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**COMPARATIVE STUDY OF DISTRIBUTION OF INDIAN STOCK
MARKET WITH OTHER ASIAN MARKETS**

Nupur Gupta

Asst. Professor,

Vivekanand Education Society's Institute of Management Studies and Research

Mumbai

Dr. Vijay Agarwal

Associate Professor, BIT Mesra

ABSTRACT

The story that Asia is becoming the growth centre of the world economy is in circulation for some time. Post the 1997 East Asian Crisis which had caused significant reduction in asset prices and stock markets in several Asian countries, these economies boomed back. These economies maintained high interest rates thereby making them attractive to foreign investors. As a result these economies received a large inflow of funds and experienced a dramatic run-up in asset prices. As a part of market integration, the capital

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market of India is no longer cut off from international economic events and their stock index movements. This paper finds the correlation of Indian Stock market with five other major Asian economies: Japan, Hong Kong, Indonesia, Malaysia and Korea. A weak correlation concludes that the Indian stock markets offer diversification benefits to institutional and international investors. The paper finds non normality feature in the stock return distribution of the six economies of Asia including India. The Indian markets showed features of platykurtic distribution, the volatility of its weekly returns were similar to its other Asian counterparts. A negative skewness of returns, both in the short and long run indicates concentration of these returns towards higher returns and good opportunity for investment.

JEL Classification: C87, E44, G15

Keywords: Correlation, Normal distribution, Stock Returns, Skewness

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1. Introduction

The story that Asia is becoming the growth centre of the world economy is in circulation for some time. The dynamics of the world economy are changing. China and India happen to be the 2nd and the 4th largest economies respectively in the world in terms of GDP at purchasing power parity (Euro monitor 2010, Appendix A). The equity markets in emerging economies are on a high since 2005. The Asian economies are advancing technology wise and are acting as an attraction for foreign capital. The increasing regionalization of economic activities and the liberalization of financial markets since the late 1980s resulted in regional economic integration, i.e., integration among the markets within the same region e.g. greater co-movement in the stock prices of South East Asian countries due to economic ties, lower geographical distance, and foreign investments or due to a common movement of fundamentals which is called the *Contagion* factor (Mukherjee and Mishra 2007). Due to the increasing interdependence of major financial markets all over the world, the transmission of stock return movements among major national markets has become a necessary research topic and is commonly termed as *international stock market integration*. 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 would mean a free or relatively freer 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. In statistics, normality tests are used to determine whether a data set is well-modelled by a normal distribution or not, or to compute how likely an underlying random

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variable is to be normally distributed. Research done by several scholars has used variance as a proxy for risk in financial returns (Sharpe 1964), (Lintner 1965) and (Mossin 1966). Modern finance is heavily based on the assumption of normal distribution. Consequently, an understanding of how volatility evolves over time is central to the decision making process. More precisely, they are a form of model selection, and can be interpreted several ways, depending on one's probability. In descriptive statistics terms, one measures a goodness of fit of a normal model to the data – if the fit is poor then the data is not well modelled in that respect by a normal distribution, without making a judgment on any underlying variable. Volatility, which increases the unpredictability of returns to investors, is an important but poorly understood 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 (Dungey, Fry and Martin 2006).

Confronted with non-normal distributions, however, it is no longer 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. This tendency can be explained by the prospect theory, which hypothesises that investors receive decreasing reward for further gains (Allles and King 1994).

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2. Objectives

This paper aims at doing a comparative study of India with five other Asian countries namely Japan, Indonesia, Malaysia, Korea and Hong Kong in terms of Stock market returns, correlation of these returns and distribution of these returns. These countries are advancing in technology wise, are hot spot for foreign capital and as are low cost manufacturing hubs. The results of the study would show that whether Indian Stock markets (BSE Sensex) 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 Asian economies. Lastly it would compare the potential of Indian stock markets with other developed and emerging markets in Asia.

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

- 1) To see whether Indian stock market returns are correlated to the stock market returns of other selected Asian Economies.
- 2) To compare the distribution of the stock market returns of India with other selected Asian economies.

