Efficiency of Sectoral Indices: A Comparative Study on BSE and NSE Ltd.

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Abstract: The sectoral analysis is typically employed by investors who plan to select better stocks to invest. Investors normally identify the most promising sectors and review the financial performance of companies within the sector to determine which individual stock would provide better returns and purchase such stocks ultimately. The study of sectoral efficiency could provide useful input to the investors to identify the efficient sectors and to channel the available resources into the profitable sectors. This study tested the efficiency of two major stock exchanges, namely BSE and NSE sectoral indices by using daily share price returns. This study measured the random distribution and weak form efficiency in BSE and NSE sectoral indices. The analysis consisted of descriptive statistics, runs and autocorrelation test. The runs test indicated that the market did not follow random distribution.

Key words: Sectoral analysis, BSE indices, NSE indices, random walk and market efficiency, runs test

INTRODUCTION

The financial markets are pervasive in nature, since financial transactions are themselves very pervasive throughout the economic system. For instance, issue of equity shares, granting of loan by term lending institutions, deposit of money into a bank, purchase of debentures, sale of shares. The financial market can be referred to as those centers and arrangements which facilitate buying and selling of financial assets, claims and services (Gordon and Natarajan, 2012).

Dyckman and Morse (1986) state that a security market is generally defined as efficient if the price of the security traded in the market, act as though they fully reflect all available information and these prices react instantaneously or nearly so and in unbiased fashion to new information. The idea that asset prices may follow a random walk pattern was introduced by Bachielier (1900). The random walk hypothesis is used to explain the successive price changes which are independent of each other. In other words, tomorrow's price change can not be predicted by looking at today's price change. The financial markets are influenced by money flows and information flows. In free and highly competitive markets, demand and supply pressures determine the prices or

interest rates. In a theoretical sense, markets are said to be efficient if there is a free flow of information and market absorbs this information fully and quickly.

The efficiency means the ability of the capital market to function, so that the prices of securities react rapidly to new information. Such efficiency will sustain prices that are appropriate in terms of current knowledge and the investors would be less likely to make unwise investments (Poshakwale, 1996).

Fama (1970) classifies the market efficiency into three levels on the basis of the information:

- Weak form efficiency
- Semi-strong form efficiency
- Strong form efficiency

Prices under the weak form efficiency reflect all the information found in the record of past prices and volumes. This means that there is no relationship between the past and future price movements. The earlier test of weak form efficient market hypothesis looked at randomness in the short run. The semi-strong efficient market hypothesis holds that the stock prices adjust rapidly to all publicly available information. This implies that using publicly available information, investors will

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not be able to earn superior risk adjusted returns (Chnadra, 2008). If the stock market is efficient in semi strong form, then investors cannot achieve consistently above-normal returns. On the other hand, if investors can consistently obtain above-normal return on trading at the time of the public announcement of specific information, then the stock market is inefficient with respect to this information. Since, excess return represents the difference between the actual return and expected return, implicit in a test of market efficiency is some model of the expected return (Hadi, 2006).

Literature review: An attempt has been made in this study to review the earlier research works undertaken in the area of capital market efficiency to understand the research gap and methodology adopted by researchers in the earlier studies.

Fawson *et al.* (1996) evaluated monthly stock index price from the Taiwan stock market for evidence of weak from efficiency. The study found that the monthly stock prices for the Taiwan stock market exhibits weak form efficiency during the study period. Jarrett and Kyper (2005) tested the weak form efficient market hypothesis to indicate its usefulness. This study found the existence of time series components in closing prices of randomly selected organized market exchanges in the United States. According to Rahman and Hossain (2006), the Dhaka Stock Exchange (DSE) was efficient in the weak form. The study found that the null hypothesis of normality could be rejected and alternative hypothesis remained in effect. Besides, the runs test and autocorrelation results rejected the randomness of the return series of DSE simultaneously. Squalli (2006) tested the market efficiency in the represented sectors of the Dubai Financial Market (DFM) and Abu Dhabi Securities Market (ADSM). The results of runs and autocorrelation test rejected the random walk hypothesis of DFM and ADSM to be accept the weak form efficient. Cheong (2008) investigated the weak form market efficiency, using daily returns of nine sectoral indices in the Malaysian stock market. The study observed that the sectoral indices of Malaysian stock markets were inefficient, i.e., of weak form (except the property index). Asiri (2008) measured the random walk and weak form efficiency the Bahrain stock exchange. The study found that the all daily stock prices and each individual sector supported the efficiency of the Bahrain stock exchange in the weak from. Siddiqui and Gupta (2010) revealed that the indices of S&P CNX and CNX Nifty experienced random walk and Indian stock markets did not exhibit weak form of market efficiency. Selvam *et al.* (2010) studied the market efficiency of the sample companies listed on the BSE PSU Index. The study

