A Comparative Analysis of the Efficiency of the Stock Markets of India and Pakistan.

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Abstract

The concept of efficient market hypothesis ever since being proposed by Fama (1965) has been widely been a focus of the researchers of finance with the aim being to analyze the efficiency of different capital markets of the world. The present study focuses on analyzing and comparing the efficiency of the capital markets of India and Pakistan. For the purpose of realizing the objectives, Adjusted Daily closing prices of CNX Nifty (NSE India) and KSE 100 (KSE Pakistan) are taken into consideration for the period ranging between 01/04/2003 to 31/03 2013. The researchers have relied on Descriptive Statistics, ADF test, Auto-Correlation test and Jarque-Bera Statistic, Runs test to analyze the data and reach to the results. The results derived by using various parametric and non-parametric tests clearly reject the null hypothesis of the stock markets of India and Pakistan being efficient in weak form. The study provides vital indications to investors, hedgers, arbitragers and speculators as well as the relevance of fundamental and technical analysis as far as the trading/investing in the capital markets of India and Pakistan is concerned.

Keywords: CNX NIFTY, KSE 100, ADF Test, Runs Test, Weak-form efficiency, Volatility.

Introduction:

Ever since the recession of 2007 that blew away the economy of the West, the focus has shifted towards the emerging economies [Sher Verick & Iyanatul Islam(2010)]. The stock markets of India & Pakistan showed an upsurge during the first decade of
21st century because of heavy investment being made not only by the native people but also the foreign investors. In this regard, there is a latent need of determining & comparing the volatility & efficiency levels of the stock markets of India & Pakistan. Many researchers [Choudhary (1996)] had attempted to analyze the volatility of different markets but this study is first of its kind & aims to compare the volatility of the stock markets of India & Pakistan, head to head. Volatility, simply put forward, means the tendency of stock/assets prices to move in upward or downward direction. Increased volatility means increased chances of the assets prices to move either up or down deviating from normal. This in other words, means increased risk for the investors which may result in both high positive or negative returns. While the hedgers, being risk averse may not invest in stock markets with high volatility while as, speculators being risk seekers, may trade heavily by identifying the undervalued stocks with the assumption that such stocks would earn greater return that as warranted by CAPM. Increased volatility may sometimes be a vital indicator of mispriced stocks & misallocation of resources [Karmaka (2006)]. Also if the volatility is found to be decaying over the period of time, it may build a kind of trust & faith among the investors investing in these markets because of the less perceived risk. Another important perspective that has emerged for discussion pertains to the efficiency of the stock markets. “Market efficiency is a continuum. The lower the transaction costs in a market, including the costs of obtaining information & trading, the more efficient the market” [Fama (1991)]. Efficient capital market is the market that is “informationally efficient”, if prices at each moment incorporate all available information about future values [Fama, (1970)]. Further, Fama asserted that market efficiency has three forms viz., Weak form, Semi-Strong form and Strong form of Market Efficiency. This study focuses on the analysis & testing the weak form of market efficiency only with the view that if the stock markets of India and Pakistan are found to be efficient in weak form, it would mean that the role of technical analysis is predicting abnormal profits would be negligible. Also, in a weak form efficient market, arbitragers who arbitrage on past prices cease to exist.

**Review of Literature:**

Augustine O. Ekechi (1989) concluded that the Nigerian Stock Markets are weak form inefficient and rejected the null hypothesis of Nigerian Stock Exchanges following the theory of random walk. The Author used serial correlation test, runs test and descriptive statistics to validate the results [1]. Sunil Poshakwale (1996) analyzed the returns of Bombay Stock Exchange for the period 1987 to 1994 by using various techniques like descriptive statistics, Kolmogorov-Smirnov, Runs test, Serial Correlation test and concluded (on the basis of interpretation of runs test and serial correlation test) that the returns in Indian Capital Markets were non-random and therefore rejected the null hypothesis of Indian Capital Markets being efficient in weak form [2]. Andrew C. Worthington and Helen Higgs (2003) analyzed the markets of Latin America with the objective to detect whether these markets follow the theory of random walk or are weak form efficient. The Researchers analyzed the daily returns of seven countries Latin America i.e. Argentina, Brazil, Chile, Colombia,
Mexico, Peru and Venezuela through various techniques like correlation coefficient analysis, runs test, Augmented Dickey Fuller test, Phillips Perron Test and Multiple Variance Ratio Tests and concluded that significant correlation existed between returns and therefore rejected the presence of randomness in the daily returns in these seven emerging markets\(^3\). Justin Robinson (2005) found Jamaican stock exchange to be inefficient in weak form\(^4\). P. Srinivasan (2010) tested the weak form efficiency of Indian Stock Markets. The study observed 13 year data (3244 observations) taken from two major indices of India i.e. SENSEX and CNX NIFTY. Based on two unit root tests i.e. Augmented Dickey Fuller test and Phillips Perron (1988), the null hypothesis of Indian Stock Markets being in line with the theory of random walk was rejected\(^5\). P K Mishra (2012) analyzed the returns of capital markets of emerging and developed markets of the world (India, China, South Korea, Russia, Germany, US, Brazil, UK) from 2007 to 2010. After applying Augmented Dickey Fuller test, Unit root tests and GARCH(1,1) model the researcher concluded that all these markets don not follow the theory of random walk\(^6\). Amalendu Bhunia (2012) found Indian stock markets inefficient in weak-form\(^7\). Saqib Nisar and Muhammed Haneef (2012) rejected the null hypothesis as they found the South-Asian stocks inefficient in weak form\(^8\). Sajeela Rabbani, Nida kamal and Mahwesh salim (2013) found Karachi stock exchange inefficient in weak form\(^9\). Similarly Haratika Arora (2013) rejected the null hypothesis of the indian capital markets being efficient in weak form\(^10\).

