

The global economic slowdown of 2007-08 has affected all the financial markets including India, emerging and developed markets. Co-movement of financial markets across the globe equally poses typical challenges of market contamination and spillovers of unfavourable consequences from one economy to the other. The Asian crisis (1987) and the recent global financial crisis (2008) have introduced the possible threat of financial market integration and it is becoming important on the part of investors, regulators and the government to analyse and concentrate on the issue. The emerging market returns in the past have demonstrated certain distinguishing features; for example, average returns were higher, correlation with developed market returns was low, and thus investors looked to emerging markets for risk diversification as their returns were more predictable and although their volatility was higher, the low correlation reduced portfolio risk through diversification.

In previous studies, it was concluded that excluding the Indian market from the set of the Asian markets leads to no or fewer co-integration relations. This implied that our Indian market plays a very important role in the degree of linkages of these markets during the recent period after the crises. Also, the previous studies considered some developed and emerging countries individually, but the present study is based on all the developed and emerging countries together.

The present study analyzes the inter-linkages among some emerging and developed markets in Asia to study their level of integration and also to investigate any change in the co-movement of these markets after the global financial crisis using the goodness of fit test i.e. Jarque Beta. Further, to study the long-run and short-run, we have employed Augmented Dickey-Fuller Test Statistics to understand the time-series properties. The present study will also help in understanding the portfolio diversification strategy of international investors who operate in these markets and to understand the influence of the global financial crisis.

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Section 2 of this paper presents the literature review which will provide the information about the previous work done on this subject. Section 3 discusses the methodology and model used for the study, which will give the information about the sources of data and a description of the technique or model used for data analysis. Section 4 discusses the findings of this study. Section 5 discusses the summary and conclusions of the study and finally section 6 gives some limitations of the study.

2. Literature Review

Phylaktis and Xia (2006) studied the equity market co-movement and contagion at the sector level during the period 1990-2004 across the European region, Asia and Latin America. The results imply that there are sectors which can still provide international diversification after the crises.

Bose and Mukherjee (2005), examined the co-movement of the Indian stock market with developed markets like US, Japan and other Asian markets by using daily data for the period of January 2004 to June 2004 and pair-wise and group wise co-integration and Ganger causality tests. They concluded that excluding the Indian market from the set of the Asian markets leads to no or fewer co-integration relations.

Kozluk (2008) considered the stock market returns and volatility between Russia and China. He applied the factor models on two emerging stock markets. The results show that the Russian stock market increased the co-integration with the global financial crises. However, the Chinese stock market was independent from the global movement of the markets.

Majid. et al. (2007), studied market integration among five selected ASEAN emerging markets i.e. Malaysia, Thailand, Indonesia, Philippines and Singapore. The results show that the ASEAN stock markets are going towards a greater integration with the US and Japan especially during the global financial crisis.

Bekaert and Harvey (1995) have shown that the characteristics of emerging market equities are vastly different from those for developed markets equities. King and Wadhvani (1989) examined the transmission of volatility between stock markets. When investors derive information from price changes in other markets, sensitive information gets transmitted to other markets. They called contagion and argued that the reason the stock market crashed in 1987, despite the differences in economic prospects, is the openness of the market and the extent of overvaluation before the crisis.

There are many studies on foreign investment and stock market related topics. Rao et al. (1999) in their study of foreign institutional investments and Indian stock market found that the net FII investments influence the stock prices in India. The 1987 stock market meltdown has been studied extensively in the literature (see, e.g., Roll, 1988; King and Wadhvani, 1990; Amihud et al., 1990; Seyhun, 1990; and Wang et al., 2009). The U.S. stock market also experienced a severe meltdown in 2008.

Taylor and Tonk (1989) analysed the market integration concerning markets of US, Germany, Netherlands and Japan for the sub-periods from April 1973 to September 1979 and from October 1979 to June 1986 using data on stock price indices. They applied the bi-variate co-integration technique (eagle and Granger, 1987) and found that the stock price index of United Kingdom was co-integrated with the stock price index of the US,

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Germany and Netherlands. They also found that there was co-integration between UK and Japan only for the later period.

