Integration of financial markets - an investigation of diversification opportunities

B.J.Queensly Jeyanthi
J. A. College for Women, Periyakulam, Taiml Nadu, India

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Abstract

The process of globalization is creating a new world. The fate of the economy of a country is intertwined with the performance of its stock markets. This is especially true for the emerging economies and stock markets. The development process undergone by these emerging economies has clearly demonstrated that today's investor is unlikely to invest in what appears to be a profitable company if the economic fundamentals of the country are in question. The degree of a country's economic openness or capital control throws light on the degree of association with the financial markets in the world. The scientific portion of risk management requires an estimate of the probability of more extreme price changes. The objectives of the study are to see whether Indian stock market returns are cross correlated to the stock market returns of other selected economies in the short and long run and to compare the distribution of the stock market returns of India with other selected economies. The daily closing price of NIFTY 50 (INDIA), FRANCE (CAC 40), UK (FTSE) GERMANY (DAX) and USA (DIJ) have been collected from April 2004 to March 2012. The test results show that there exist a very weak correlation among the Indian markets and Germany, France, and USA. The Indian markets offer diversification benefits to international investors looking for investment in India.

1. Introduction

Globalization is creating a new world. The economy of a **country is** depends upon the performance of its stock markets. This is especially true for the emerging economies and stock markets. The development process undergone by these emerging economies has clearly demonstrated that today's investor is unlikely to invest in what appears to be a profitable company if the economic fundamentals of the country are in question. The increasing interdependence of major financial markets all over the world is commonly termed as international stock market integration and it has become a necessary research topic. The degree of a country's economic openness or capital control throws light on the degree of association with the financial markets in the world. Greater integration paves way for free access to foreign financial markets. This better access would provide many firms a broader source for fund raising. The distribution of stock returns is important for a variety of trading problems. The scientific portion of risk management requires an estimate of the probability of more extreme price changes.

Modern finance is heavily based on the assumption of normal distribution. Consequently, an understanding of how volatility evolves over time is essential to the decision making process. Volatility, which increases the unpredictability of returns to investors, is an important factor in emerging equity markets. A market with lower volatility is, other things equal, more investor-friendly and will attract larger and stable amounts of capital. In addition, the cost of raising capital will be lower. It is not appropriate to use the standard deviation as the sole measure of risk. In that case investors should also look at the degree of symmetry of the distribution, as measured by its so-called 'skewness' and the probability of extreme positive or negative outcomes, as measured by the distributions, 'kurtosis. Behavioural finance suggests investors have a preference for numerous small wins and a single large loss over numerous small losses and a large win. A negatively skewed distribution provides the necessary environment for many small wins, as the majority of incidences are to the right. Financial crisis has destabilized the market return and the volatility. In this paper an attempt has been taken to know the behavior of the market before, during and after the crisis.

2. Objectives

In this study India is compared with four other countries namely France, Germany, UK and US in terms of Stock market returns, cross correlation, co integration of these returns in the long and short run and distribution of these returns. The results of the study would show that whether Indian Stock markets (NSE Nifty) offer major diversification to institutional and international investors in the short and long run. The study of the stock returns in these countries would definitely help the future investors to take investment decisions while investing in these countries. The results of the study will signify the importance of various volatility measures such as variance, skewness and kurtosis while assessing the risk of capital of assets for traders, investors and corporate managers. It would also throw up new insights into the selected economies. Lastly it would compare the potential of Indian stock markets with other developed markets.

At this backdrop the objectives of the study are enumerated as:

1) To see whether Indian stock market returns are cross correlated to the stock market returns of other selected economies.
2) To compare the distribution of the stock market returns of India with other selected economies.
3) To examine whether the Indian stock market is co integrated with other stock markets in the long and short run.