**Objectives of the Study:**

- To test the weak form of Market efficiency of the stock markets of Indian and Pakistan.
- To determine the volatility levels in the stock markets of India and Pakistan.
- To draw a comparison between the Stock markets of India and Pakistan on important parameters like efficiency and Volatility.

**Hypothesis:**

H0: The Stock Markets of India and Pakistan are efficient in weak form and follow the theory of random walk.

H1: The Stock Markets of India and Pakistan are inefficient in weak form and don’t follow the theory of random walk.

**Research Methodology:**

The study has heavily relied on academic journals, books and research papers for obtaining the relevant data. For the purpose of analysis and testing the weak form efficiency and Volatility of the stock markets of India and Pakistan, Daily Adjusted Close prices of CNX NIFTY and KSE100 have been obtained for the period starting from 01/01/2004 up to 31/12/2013 from the respective websites of NSE of India and KSE of Pakistan.
The adjusted close prices are used to calculate the daily returns using the following formula.

\[ R = \ln \left( \frac{P_t}{P_{t-1}} \right) \]

Where \( R \) = Daily return,
\( \ln \) = Natural Log,
\( P_t \) = Price at time \( t \),
\( P_{t-1} \) = Price at time \( t-1 \).

The following methods are used to test Auto-correlation, Volatility and Randomness of the data. The computations in the present study are aided by Eviews 6.0:

- The Auto-correlation and Runs test is used to find serial-correlation among the index returns.
- Testing for stationarity (unit root test) is done by using the Augmented Dickey-Fuller test.
- Descriptive Statistics and Jarque-Bera Statistic are used to check the data for normality.
- GARCH (1, 1) Model is employed to forecast and analyze the state of volatility.

**Analysis and Discussion:**

### Table 1: Results of Augmented Dickey Fuller Test.

<table>
<thead>
<tr>
<th>Indices</th>
<th>Level</th>
<th>First difference</th>
<th>t-statistic</th>
<th>t-statistic</th>
<th>Probability</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ADF</td>
<td>Critical Value @ 5%</td>
<td>Probability</td>
<td>Critical Value @ 5%</td>
<td>Probability</td>
<td></td>
</tr>
<tr>
<td>CNX Nifty</td>
<td>-48.91836</td>
<td>-2.862393</td>
<td>0.0001</td>
<td>-23.80213</td>
<td>-2.862400</td>
<td>0.0000</td>
</tr>
<tr>
<td>KSE 100</td>
<td>-45.62748</td>
<td>-2.862406</td>
<td>0.0001</td>
<td>-22.20732</td>
<td>-2.567279</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

The analysis done in Table 1, clearly discloses that the ADF T-statistic for both the CNX NIFTY and KSE 100 (both at level and First difference) is highly negative compared to their respective critical levels at 5% and the probability of acceptance of null hypothesis in all the cases is less than 5%. This clearly indicates that the data (both of CNX NIFTY and KSE 100) does not follow the theory of random walk and hence the null hypothesis is to be rejected and the alternative hypothesis is to be accepted.

### Table 2: Results of Auto-correlation test

<table>
<thead>
<tr>
<th>Indices</th>
<th>Auto correlation coefficient at lag 1</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNX Nifty</td>
<td>0.068</td>
<td>0.000</td>
</tr>
<tr>
<td>KSE 100</td>
<td>0.131</td>
<td>0.000</td>
</tr>
</tbody>
</table>

The results of Auto-correlation test are presented in Table 2. The Auto-correlation test clearly demonstrates that there exists a significant Auto-correlation in the time series data of CNX NIFTY and KSE 100 respectively. However the Auto-correlation coefficient is much higher in KSE 100 returns compared to the CNX NIFTY returns.
Nevertheless, as per this test, none of the two stock exchanges follow the theory of random walk.