found that the PSU Index performed well during the study period and investors of PSU companies earned maximum return through stock market operations. Mehla and Goyal (2012) tested the weak form efficiency of Indian stock market. The results of runs and autocorrelation test provided evidence that the share prices did not follow random walk. Sharma and Seth (2011) studied the impact of recent financial crisis on stock market efficiency in emerging stock markets such as India. It was found that Indian stock market did not exhibit weak form of market efficiency and thus did not follow random walk during the study period. Sapate and Ansari (2011) analysed the weak form of Market Efficiency Hypothesis (EMH). It was found that the stock market returns followed random walk and they supported the weak form of market efficiency. Tahir (2011) identified the Karachi stock exchange as inefficient in the weak form and therefore, investors may make better returns on the basis of historical data. Gupta and Yang (2011) explored the weak form efficiency or random walk hypothesis for the two major equity markets (BSE and NSE) in India. This study found that the market efficiency was mixed. Jana and Meher (2012) observed the return of some market indices to be random and some indices were not random. The study found that the analysis of autocorrelation was significant at 5% confidence level. Fernando (2012) tested the efficiency of emerging Colombo Stock Exchange (CSE). The evidence of this study confirmed that the CSE was not in weak form efficient. The Indian stock market was efficient (Harper and Jin, 2012). The results of Indian stock market return reveal that the weak form was not efficient. Ramkumar *et al.* (2012) tested the 13 sectoral indices of BSE and examined the market efficiency. The study found that the returns of 8 indices out of 12 indices, namely; BSE Automobile Index, BSE Bankex, BSE Capital Goods Index, BSE Consumer Durables Index, BSE Health Care Index, BSE Metal Index, BSE PSU Index and BSE Realty Index followed normal distribution and earned better return. Enninful and Dowling (2013) examined the market efficiency in two Pan-European Countries (Large Capitalization Euro stocks 50 and Small Capitalization Euro stocks). It is found that the large capitalization Euro stocks were weak form efficiency can be influence by high volatility.

The earlier studies concentrated on estimating the indices in global stock exchanges. There was no comprehensive study carried out in Indian Stock markets with respect to indices from Bombay and National stock exchange. In order to fill this gap, the present study was undertaken to analyse the market efficiency in BSE and NSE sectoral indices in the Indian context.

Statement of the problem: Capital market is a vital institution that facilitates economic development of India. Many people are interested in understanding the efficiency of the capital market. The retail investors could be motivated to save and invest their hard earned money in the capital market only if their securities in the market are correctly priced. The significant number of investors suffer due to lack of awareness about how to invest their money in correct indices in the Indian stock market. Besides, majority of investors do not have any idea about which index is the best in India for investment. The information about the economic development and performance of different indices are to be provided to the retail investors and other stakeholders on a periodical basis. There are a few earlier studies which tested the efficiency of global stock markets in general and random walk for various popular indices in particular. But in India, very few studies have examined the daily returns. It is to be noted that no researcher in India has made a comparative study, covering indices returns from two major stock exchanges. Hence, the present study investigates the efficiency of sectoral indices of Bombay Stock Exchange (BSE) and National Stock Exchange (NSE) by using the daily returns.

Need of the study: The efficiency of stock market has direct consequences for the action of investors in the market and the wealth of countries. It is of great interest to many to investigate which indices influence the stock market efficiency. Investors also need to understand the efficiency of stock market indices to invest their money in a profitable way while the policy makers need the latest information about the performance of different indices to devise appropriate policies. The sectoral index indicates the performance of same kind of businesses (industry) in the country. Thus, the study on sectoral efficiency could provide useful input to the government, policymakers and investors to identify the efficient sectors and to channel the available resources to the profitable sectors. Besides, this study is also useful to other stakeholders.

Scope of the study: The efficient market hypothesis has been tested by using different statistical techniques. The present study focuses on the efficiency of Indian stock market for a period of 4 years for BSE and NSE sectoral indices. The study evaluates the normality, randomness and weak form efficiency of BSE and NSE sectoral indices on the basis of daily returns. The study proposes to identify which indices are best for the investors to invest their money and earn the maximum return from the BSE and NSE sectoral indices. Hence, this study evaluates the market efficiency of BSE and NSE sectoral indices to give a comprehensive view of the Indian stock market.

Objectives of the study: The main objectives of this study are to examine the randomness of price returns of BSE and NSE sectoral indices and to evaluate the market efficiency in BSE and NSE sectoral indices.