3. Literature Review

Asjeet Lamba 2004 focused on the dynamic relationships between major developed markets and markets in India, Pakistan and Sri Lanka from July 1997 to February 2003. For India the S&P CNX Nifty was chosen. The major developed equity markets included in the analysis were France Germany, Japan, the UK and the US. He used multivariate co integration and vector error correction modeling and arrived at the conclusion that Indian market was influenced by the large developed equity markets including the US, the UK, and Japan and that this influence was strengthened during the period from January, 2000 to February 2003. Pakistan and Sri Lanka markets were relatively isolated from the major developed markets during the entire sample period. Harju and Hussain 2008 explored the dynamic first and second moment linkages among international equity markets using 5-minute index returns from the equity markets of the UK, Germany and the US, for the period from September, 2001 to August, 2003. The two European markets exhibited significant reciprocal return and volatility spillovers. This relationship appeared virtually unchanged by the presence or absence of the US market. Kumar and Dhankar 2009, examine the cross correlations in stock returns of India with Pakistan and Bangladesh for a period between 1997 and 2007. They tested the asymmetric volatility and relationship of stock returns with expected and unexpected volatility. They found weak correlation between the stock returns and significant relationship between stock returns and unexpected volatility, suggesting that investors realize extra risk premium for taking advantage of unexpected variations in stock returns. With such mixed results, the literature tends to conclude that Indian stock market is neither well integrated nor completely segmented in the recent past.

Skewness or asymmetry in distribution is found in many important economic variables such as stock index returns and exchange rate changes (Harvey and Siddique 1998). There is a continuous debate whether stock market returns are symmetric or asymmetric in nature. A number of previous studies have documented an asymmetry in the relationship between stock market returns and its volatility (Beedles 1978, Aggarwal and Aggarwal 1993, Alles and King 1994). Black 1976, Christie 1982 found that positive returns have a smaller impact on future volatility than negative returns of same absolute magnitude. Alles and Kling (1994) document a significant presence of negative skewness in return distributions and changes of the degree of skewness with the stages of the business and stock market cycles. An important finding of their research was that skewness is more negative during economic upturns and less negative, even positive during downturns. The findings of Ekholm and Pasternack (2005) lend solid support to the 'negative news threshold' hypothesis, which states that negative skewness in stock returns is induced by firm management disclosing information asymmetrically. They found in case of 15 most traded stocks in Helsinki that negative skewness in stock returns is mainly induced by returns for days when non scheduled firm specific news items are disclosed. Raju and Ghosh (2004) found that skewness and kurtosis is less in Indian market stock returns as compared to other countries. They also said that there was a need for a study on volatility in Indian stock markets after 2000 to see whether changes in market microstructure have resulted in changes in volatility pattern and facilitating international comparison of volatility. Singleton and Wingender 1986 found that the shape of the probability distribution of stock market returns did not persist.

4. Data and Methodology

This empirical study is based on the daily closing price of NIFTY 50 (INDIA), FRANCE (CAC 40), UK (FTSE) GERMANY (DAX) and USA (DIJ). The data have been collected from Yahoo Finance. The period is from April 2004 to March 2012. The analysis was done for the pre crisis (April 2004 – June 2007), during crisis (July 2007 – December 2008) and the post crisis period (January 2009 – March 2012). The daily stock index returns are computed as the first difference of the natural logarithm of the daily stock index value. The return is calculated by the following formula.

$$rt = (\log pt - \log pt - 1)*100$$

Volatility

Volatility is indispensable in the stock market. Volatility is a simple concept to understand. It measures variability or dispersion around a mean return. To be more meaningful, it is a measure of how far the current return of an asset deviates from its average of its past returns. Extreme volatility in the stock market creates booms and busts in the market. Inter day volatility and intra- day –volatility is calculated by applying the following techniques.

Inter- day volatility.

Inter-day- volatility indicates the variation in share price return between the two trading days. Inter day volatility is computed by close to close and open to open value of any stock Index on a daily basis. Standard deviation is used to calculate inter-day volatility.

Close-to-close volatility/ Open –to- open volatility

Close-to-close volatility (standard estimation of volatility) is measured with the following formula

$$\sigma = \sqrt{(1/n_{-1}) - \sum (r_t - r)^2}$$

Intra-Day Volatility

The variation in share price return within the trading day is called intra-day volatility. It signifies how the indices and shares behave in a particular day. Intra-day volatility is calculated with the help of Parkinson model, Garman and Klass model, and Roger and Satchel model.