**Table 3: Results of GARCH (1,1) Model.**

<table>
<thead>
<tr>
<th>Indices</th>
<th>CNX Nifty</th>
<th>KSE 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\alpha + \beta$</td>
<td>0.987255</td>
<td>0.962221</td>
</tr>
</tbody>
</table>

GARCH (1, 1) Model has been used to test the volatility of both the indices. The resultant GARCH Model (1,1) provides us with two coefficients ($\alpha$ and $\beta$). If the sum of $\alpha$ and $\beta$ is less than 1, it implies a tendency of volatility response to decay over time, also if the sum of ARCH term ($\alpha$) and GARCH term ($\beta$) is 1, it implies a tendency of persistent volatility over time and if the sum of $\alpha$ and $\beta$ is greater than 1, it implies increased volatility over time (Saif Siddiqui, 2013). As is clear that the sum of $\alpha$ and $\beta$ for CNX NIFTY and KSE 100 is 0.987255 and 0.962221 respectively. This clearly indicates that the volatility in both the indices is tending to decay over time. Also, the CNX NIFTY is demonstrating higher Volatility compared to the KSE 100.

**Table 4: Results of Descriptive Statistics and Jarque Bera Statistic.**

<table>
<thead>
<tr>
<th>Descriptive Statistics</th>
<th>CNX Nifty</th>
<th>KSE 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.0006357</td>
<td>0.000823</td>
</tr>
<tr>
<td>Median</td>
<td>0.0012457</td>
<td>0.001398</td>
</tr>
<tr>
<td>Mode</td>
<td>-0.0053333</td>
<td>0.000000</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>9.029</td>
<td>5.595877</td>
</tr>
<tr>
<td>Skewness</td>
<td>-0.254</td>
<td>-0.395854</td>
</tr>
<tr>
<td>Jarque-Bera Statistic</td>
<td>9319.163</td>
<td>832.5948</td>
</tr>
<tr>
<td>Probability (Jarque-Bera Statistic)</td>
<td>0.000000</td>
<td>0.000000</td>
</tr>
</tbody>
</table>

The results of Descriptive Statistics are presented in Table 4. For any data to be random, the first assumption is that it should possess the characteristics of a normal distribution. An important property of a normal distribution is that the skewness and kurtosis must be equal to 0 and 3 respectively. A look at table 3 reveals that both the distributions are not normal. Also, the probability of acceptance of null hypothesis as per Jarque-Bera Statistic is less than 5% (level of significance) in both the cases. Therefore, as per this technique, none of the two stock markets follow the theory of random walk as the distributions are not normal.

**Table 5: Results of Runs Test.**

<table>
<thead>
<tr>
<th>Indices</th>
<th>Test Value</th>
<th>Cases &lt; Test Value</th>
<th>Cases $\geq$ Test Value</th>
<th>Total Cases</th>
<th>Number of Runs</th>
<th>Z-Statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNX Nifty</td>
<td>0.001246</td>
<td>1373</td>
<td>1373</td>
<td>2746</td>
<td>1298</td>
<td>-2.901</td>
<td>0.004</td>
</tr>
<tr>
<td>KSE 100</td>
<td>0.01397861</td>
<td>1356</td>
<td>1357</td>
<td>2713</td>
<td>1262</td>
<td>-3.668</td>
<td>0.000</td>
</tr>
</tbody>
</table>
The Runs Test has been adopted to check if there is any effect of preceding returns on following returns. If no such effect is found, then the observations are independent and follow a random walk. Since the probability of acceptance of null hypothesis in both the cases is below 5%, we conclude that none of the two tests follow the theory of random walk and hence are inefficient in weak form.

Conclusion:
The stock markets of India and Pakistan are still in phase of infancy and juvenility compared to those of west. Although the investments in these markets have increased over the past decade but they will continue to blossom and groom only and only if the markets are fair (efficient). All the statistical and Econometric tools used for the study clearly reveal that the stock markets of both the emerging economies i.e. India and Pakistan are inefficient in weak form. The validity of the theory of random Walk in Stock Markets of India and Pakistan also stands refuted as the tests used to determine the same clearly rejected the null Hypothesis of the Indian markets being random. The results of this study are consistent with the findings of [Sunil Poshakwale (2006)], [Khan Maqsood Ahmad, Shahid Ashraf (2006)], [Alan Harper and Zhenhu Jin (2012)], [Mishra Vandna, Mishra Amit Kumar, Rustogi Sanjay (2012)], [Haritika Arora (2013)] and [Suresh Chandra Das and Bishnupriya Mishra (2013)]. There will be always a scope of Technical and Fundamental analysis in these two stock Markets as long as they continue to be inefficient in weak form. Also as analyzed through GARCH (1, 1) Model, the volatility of both the stock markets is decaying over the period of time. The Stock markets of India are showing higher volatility compared to the Stock markets of Pakistan.

References