3. Literature Review

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Mukherjee and Bose 2008 investigated the level of market integration of India with the developed countries of US, Japan and five other Asia Pacific markets for the period between 1999 to 2005. They found that Stock returns in India were led by major stock index returns in US, Japan, Hong Kong, South Korea and Singapore. They also found that Indian markets exerted considerable influence on stock returns in Japan and South Korea along with Taiwan and Malaysia. Wong et al (2005), Nath and Patel (2003) found causality from United States and Japan on Indian stock market returns only in the long run and not in the short run. Yang and Lim 2002, fan 2003, Choudhary and Lin 2004 found increase in the interdependence among the crisis affected East Asian economies post 1997 with dominance of Japan in this regional area. Pandey and Kumar (2008) found co movement of Indian markets with eight other key stock exchanges in Asia for the period from 2000 to 2008. They found that the period was marked with high volatility among all markets under study. 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 financial markets in the Asia-Pacific region have been 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

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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. Research Design

4.1 Type of study

The study done is Empirical in nature. It provides basis for external validation. Empirical study relies on experience or observation alone i.e data based research. It is capable of being verified by observation or experiment. An attempt has been made to answer the questions raised in this paper through quantitative investigation.

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4.2 Data Collection and Sample Size

The weekly closing prices of six major Asian countries: BSE Sensex (Mumbai-India), Hang Seng (Hong Kong-China), JKSE (Jakarta- Indonesia), KLSE (Kuala Lumpur- Malaysia), Nikkie (Japan) , and KS11(Seoul-Korea) were taken from www.yahoofinance.com from 1st week of Jan 2005 till the last week of December 2009 were collected and used in the analysis.

4.3 Research Methodology

The weekly returns on the basis of the closing values of the stock indices were calculated as below:

$$R_t = (P_t - P_{t-1}) / P_{t-1} * 100$$

Where **R** represents returns, **P** is the closing value of the stock index and **t** is the time

Simple average of weekly returns were taken and multiplied by 52 to get yearly returns. These simple weekly returns represent the returns generated by active stock trading in the respective markets.

In order to calculate compounded annual growth rate of returns log linear method was used as follows:

$$L_n(P) = \text{Log } a + t \log (1+g)$$

Where **P** represents the index value at a particular period, **g** is the growth rate, **t** is time and **a** is a constant.

5. Data Analysis and Findings

Since stock prices are time series data, a check needs to be done to find the stationarity of the given time series. A time series is said to be stationary if its mean value and its variance do not vary systematically over time, hence time series data should be first tested for stationarity. In econometrics, a time series that has a unit root is known as a random walk. A random walk is an example of a non stationary time series. For example, asset prices, such as stock prices, follow a random walk, that is they are non stationary. (Gujarati, 1995). In table 1 and 2, unit root for testing stationarity of weekly closing prices was conducted first using Augmented Dickey Fuller Test (ADF). In all the six markets, the tau¹ value of the weekly closing prices for, 5, 1 year and 6 months were found to be less than the tabulated value, which indicated the stock prices were not stationary. Then the unit root test for the returns of the stock prices was conducted. The tau value of these returns for 5, 1 year and 6 months were found to be higher than the tabulated value at 5% level of significance. This indicated that the stock returns were stationary.

Table 1: Unit root test for stationarity of weekly closing prices

¹ Tau: - The time rate of changes of deviations from a fixed point.

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Name of Market	BSE (India)	HangSeng(Hong Kong)	JKSE(Indonesia)	KLSE(Malaysia)	Nikkie(Japan)	KS 11(Korea)
	closing tau value	closing tau value	closing tau value	closing tau value	closing tau value	closing tau value
during last 5 years(2005-2009)	0.228	-1.395	-0.994	-1.017	-0.957	-1.931
during last 1 year(2009)	0.907	-1.180	-0.766	-1.015	-3.278	-1.603
during last 6 months(Q2,Q3 of 2009)	0.305	-3.443	-2.235	-3.668	-2.587	-2.100

Table 2: Unit root test for testing stationarity of stock market returns

Name of Market	BSE (India)	HangSeng(Hong Kong)	JKSE(Indonesia)	KLSE(Malaysia)	Nikkie(Japan)	KS11(Korea)
	Tau value for returns	Tau value for returns	Tau value for returns	Tau value for returns	Tau value for returns	Tau value for returns
during last 5 years(2005-2009)	-9.379	-16.275	-7.652	-14.624	-10.062	-17.237
during last 1 year(2009)	-4.585	-5.095	-8.321	-4.250	-4.688	-2.815
during last 6 months(Q2,Q3 of 2009)	-4.352	-0.580	-1.294	-1.222	-5.549	-5.644