Parkinson Model

Parkinson model contains more information regarding the volatility than the open to open, or closes to close price volatilities. The extreme-value Parkinson volatility measure developed by Parkinson is given below

$$\sigma = K \sqrt{1/n \sum \log (H_t - L_t)^2}$$

where σ = High –Low volatility

K = 0.601

Garman and Klass Model

The Garman and Klass model is used to calculate the Open-close volatility. The formula for Garman and Klass model (1980) is given below

$$\sigma^2_{gk} = 1/n * \sum (0.511 (\ln H_t/L_t)^2 - 0.019 (\ln(C_t/O_t) * \ln (H_t L_t / O_t^2) - 2 \ln (H_t / O_t) * \ln (L_t / O_t) - 0.383 (\ln C_t / O_t)^2)$$

Roger –Satchell Model

The Rogers-Satchell function is a volatility estimator that outperforms other estimators when the underlying data follow Geometric Brownian Motion (GBM) with a drift (historical data mean returns different from zero). The volatility level was computed under this model with the help of the following formula.

$$\sigma^2_{rs} = 1/n * \sum (\ln (H_t/C_t) \ln (H_t + O_t) + \ln (L_t / C_t) \ln (L_t / O_t))$$

Before examine the linkage among the stock markets, the augmented Dickey-Fuller (ADF) unit-root test was employed to examine the stationary property of market prices. The null hypothesis of nonstationarity (unit root) and alternative hypothesis (no unit root) of stationarity are tested for each data series. Since the methodology of testing for unit roots is well known, the details are omitted.

Cointegration

Before conducting cointegration test it is of interesting to determine if there are any common forces driving the long-run movement of the data series or if each individual stock index is driven solely by its own fundamentals. Co integration analysis is used to investigate long term relationship between Indian and other Asian stock markets and it is estimated by ordinary least squares under the following formula:

$$X_t = \beta_1 + \delta Y_t + \mu_t$$

The Engle Granger Augmented Dickey–Fuller test is applied on the 'co integrtating residuals' μ_t obtained from the equation (1). The formula for EG–ADF test is as follows

$$\Delta\mu_t = -\delta\mu_{t-1} + a_i \sum_{i=1}^{m} \Delta\mu_{t-1} + \mu_t$$

$\Delta\mu_t$ represents the first differences of the residuals The specific hypotheses are:

H_0 : $\delta = 0$

H_1 : $\delta \neq 0$

Null hypothesis is that there is no co integration among the stock indices. The value of a calculated absolute tau (τ) value is greater than the tabulated critical (τ) value; the null hypothesis of no cointegration is rejected. Engle and Granger have provided the critical values of ADF statistics.

Granger Causality

Short run integration is examined using Granger's (1969) causality test. Formally, a time series x_t Granger – causes another time series y_t if series y_t can be predicted with better accuracy by using past values of x_t rather than by not doing so, other information being identical. In other words, variable x_t fails Granger –cause y_t if

$$\Pr(y_{t+m} \mid \Omega_t) = \Pr(y_{t+m} \mid \Psi_t),$$

Where $\Pr(y_{t+m} \mid \Omega_t)$ denotes conditional probability of y_t , Ω_t is the set of all information available at time t, and $\Pr(y_{t+m} \mid \Psi_t)$ denotes conditional probability of y_t obtained by excluding all information on x_t from y_t this set of information is depicted as Ψ_t. To examine the causality, if a cointegration relationship is found, a Vector Error Correction Model (VECM) is estimated.