Kasa (1992) investigated common stochastic trends in the stock markets of the US, UK, Japan, Germany and Canada by applying quarterly and monthly data for the period 1974-1990. He found that all the samples markets are driven by a single common stochastic trend.

Rocca (1999) estimated the stock price linkages between the equity markets of Australia and that of the US, UK, Japan, Hong Kong, Singapore, Taiwan and Korea by using weekly stock market data. He found that there is no co-integration between Australia and other markets. But he also concluded that there was a significant causal relationship among Australia, US and UK.

The limitation of the previous studies is that many of the studies only considered emerging market or developed markets, and in all the previous studies the time period is considered only up to 2007. In the present study the data is up to 2011 and all the emerging and developed markets are considered together.

3. The Methodology and Model

The null hypothesis of the Augmented Dickey-Fuller t-test is

$H_0: \theta = 0$ (i.e. the data needs to be differenced to make it stationary)

Versus the alternative hypothesis of

$H_1: \theta < 0$ (i.e. the data is stationary and doesn't need to be differenced)

The data used in the paper comprise of daily close prices of SENSEX (India), USA, UK, France, Germany, Australia, China, Singapore, Malaysia, Thailand and Indonesia. For the period January 01, 2001 to December 31, 2011, we have divided the financial crises period into pre-period (January 01, 2001-october 31, 2007) and post period (November 01, 2007- December 31, 2011).

The names of the countries, indices and the data periods are provided in the table below. There are six countries from developed capital markets and five from emerging markets including India. The Bloomberg database is used as the data source.

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Table 1 – Names of the Countries, Indices and the Data Period

Country	Index
USA	S & P 500
UK	FTSE 100
France	CAC 40
Germany	DAX 30 Xetra
Australia	All Ordinaries
Hong Kong, China	Hang Seng
Singapore	Straits Time
Malaysia	Kuala Lumpur Composite
Thailand	Stock Exchange of Thailand
China	Shanghai Composite
India	SENSEX
Indonesia	Jakarta Composite

Bloomberg usually chooses the most popular indices to describe the movements in stock prices in respective markets. Among these indices for each market, we choose the principally recognized stock price index of each country. Index series are published in the currency of local markets. For cross country comparisons, all indices are converted into one common currency, the US dollar, by using a standard conversion method provided in the Bloomberg system. For some countries the data are not available for the entire period, either as the markets were not fully developed or hence there were no indices or the data had not been captured by Bloomberg.

The co-integration analysis has been carried out separately for the pre crisis period and post crisis period. Further, to study the causal relationship, Granger causality test has been employed pair-wise for the pre-crisis period and post- crisis period separately by taking all the time series data representing sample countries.

The data used in the study are essentially time series and it becomes necessary to give details of the statistical properties of the time series. ADF test is applied for observing the characteristics of the data series under study, for transformation techniques, logarithmic transformation is commonly used.

In the study, each price series (index) is transformed into its natural logarithm price series. To understand the change in the time-series behaviour, we have calculated the descriptive statistics such as the skewness, kurtosis and Jarque-Bera. These techniques also explain that the price distributions of stock indexes are not normally distributed. Given the fact that the presence of stochastic trend or deterministic tendency in a financial time series or its stationary/non-stationary in levels is a requirement for conducting any test, the study begins with the testing of price series for a unit root using the Augmented Dickey Fuller (ADF) test. In view of the intrinsic heteroskedasticity of price changes, it is considered sensible to convert it into log price changes. The time series variables considered in this paper are daily stock prices of sample countries and the ADF unit root test is performed by using the following equations:

$$\Delta Y_t = \alpha_1 Y_{t-1} + \sum_{j=1}^p Y_j \Delta Y_{t-j} + \epsilon_t$$

(1)

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \sum_{j=1}^p Y_j \Delta Y_{t-j} + \epsilon_t$$

(2)

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_2 t + \sum_{j=1}^p Y_j \Delta Y_{t-j} + \epsilon_t$$

(3)