Hypotheses of the study: In the light of the objectives, the following null hypotheses were developed and tested:

- NH_1: there is no random distribution in the returns of BSE and NSE sectoral indices
- NH_2: there is no weak form efficiency in the returns of BSE and NSE sectoral indices

MATERIALS AND METHODS

Sample selection: The present study tested the performance of sectoral indices listed in BSE and NSE. Turnover values of indices were used to decide the sample size for this study. There were totally 13 sectoral indices in BSE and 11 indices in NSE as on March 2014. Out of 13 BSE sectoral indices, top 5 indices were selected and out of 11 NSE sectoral indices, top 5 indices were selected as the sample size, based on their turnover values in the market. Therefore, only top 5 indices from both BSE and NSE were selected. The details of sample indices are given in Table 1.

Sources of data: The study was mainly based on secondary data, i.e., daily returns of BSE and NSE sectoral indices. The details regarding sample indices were collected from BSE official website www.bseindia.com and www.nseindia.com while daily returns of sample indices were collected from PROWESS Corporate Database published by CMIE. Other required data were collected from various websites, books and journals.

Period of the study: The study is an attempt to test the efficiency of the Indian Capital Market by analyzing the share price returns of sample sectoral indices from Bombay and National Stock Exchange Ltd. during the study period from 1st April, 2009 to 31st March, 2014. For the purpose of this study, a total of 1003 observations were made to collect the required data.

Table 1: Name of BSE and NSE sample secotral indices listed

Name of the stock exchange	Name of the sectoral indices
BSE secotral indices	BSE Bankex
	BSE IT Index
	BSE PSU Index
	BSE Power Index
	BSE TECk Index
NSE sectoral indices	CNX Bankex
	CNX Energy Index
	CNX Finance Index
	CNX IT Index
	CNX PSU Bank Index

www.bseindia.com and www.nseindia.com

Tools used for analysis: For the purpose of analysis of sectoral indices in the Bombay Stock Exchange Ltd. and National Stock Exchange, the following tools were used.

Descriptive statistics: Descriptive statistics was used to identify the measure of average return and risk. Measures of central tendency include the mean while measures of variability include standard deviation, skewness and kurtosis. Descriptive statistics provided a useful summary of security returns and the historical account of return behavior. Although, past information is useful in any analysis, one should always consider the expectations of future events.

Mean: Mean is the average value of the series, obtained by adding up the series and dividing by the number of observations. It is the most common measure of central tendency. The mean is calculated by using the following equation:

$$\text{Mean}(\overline{x}) = \frac{\Sigma x_i}{n}$$

Where:
$\overline{x}$ = The mean
Σ = Symbol of summation
x_i = Value of the ith item x, i = 1, 2, 3, ..., n
n = Total No. of items

Standard deviation: Standard deviation is the square root of the mean of the squared deviation from the arithmetic mean. It measures the absolute dispersion greater the standard deviation, greater will be the magnitude of the deviation of the values from their mean. A small standard deviation means a high degree of uniformity of the observation as well as homogeneity of a series. A large standard deviation means just the opposite. The standard deviation of a random variable X is defined as:

$$\sigma = \sqrt{E(X-E(X))^2} = \sqrt{E(X^2)-(E(X))^2} = \sqrt{VAR(X)}$$

Where:
E(X) = The expected variable of X
VAR(X) = The variance of X

Skewness: Measures of skewness indicated the direction and extent of skewness. Skewness is a measure of symmetry or more precisely, the lack of symmetry. A distribution of data set is symmetric, if it looks the same to the left and right of the centre point. The skewness for a normal distribution is zero and any symmetric data should have skewness near zero. Negative values for the skewness indicate that data are skewed left and positive values for the skewness indicate that data are skewed right. The skewness is calculated as follows:

$$\gamma_1 = \frac{\mu_3}{\sigma^3}$$

Where:
μ_3 = The third movement about the mean
σ = The standard deviation

Kurtosis: Kurtosis measures the amount of peakedness of distribution. A flatter distribution than normal distribution is called platykurtic. A more peaked distribution than the normal distribution is referred to as leptokurtic. Between these two types of distribution, there is a distribution which is normal in shape, referred to as a mesokurtic distribution. A negative kurtosis value implies a platykurtic distribution and a positive kurtosis value implies a leptokurtic distribution. The kurtosis is defined as:

$$\gamma_1 = \frac{\mu_4}{\sigma^4}$$

Where:
μ_4 = The fourth movement about the mean
σ = The standard deviation

Runs test: Runs test is used for measuring the market performance. It does not require specification of the probability distribution. It depends only on the share price. It is essentially concerned with direction of changes in price. The randomness of the sample can be tested by using the runs test. A run is defined as the sequences of identical occurrence of the elements (numbers or symbols), preceded or followed by different occurrence of the elements or by no elements at all. The following formula is used for the runs test:

$$M = \frac{N(N+1)-\sum_{i=1}^{3} n_i^2}{N}$$

Where:
M = Expected number of runs
n_i = Number of price changes of each sign (i = 1, 2, 3)
N = Total number of price changes