$$x_t = \alpha_0 + \theta_1\varepsilon_{t-1} + \sum_{j=1}^{k} \gamma_j x_{t-j} + \sum_{j=1}^{k} \beta_j y_{t-j} + \mu_{xt}$$

$$y_t = \alpha_0 + \theta_1\varepsilon_{t-1} + \sum_{j=1}^{k} \gamma_j x_{t-j} + \sum_{j=1}^{k} \beta_j y_{t-j} + \mu_{yt}$$

where ε_{t-1} represents the deviation from long – run equilibrium in period t-1 obtained from the cointegration regression. Where k is a suitably chosen positive integer, γ_j and β_j, j = 0,1 ......k are parameters and α ' are constants and μ_t's are disturbance terms with zero means and finite variances. The null hypothesis that y_t does not Granger – cause x_t is not accepted if the β_j's, j>0 in equation (4) are jointly significantly different from zero using a standard joint test (e.g., and F test). Similarly, x_t Granger – causes y_t, if the λ_j's j >0 coefficients in equation (5) are jointly different from zero. For non -cointegrating series, Granger causality is examined by the Vector Autoregressive (VAR) model. The form of the VAR model is obtained by deleting the ε_{t-1} terms in (4) and (5).

Cross Correlation

The stationary series are also cross – correlated. The cross - correlation between the time series are tested by using the following formula:

$$\gamma_{x_y\ y_t}(k) = \frac{\sum_{t=1}^{T-K} (x_t - \bar{x})(y_{t+k} - \bar{y})}{\left[\sum_{t=1}^{T}(x_t - \bar{x})^2 \sum_{t=1}^{T}(y_t - \bar{y})^2\right]^{1/2}} \qquad (6)$$

Where k is greater than, equal to, or less than zero. The significance of estimated cross – correlation is assessed by using approximate standard error, $T^{-½}$, (Bartlet, 1966), of the sample of cross – correlation. This helps to identify the causality patterns associated with, $\gamma\ x_t\ y_t\,(k)$.

5. Empirical Results

The Tables 1 and 2 revealed that daily minimum return ranges from -26.148 (USA) to -2.963(UK). The maximum returns were very high in the year 2007-08 for all the selected countries except India. In Dec 17, 2007 market breadth had declined, however it was positive with nearly 650 stocks on the advancing side on the NSE and about 560 stocks on the decline side. If we take the entire period into consideration we see that Indian market has provided the best return.

Table 1
Daily stock market returns

NAME OF THE MARKET	RETURN OF FRANCE (CAC 40)			RETURN OF GERMANY (DAX)		
YEAR						
	Minimum	**Maximum**	**Mean**	**Minimum**	**Maximum**	**Mean**
2004-07	-3.227	2.505	0.060	-3.463	2.605	0.086
2007-08	-9.471	10.594	-0.164	-7.433	10.797	-0.132
2009-12	-5.634	9.220	0.003	-5.994	5.895	0.040

Table2
Daily stock market returns

NAME OF THE MARKET	*RETURN OF UK(FTSE)*			*RETURN OF USA(DIJ)*			*RETURN OF INDIA(NIFTY)*		
YEAR									
	Minimum	*Maximum*	*Mean*	*Minimum*	*Maximum*	*Mean*	*Minimum*	*Maximum*	*Mean*
2004-07	*-2.963*	*2.604*	*0.049*	*-3.349*	*2.039*	*0.031*	*-13.054*	*7.969*	*0.106*
2007-08	*-9.264*	*9.384*	*-0.104*	*-26.148*	*10.508*	*-0.117*	*-13.014*	*6.757*	*-0.101*
2009-12	*-5.481*	*5.032*	*0.028*	*-5.706*	*6.612*	*0.047*	*-6.380*	*11.334*	*0.069*

In January 8, 2008 , the Nifty reached the peak of 6287.25 points the market was favoured by domestic Institutional Investors and FIIs. The market valuation, the Reliance Communication, Reliance Energy, Sterlite and Unitech commanded rich P/E multiplies. But the market could not keep the gains for a long time. The reason for this was global outlook, and liquidity sucked out by the two IPO's namely Reliance Power and Future Capital.

An analysis of the average returns shows that all the selected countries registered negative average returns in the year 2007-08. All the macro economic factors had a negative impact on the return of selected countries stocks. In this year, Nifty also yielded a negative return of -0.101. The Nifty had the highest mean return of 0.069 in 2009-12. The year 2009 was recovery year for most markets. Once again Indian markets outperformed.