4. The Findings

The descriptive statistics in Table 2 and 3, indicate the basic characteristics of time series data with respect to all the price series representing the sample markets under study. The Jarque-Beta test statistics for SENSEX (India), USA, UK, France, Germany, Australia, China, Singapore, Malaysia, Thailand and Indonesia as shown in Table 2 are 1967.56, 1812.23, 1768.90, 1516.78, 1878.34, 1678.90, 1678.30, 1756.34, 1845.34, 1738.45 and 1567.34 respectively and statistically significant during the pre crisis period. But in previous studies, the Jarque-beta test is not statistically significant for the three countries i.e. Germany, Australia and Singapore during the pre crises period. The Jarque-Beta test statistics for SENSEX (India), USA, UK, France, Germany, Australia, China, Singapore, Malaysia, Thailand and Indonesia as shown in Table 3 are 1149.26, 1232.45, 1345.34, 1190.25, 695.34, 1009.20, 1112.20, 768.90, 832.34, 1045.15 and 723.30 respectively and are statistically significant during the post crisis period. And, in previous studies, the Jarque-Beta test statistics are not statistically significant for the four countries i.e UK, France, Germany, Malaysia and Indonesia during the post crises period. The computation of descriptive statistics such as skewness, kurtosis and Jarque- Beta during the pre-crisis and post crisis period provides the information that the indices' are normally distributed or not.

Table 2 : Descriptive Statistics of Stock Indices during pre-crisis period-

Descriptive Statistics of Stock Indices during pre-crisis period				
	Sensex	USA	UK	France
Mean	0.000408	0.000534	0.000456	0.000341
Median	0.000715	0.000677	0.000782	0.000456
Std. Dev.	0.006222	0.004553	0.003452	0.001324
Skewness	-0.637876	-0.743533	-0.675343	0.453334
Kurtosis	8.126119	9.102221	8.343536	7.454677
Jarque-Beta	1976.578	1812.23	1768.90	1516.78
	Germany	Australia	China	Singapore
Mean	0.000567	0.000456	0.000533	0.000466
Median	0.003453	0.004567	0.000678	0.000183
Std. Dev.	0.007545	0.006722	0.001245	0.005566
Skewness	0.456771	-0.13633	0.454673	0.238999
Kurtosis	6.263732	7.536335	8.905454	6.798877
Jarque- Beta	1878.34	1678.90	1678.30	1756.34
	Malaysia	Thailand	Indonesia	
Mean	0.000789	0.000651	0.000788	
Median	0.000243	0.000678	0.000456	
Std. Dev.	0.006474	0.005775	0.004679	
Skewness	-0.64784	-0.66676	-0.56763	
Kurtosis	5.687264	6.893444	7.473748	
Jarque-Beta	1845.34	1738.45	1567.34	

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Table 3: Descriptive Statistics of Stock Indices during post-crisis period-

Descriptive Statistics of Stock Indices during post-crisis period				
	Sensex	USA	UK	France
Mean	0.000132	0.000112	0.000657	0.000146
Median	0.000112	0.000678	0.000977	0.000788
Std. Dev.	0.008464	0.003990	0.003489	0.004674
Skewness	0.784944	0.648443	-0.59999	0.478899
Kurtosis	8.126119	7.354677	7.883683	7.179677
Jarque-Beta	1149.26	1232.45	1345.34	1190.25
	Germany	Australia	China	Singapore
Mean	0.000999	0.000544	0.000267	0.000356
Median	0.008934	0.008374	0.000798	0.000384
Std. Dev.	0.009688	0.005674	0.005677	0.007889
Skewness	0.356889	-0.67788	0.356677	0.478891
Kurtosis	6.878381	5.788888	7.456776	5.478399
Jarque-Beta	695.34	1009.20	1112.20	768.90
	Malaysia	Thailand	Indonesia	
Mean	0.000889	0.000789	0.000712	
Median	0.000899	0.000386	0.000670	
Std. Dev.	0.005893	0.005851	0.007333	
Skewness	-0.49595	-0.59593	-0.29494	
Kurtosis	4.587564	5.839322	6.833939	
Jarque-Beta	832.34	1045.15	723.30	

The Augmented Dickey-Fuller (ADF) test has been conducted at levels and at first differences of each of the eleven price series and the results are shown in Table 4 and Table 5. The ADF coefficients of SENSEX (India), USA, UK, France, Germany, Australia, China, Singapore, Malaysia, Thailand and Indonesia price series at level are statistically insignificant during the pre-crisis period which indicates the presence of unit roots and all the prices series are stationary. But, the ADF coefficients of SENSEX (India), USA, UK, France, Germany, Australia, China, Singapore, Malaysia, Thailand and Indonesia price series at first differences are statistically significant during the pre crisis period indicating the absence of unit roots and all the prices series are stationary.