Autocorrelation: Autocorrelation is the statistical tool used for measuring the indices successive terms in a given time series and dependence of the successive share price changes. One way to test for randomness in stock price changes is serial correlations (also called as autocorrelation). If such autocorrelations are negligible, the price changes are considered to be serially independent. Numerous serial correlation studies, different stocks, different time lags and different time period were conducted to detect serial correlations. The following equation is used for autocorrelation:

$$P_k = \frac{\sum_{t=1}^{n-k}(R_t - \bar{R})(R_{t+k} - \bar{R})}{\sum_{t=1}^{n}(R_t - \bar{R})^2}$$

Where:

k = The number of lags

R_t = The real rate of return

n = The total number of observations

P_k = The sample autocorrelation function for the lag k

Limitations of the study: The proposed study suffers from the following limitations:

- The study was purely based on secondary data and hence, it could be riddled with certain limitations which are bound to be connected with secondary data
- This study focused only on select 5 sectoral indices for BSE and NSE
- The study period covered only 4 years from April 2009 to March 2014
- All the limitations associated with various tools like descriptive statistics, runs and Autocorrelation Function (ACF) test are also applicable to this study

RESULTS

Results of random walk and market efficiency in sectoral indices: The main aim of this study is to find out the existence of the random walk in the stock market and analyse the efficiency of market in India. For the purpose of this study, the results of the study is made as follows:

- Results of descriptive statistics of index returns for BSE and NSE
- Results of randomness for BSE and NSE sample sectoral indices
- Results of market efficiency for BSE and NSE sample sectoral indices

Results of descriptive statistics of index returns for BSE and NSE: Table 2 presents a summary of descriptive statistics of the daily returns for the sample sectoral indices under the BSE and NSE during the study period. As stated earlier, mean, standard deviation, skewness and kurtosis were used for the analysis. It is to be noted that the mean average returns were positive for 3 sample indices in BSE (BSE Bankex, IT Index and BSE TECk Index) and NSE (NSE Bankex, NSE Finance Index and NSE IT Index). The mean return (0.0616) for BSE IT Index was higher than the remaining 4 indices in BSE. The NSE IT Index (0.0561) was higher than the remaining

Table 2: Results of descriptive statistics for BSE and NSE sample sectoral indices during the study period from 01.04.2009 to 31.03.2014

Name of the indices	Mean	SD	Skewness	Kurtosis
BSE secotral indices				
Bankex	0.0441	1.60832	0.223	1.739
IT Index	0.0616	1.40687	0.495	8.572
PSU Index	-0.0287	1.13732	-0.044	0.584
Power Index	-0.0500	1.26282	-0.210	0.875
TECk Index	0.0475	1.21606	-0.486	5.385
NSE sectoral indices				
Bankex	0.0429	1.86206	0.226	1.696
Energy Index	-0.0004	1.23291	0.009	0.467
Finance Index	0.0457	1.52132	0.139	1.295
IT Index	0.0561	1.40795	-0.626	9.554
PSU Bank Index	-0.0019	1.63006	0.109	1.204

Collected from PROWESS corporate database and computed using SPSS (Version 19)

sample indices. It is to be noted that the highest return were earned for BSE IT Index (0.0616) and NSE IT Index (0.0561) while the lowest return was realized for BSE Bankex (0.0441) and NSE Bankex (0.0429) during the study period. The values of standard deviation of BSE returns ranged from 1.60832 (BSE Bankex) to 1.21601 (BSE TECk Index). The BSE Bankex earned the highest standard deviation (1.60832) which indicates the highest risk, followed by BSE Index (1.40687), BSE Power Index (1.26282), BSE TECk Index (1.21601) and BSE PSU Index (1.13732). It is to be noted that the NSE Bankex earned the highest standard deviation of 1.86206 which reveals the highest degree of risk. NSE Energy Index recorded the lowest standard deviation (1.23291) which reveals the lowest degree of risk during the study period.