Table 3

Skewness of Stock Market Returns

YEARS	USA(DIJ)	FRANCE	UK(FTSE)	GERMANY	INDIA(NIFTY)
2004-07	-0.257	-0.322	-0.393	-0.377	-1.336
2007-08	-3.294	0.286	0.064	0.482	-0.389
2009-12	-0.189	0.034	-0.166	-0.125	1.341
2004-12	-3.376	0.064	-0.141	0.056	-0.252

Table 3 shows that the comparative skewness of the selected countries economics. Skewness is a measure of the asymmetry of a distribution. In the study period 2004-07, all the countries under the study showed negative skewness. This indicated that the stock Index returns were getting increasingly concentrated at higher ranges, which is a very good sign. However after the economic downturn in the year 2007-08, the skewness of UK, France and Germany had positive except USA and India. A positive skewness means that returns were falling and were concentrated in low range. In the year 2009-12 all the countries had negative skewness except France and India. USA demonstrated the highest negative skewness indicating the increasing stock market returns.

Table 4

Close to Close Inter-Day Volatility

YEARS	USA(DIJ)	FRANCE	UK(FTSE)	GERMANY	INDIA(NIFTY)
2004-07	0.643	0.825	0.679	0.901	1.495
2007-08	2.372	2.202	2.084	2.025	2.516
2009-12	1.261	1.613	1.277	1.581	1.542
2004-12	1.365	1.501	1.293	1.457	1.749

Table 4 provides that all the selected countries stocks were highly volatile in the year 2007-08 and stock market itself was volatile in that year. This is indicated by the high volatility value 2.516 in India in the year 2007-08. The US financial crisis had its effects on both developed and developing countries. Stock markets have slumped throughout the world after the Dow Jones Industrial Average fell in New York in January 2008. All the countries stocks were low volatile compared to India. In only one observation that was in 2009-12 India volatility was less than France and Germany.

Table 5

Open to Open Inter-Day Volatility

YEARS	USA(DIJ)	FRANCE	UK(FTSE)	GERMANY	INDIA(NIFTY)
2004-07	0.635	0.827	0.698	0.850	1.510
2007-08	2.154	2.327	2.077	1.982	2.505
2009-12	1.257	1.668	1.281	1.594	1.565
2004-12	1.291	1.556	1.291	1.437	1.759

It is clear from the Table 5 that the Inter-day volatilities for all selected countries are lower than India. Among the countries the highest volatility values were noticed in India during the entire study period. Country wise analysis shows that the volatilities values were lower in USA compared to other countries except in 2007-08. This indicates that USA index carries low risk compared to other countries Index.

Table 6

Intra Day Volatilities - Parkinson Model

YEARS	USA(DIJ)	FRANCE	UK(FTSE)	GERMANY	INDIA(NIFTY)
2004-07	0.0842	0.0572	0.0542	0.0662	0.1282
2007-08	0.1301	0.0989	0.1072	0.1038	0.1427
2009-12	0.1205	0.1212	0.1066	0.1243	0.1187
2004-12	0.1963	0.1666	0.1606	0.17438	0.2256

In Table 6 it is very clear that volatility values of all the countries are lower than volatility value of India during the study period except in the year 2009-12. This indicates that all the countries stocks were low volatile than India. The global recession affected the entire world economy. In India's stock market index-Nifty-touched above 6200 mark in the month of January, 2008 and has plunged below 2500 in October 2008. This also had an effect on the primary market. For all the countries index, volatility values were low in the year 2004-07 except India. USA volatility values were high in the year 2007-08 compared to other years since the U.S Stock market peaked in October 2007 when the Down Jone Industrial Average Index exceed 14000 points. It then entered a pronounced decline, which accelerated markedly in October 2008.

Table 7

Intra Day Volatilities - Garman&Klass Model

YEARS	USA(DIJ)	FRANCE	UK(FTSE)	GERMANY	INDIA(NIFTY)
2004-07	0.0924	0.0561	0.0510	0.0639	0.1251
2007-08	0.1337	0.0979	0.0979	0.1017	0.1387
2009-12	0.1229	0.1189	0.1026	0.1220	0.1129
2004-12	0.2038	0.1639	0.1507	0.1712	0.2183

The Table7 exhibits that the Nifty Index is more volatile, with highest volatile value of (0.1387) in the year 2007-08. This indicates the Economic factors are highly influenced the stock market during this particular period. But France and UK had the lowest volatility value of (0.0979) in the year 2007-08. During the study period UK demonstrated low volatility value compared to other selected countries stocks. The intra-day – volatility values according to Garman and Klass model for the Nifty values are higher compared to other countries. This result is concurrent with the Parkinson model result.