Table 3: Correlation of BSE Sensex with other Asian economies

	Hang Seng	JKSE	KLSE	Nikkie	KS11

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5 yr Correlation between BSE & other markets (2005-2009)	-0.146	0.112	0.171	0.171	0.589
1yr Correlation between BSE & other markets (2009)	-0.051	0.004	0.122	0.074	0.533
Last 6 months Correlation between BSE & other markets (July - Dec 2009)	-0.299	0.180	-0.145	-0.022	0.387

Table 4: Compounded Annual Growth rate of Stock market returns

	BSE (India)	Hang Seng(Hong Kong)	JKSE(Indonesia)	KLSE(Malaysia)	Nikkie(Japan)	KS11(Korea)
5 yr (2005 - 2009)	14.228	0.347	-0.272	0.554	-8.512	7.004
1 yr (2009)	79.504	65.696	-3.466	-0.051	29.821	45.766
6 months (Jul-Dec 2009)	34.029	29.458	30.039	28.076	0.449	17.699

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Table 3 depicts the correlation of Indian stock market represented by BSE- Sensex with five other Asian Countries. A very weak negative correlation is observed between the Hong Kong markets represented by Hang Seng and the BSE Sensex for the entire period from 2005-2009. The last six months of year 2009, saw an increase in the negative correlation between the two markets. The relationship was insignificant to be further tested upon. Coming to the Indonesian markets, a weak positive correlation was observed between the Indian Markets and the JKSE. However this weak positive correlation turned negative in the year 2009. The last six months of 2009, saw a higher negative correlation than the overall correlation for the year 2009. Again the correlation seemed insignificant to be tested upon. Similar trend of correlation was observed between India and the Malaysian markets as well as between India and the developed Japanese markets. There existed a weak positive correlation between India and both these markets for the entire period of study from 2005 to 2009. However in the last six months of 2009, a weak negative correlation was observed between India and these two major markets of Asia. The only significant positive correlation was observed between India and the Korean markets. For the entire study period from 2005-2009, a positive correlation nearing 0.6 was observed. A similar correlation was observed in the year 2009, however in the last six months of this year, the correlation became weak. This throws a light on international diversification. Due to the weak correlation found between India and the other five Asian economies, it can be concluded that investments in India would lead to portfolio diversification and mitigate risk for international investors.

Table 4 depicts the compounded annual growth returns of the all the six Asian economies including India. Looking at the compounded annual growth rate in the period between 2005-2009, it is evident, Indian markets gave the maximum returns around 14%. The other Asian markets gave low to negative returns, with the developed Japanese markets giving the highest negative returns. The years 2008 and 2009 saw the Global meltdown or recession

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which started in US due to the mortgage bubble burst. Asian Countries also witnessed a slowdown in their respective real economies and financial markets. 2009 was a recovery year for most markets. Once again the Indian Markets outperformed all the other Asian markets and gave compounded annual growth rate nearing 80%. Though Indonesian and the Malaysian markets continued to show negative returns. The last six months of 2009, saw Japanese markets with generating almost nil returns. India once again outperformed all the other Asian markets.

Table 5: Skewness of Stock Market returns

	BSE (India)	HangSeng(Hong Kong)	JKSE(Indonesia)	KLSE(Malaysia)	Nikkie(Japan)	KS 11(Korea)
during last 5 years(2005-2009)	-0.351	-0.193	-1.013	-0.842	-1.412	-0.592
during last 1 year(2009)	0.117	0.119	0.511	-0.168	0.208	-0.808
during last 6 months(Jul - Dec 2009)	-0.458	-0.008	-0.025	0.731	0.637	-0.276

Table 5 depicts the comparative skewness of the selected Asian economies. Skewness is a measure of lack of symmetry, and deviations from zero indicate the data is spread more to the left or right than in a normal distribution. Negative skew or left skew has fewer low values and a longer left tail, while positive skew has fewer right values and a longer right tail. In the study period from 2005 -2009, all the countries under study showed negative skewness, with Japan demonstrating the maximum negative skewness. This indicated that the stock index returns were getting increasingly concentrated at higher ranges, which is a very good sign.