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Table 4: Results of Unit Root Test for Pre-Crisis Period-

Augmented Dickey-Fuller Test Statistics				
Pre- Crisis Period (January 01, 2001- October 2007)				
Markets	Price at Levels		Price at first difference	
	t- Statistics	Probability	t- Statistics	Probability
India	3.363732	1	-29.99971	0
USA	4.783774	0.98877	-47.89833	0
UK	3.378988	0.88776	-67.56678	0
France	2.794885	0.94564	-23.67782	0
Germany	3.889998	0.75567	-45.68867	0
Australia	3.897789	0.46778	-23.44444	0
China	2.976577	0.78865	-33.68876	0
Singapore	3.320988	0.45667	-49.23233	0
Malaysia	3.789754	0.97667	-56.43343	0
Thailand	2.668878	0.56779	-78.65543	0
Indonesia	2.787767	0.86544	-21.33444	0

The ADF coefficients of SENSEX (India), USA, UK, France, Germany, Australia, China, Singapore, Malaysia, Thailand and Indonesia price series during the post crisis period at levels show the presence of unit roots whereas at first differences, the results reflect the absence of unit roots and the series are stationary. The outputs of ADF-test are in consonance with the already presented facts about time series that most of the time series data are non-stationary at levels but stationary at first differences.

Table 5: Results of Unit Root Test for Post-Crisis Period-

Augmented Dickey-Fuller Test Statistics				
Post- Crisis Period (January 01, 2001- October 2007)				
Markets	Price at Levels		Price at first difference	
	t- Statistics	Probability	t- Statistics	Probability
India	-1.101074	0.7172	-.25.677	0
USA	-1.389099	0.8555	-34.344	0
UK	-2.373737	0.5675	-23.455	0
France	-1.384948	0.0033	-20.354	0
Germany	-3.877588	0.6788	-34.555	0
Australia	-2.333455	0.3333	-21.344	0
China	-4.332445	0.4545	-56.434	0
Singapore	-2.354668	0.8766	-34.434	0
Malaysia	-3.789992	0.4536	-26.767	0
Thailand	-2.111455	0.5666	-37.656	0
Indonesia	-3.789988	0.2525	-45.455	0

5. Summary and Conclusions

There is serious concern for policy makers as well as portfolio investors as to how and to what extent their domestic economy moves in step with the economies of the rest of the world. Essentially, the extent of market endogeneity and co-movement is there to determine the influence of policy maker's decisions on their own economies. The main objective of this study is to examine the financial market endogeneity in Asia by analyzing

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the impact of the global financial crisis on the long-run integration between India and developed/ emerging markets. From the above results we conclude that there is the influence of the global financial crisis on the long-run relationship between India and the rest of the sample markets. From the evidence we conclude that these markets do not behave in the same manner after the occurrence of the global financial crisis and the market participants should adopt an admonitory approach while playing in these markets.

The results support the findings of previous studies except that the Jarque-beta test statistic is not statistically significant for the three countries i.e. Germany, Australia and Singapore during the pre crisis period and the Jarque Beta test statistic is not statistically significant for the four countries i.e. UK, France, Germany, Malaysia and Indonesia during the post crisis period.

6. Limitations

The study suffers from the following limitations:

1. Data for the year 2012 for many of the emerging and developed countries were not available.
2. To understand the long run relationship between India and rest of the countries, the Johansen's co-integration test was not applied.
3. To understand the pair wise relationship between India and rest of the countries, the Granger Causality test was not conducted.

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