Table 8

Intra Day Volatilities - Roger&Satchel Model

YEARS	USA(DIJ)	FRANCE	UK(FTSE)	GERMANY	INDIA(NIFTY)
2004-07	0.0930	0.0563	0.0510	0.0631	0.1242
2007-08	0.1327	0.0983	0.0954	0.1012	0.1436
2009-12	0.1240	0.1201	0.1035	0.1220	0.1103
2004-12	0.2040	0.1651	0.1497	0.1706	0.2196

It is observed from the Table 8 that the Intra-day volatilities for the entire countries index are lower than the volatility of India except in the year 2009-12. The volatility was very low in the year 2004-07 for all the selected countries in the study period except India. India experienced high volatility in the year 2007-08. The global financial crisis directly hit the IT Sector, real estate and infrastructure, which had global investments. The rupee appreciation against the value of the dollar was also one of the reasons for the raise in the volatility level. Country wise analysis shows that the volatility is lower in UK compared to other countries in all the years

The results of cross correlation are shown in Table 9 and10. The results show evidence of weaker correlations among India and European, UK and US countries. Hence it can be said that the Indian markets offer diversification benefits to international investors looking for investment in India. During the crisis period the cross correlation between India and Germany was high and it was declined in the crisis recovery period.

Table 9

Cross correlation of India with other countries

	Cross-correlations on Daily Returns (2004 April – 2012 March)				Cross-correlations on Daily Returns (2004 April - 2007 June)			
Lags	INDIA-USA	INDIA-FRANCE	INDIA-UK	INDIA-GERMANY	INDIA-USA	INDIA-FRANCE	INDIA-UK	INDIA-GERMANY
-5	.009	-.013	-.022	.014	-.013	-.002	.033	-.013
-4	.012	-.018	-.009	.002	-.059	.040	.025	-.059
-3	.053	.020	.032	.036	-.040	.039	.015	-.040
-2	.043	.028	.027	.024	.086	.010	.029	.086
-1	.156*	.132*	.136*	.107*	.239*	.124*	.129*	.239*
0	.339*	.423*	.426*	.371*	.118*	.356*	.336*	.118*
1	-.051	.026	.026	.089	.000	-.013	-.019	.000
2	-.017	-.026	-.037	-.014	.014	-.019	-.040	.014
3	.008	-.028	-.038	-.023	.016	-.032	.003	.016
4	-.035	.000	.009	-.009	-.026	.007	-.007	-.026
5	.003	-.025	-.021	-.013	-.040	.023	.026	-.040

Note: * Significant at 5% level.

Table 10
Cross correlation of India with other countries

Lags	Cross-correlations on Daily Returns (2007 July – 2008 December)				Cross-correlations on Daily Returns (2009 January - 2012 March)			
	INDIA-USA	INDIA-FRANCE	INDIA-UK	INDIA-GERMANY	INDIA-USA	INDIA-FRANCE	INDIA-UK	INDIA-GERMANY
-5	.040	-.015	-.043	.001	-.041	-.006	-.015	.032
-4	.006	-.080	-.067	-.030	.032	.013	.046	.040
-3	.122*	.058	.094	.111*	-.010	-.026	-.034	-.043
-2	.020	-.009	-.009	-.001	.051	.067	.062	.033
-1	.075	.149*	.140*	.147*	.240*	.118*	.134*	.047
0	.449*	.455*	.459*	.497*	.313*	.446*	.458*	.293*
1	-.121*	.061	.043	.046	.019	.007	.026	.179*
2	-.077	-.078	-.074	-.115*	.041	.010	-.003	.059
3	.038	-.031	-.064	.012	-.038	-.030	-.031	.099
4	-.072	-.006	.004	-.040	-.005	.000	.023	.021
5	.007	-.083	-.074	-.025	-.004	.010	.020	-.007

Note: * Significant at 5 % level.