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However after the economic downturn in the years 2007- 2008, the skewness of all Asian countries under study became positive except Malaysia and Korea. A positive skewness meant that returns were falling and were concentrated in this low range. However the last six months, showed signs of recovery, with the skewness of all countries under study except Japan and Malaysia became negative again. This signified an economic upturn and concentration of returns towards higher values. India demonstrated the highest negative skewness indicating the increasing stock market returns.

Table 6: Descriptive statistics of Weekly stock market returns in the long run (2005-2009)

	BSE Sensex	Hang Seng	JKSE	KLSE	Nikkie	KS 11
Mean	0.453	0.231	0.439	0.153	0.028	0.307
Median	0.929	0.491	0.951	0.298	0.246	0.643
Standard Deviation	3.993	3.636	3.875	2.140	3.423	3.592
Sample Variance	15.941	13.223	15.017	4.578	11.720	12.906
Kurtosis	1.762	2.622	4.684	2.860	10.262	6.762
Skewness	-0.351	-0.193	-1.013	-0.842	-1.412	-0.592
Range	30.032	28.752	33.650	16.135	36.465	39.058
Minimum	-15.954	-16.319	-21.365	-9.255	-24.334	-20.490
Maximum	14.078	12.433	12.285	6.879	12.131	18.568
Jarque Bera Value	22.022	3.175	74.295	30.956	657.740	169.114

Table 6 depicts the descriptive statistics of the six Asian markets for the period between 2005 and 2009. The mean of the weekly returns of India and the Indonesian markets were observed to be the highest around 23%. Japan's markets were flat during the study period. Volatility as measured by standard deviation and its square, the variance was the least observed in the Malaysian markets. The other five Asian markets generated variance in the

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range of 11%-15%. Indian markets showed maximum variance. Kurtosis, as referred to as the volatility of the volatility, measures the peakedness of the distribution. The weekly returns of Hong Kong and Malaysian markets were more near to their respective means, as their kurtosis were nearing 3. Weekly returns of Indian stock markets indicate a low peak with a fat mid range on either side. The kurtosis of India is platykurtic which signifies the normal distribution of stock returns in Indian stock market; however, the high kurtosis of other markets exhibits heavier tail than the standard normal distribution implying that returns are concentrated on one level. The study uses Jarque-Bera test to examine the normal distribution

characteristic of all the stock markets. The fact that it is significant at 5 per cent level of significance for selected Asian stock markets market questions the normal distribution of returns and thereby the random walk behaviour of the Asian markets. Indonesian, Korean and Japanese markets showed the features of a leptokurtic market, with their returns too closely bunched around their average. Under the null hypothesis of normality, the Jarque Bera (JB) statistic asymptotically follows a chi-square distribution with two degrees of freedom. The computed value convincingly rejects the normality assumption.

6. Conclusion

In this paper, the correlation of stock returns of India with five other Asian countries is found out. There exists a very weak correlation between the Indian markets and Hong Kong, Indonesia, Malaysia and Japan. Comparatively higher correlation was found between the Indian and the Korean markets, which seemed to have weakened in the short run. Hence it can be said that the Indian markets offer diversification benefits to international investors looking for investment in the Asia Pacific region. Indian markets also delivered the highest

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compounded annual growth rate in stock market returns, both in the short as well as long run. In the second part of the study of the stock returns of the six Asian countries is analysed for a period over five years from Jan 2005- Dec 2009. The Indian markets showed features of platykurtic distribution, the volatility of its weekly returns were similar to its other Asian 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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Appendix 1

Top 10 largest economies by GDP in PPP terms: 2010 and 2020 US \$ millions

Ranking	2010		2020	
	Country	GDP (I\$ million)	Country	GDP (I\$ million)
1.	USA	14,802,081	China	28,124,970
2.	China	9,711,244	USA	22,644,910
3.	Japan	4,267,492	India	10,225,943
4.	India	3,912,991	Japan	6,196,979
5.	Germany	2,861,117	Russia	4,326,987
6.	Russia	2,211,755	Germany	3,981,033
7.	United Kingdom	2,183,277	Brazil	3,868,813
8.	France	2,154,399	United Kingdom	3,360,442
9.	Brazil	2,138,888	France	3,214,921
10.	Italy	1,767,120	Mexico	2,838,722

Source: Euromonitor International from IMF, International Financial Statistics and World Economic Outlook/UN/national statistics