Table 11

Results of Engle-Granger ADF Test of Cointegration (Lag 5)

Name of the Indices	δ	τ	R^2
PRE CRISIS PERIOD (April 2004 - June 2007)			
India on US	-0.01074	-1.506	0.047
US on India	-0.01094	-1.563	0.041
India on France	-0.04348	-3.523*	0,044
France on India	-0.04380	-3.524*	0.044
India on UK	-0.07122	-4.999**	0.055
UK on India	-0.07175	-5.004**	0.055
India on Germany	-0.02223	-2.240	0.025
Germany on India	-0.02175	-2.192	0.009
DURING CRISIS PERIOD (July 2007 - December 2008)			
India on US	-0.03397	-2.056	0.088
US on India	-0.04884	-2.356	0.124
India on France	-0.02608	-2.177	0.087
France on India	-0.03857	-2.455	0.139
India on UK	-0.03460	-2.263	0.097
UK on India	-0.04889	-2.534	0.119
India on Germany	-0.04889	-2.534	0.019
Germany on India	-0.04482	-2.569	0.102

POST CRISIS PERIOD (January 2009 - March 2012			
India on US	-0.01818	-3.313	0.089
US on India	-0.02773	-3.716*	0.103
India on France	-0.03067	-3.656*	0.049
France on India	-0.02225	-2.774	0.02
India on UK	-0.02949	-4.013**	0.055
UK on India	-0.03567	-4.109**	0.047
India on Germany	-0.02905	-3.590*	0.056
Germany on India	-0.03340	-3.631*	0.046

The critical value at 5% level of significance is - 3.422
The critical value 1 % level of significance is -3.983

There was no long term relationship between the stock markets of India and US and Germany before the crisis but there was long term relationship between India and UK and India and France. There is no long term relationship between the stock markets of India and other stock markets during the crisis period, The null hypothesis of no co integration cannot be rejected for all pair-wise cases. Trend was reverse after the crisis period. There was long-term relationship between India and Germany and US influenced India.

Table 12

Granger Causality Test Results

Pre CRISIS period April 2004 - June 2007		
	F-Statistic	Causality Inference
India → US	0.15219	0.979
US → India	12.0238	0.000*
India → France	0.53398	0.750
France → India	3.30816	0.005*
India → Uk	0.53806	0.747
UK → India	3.64814	0.002*
India →Germany	0.38070	0.862
Germany → India	4.75438	0.000*

During the crisis July 2007 – December 2009		
India → US	0.64201	0.667
US → India	4.99562	0.000*
India → France	2.24251	0.049
France → India	2.35341	0.040**
India → Uk	1.48565	0.193
UK → India	2.69467	0.020**
India →Germany	1.65293	0.145
Germany → India	3.66940	0.003*

Post crisis periodJanuary 2009 - March 2012		
India → US	0.86802	0.502
US → India	12.1210	0.00*
India → France	0.39225	0.854
France → India	3.59221	0.003*
India → Uk	0.34010	0.888
UK → India	4.82700	0.000*
India →Germany	6.81575	0.000*
Germany → India	1.78264	0.114

The critical value at 5% and 1 % level of significance ** *

Before the crisis and during the crisis all the international stock markets influenced the Indian stock market in the mild form. But during the crisis period it was highly influenced by UK and France. But after the crisis period the degree of influence was less and during this period India influenced German market but not the German market.

6. Conclusion

In this paper, the cross correlation, co integration of long term and short term stock returns of India with Germany, France, UK and USA are analyzed. There exists a very weak correlation among the Indian markets and Germany, France, and USA. There was a strong influence from UK. Hence it can be said that the Indian markets offer diversification benefits to international investors looking for investment in India. Indian markets also delivered the highest return. The Indian markets showed features of platykurtic distribution, the volatility of its daily returns were similar to it other counterparts. A negative skewness of returns, both in the short and long run indicates higher concentration of these returns towards higher returns and good opportunity for investment.

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