It is clearly understood from the results of skewness that out of 5 BSE sample indices, 3 indices, namely BSE PSU Index (-0.044), BSE Power Index (-0.210) and BSE TECk Index (-0.486) earned negative values during the study period. The results of skewness clearly indicates both positive and negative values for NSE sample indices. The negative value was recorded for only 1 index, namely NSE IT Index (-0.626) and the remaining sample indices earned positive values over the period. According to the results of kurtosis, the obtained values for all BSE Sample Indices were positive during the period of study. It is to be noted that out of 5, 2 sample indices, namely BSE IT Index (8.572) and BSE TECk Index (5.385), earned values over 3. Thus, the remaining BSE sample indices, namely BSE Bankex, BSE PSU Index and BSE Power Index earned values below 3. It is seen that out of 5 NSE sample indices taken for this study, only 1 index, NSE IT Index (9.554) earned a value over the level of 3. The values above 3 indicate leptokurtic. The other NSE sample indices earned a value <3 which indicates platykurtic.

The results of descriptive statistics for all sample sectoral indices of BSE taken for this study were compared with that of NSE. The comparison of mean

value clearly shows that values for both BSE IT Index
(0.0616) and NSE IT Index (0.0561) recorded the highest
return. From the comparison analysis of standard
deviation, BSE Bankex (1.60832) and NSE Bankex (1.86206)
earned values higher than that of all the 5 sample indices
in BSE and NSE. The comparison of values of skewness
clearly indicates the fact that out of BSE sectoral indices,
3 indices of BSE earned negative value. NSE sectoral
indices reveal that only 1 index of NSE recorded a
negative value during the study period. Regarding the
analysis of kurtosis, it is to be noted that its values
for 2 BSE sample indices (BSE IT and BSE TECk Index)
and only 1 NSE sample index (NSE IT Index) earned
more than the value 3 while the values of other indices
were <3 during the study period.

It is clearly found from the total average returns for
BSE and NSE IT Index performed well. The value of
standard deviation revealed more risk for Bankex in BSE,
as well as in NSE. According to the kurtosis, its values for
BSE and NSE sectoral indices indicate the fact that out of
5 BSE Indices, the returns data for 3 indices (BSE Bankex,
BSE PSU Index and BSE Power Index) were normally
distributed while the return data for 2 indices (BSE IT
Index and BSE TECk Index) were not normally distributed
during the study period. It is seen that out of 5 NSE
indices, only 1 index (NSE IT Index) was not normally
distributed while the remaining 4 indices (NSE Bankex,
NSE Energy Index, NSE Finance Index and NSE PSU Bank
Index) were normally distributed during the study period.

**Results of randomness for BSE and NSE sectoral
indices:** The results of runs test for BSE and NSE sample
sectoral indices during the study period from 1st April,
2009 to 31st March, 2014 are displayed in Table 3. It is
clear that out of 1003 total observations for BSE and NSE
sectoral indices, the number of runs registered by BSE
sample indices were 458 for BSE Bankex, 479 for BSE IT

Table 3: Results of randomness (runs test) for BSE and NSE sample
sectoral indices during the study period from 01.04.2009 to
31.03.2014

Name of the indices	Z-values	Significant value
BSE sectoral indices		
Bankex	-2.807	0.005
IT Index	-1.472	0.141
PSU Index	-3.302	0.001
Power Index	-2.388	0.017
TECk Index	-0.467	0.641
NSE sectoral indices		
Bankex	-2.045	0.041
Energy Index	1.489	0.137
Finance Index	-2.243	0.025
IT Index	-1.358	0.175
PSU Bank Index	-3.248	0.001

Collected from PROWESS corporate database and computed using SPSS
(Version 19); Z-value at 5% level of significance

Index, 450 for BSE PSU Index, 464 for BSE Power Index
and 495 for BSE TECk Index. The number runs recorded
for the NSE sample indices, such as CNX Bankex, CNX
Energy Index, CNX Finance Index, CNX IT Index and CNX
PSU Bank Index were 470, 526, 467, 481 and 445,
respectively. All the 5 BSE sample indices earned
negative Z-values. It is seen that out of 5 NSE sample
indices, 1 index which recorded positive Z-value was
CNX Energy Index (1.489) while the indices that earned
negative Z-values were CNX Bankex (-2.045), CNX
Finance Index (-2.243), CNX IT Index (-1.358) and CNX
PSU Bank Index (-3.248). It is clear that out of 5 BSE
sample indices; 3 indices, namely; BSE BAnkex, BSE PSU
Index and BSE Power Index did not follow the random
distribution of data and the Z-values (negative) of these
indices were -2.807 (BSE Bankex), -3.302 (BSE PSU Index)
and -2.388 (BSE Power Index). It is to be noted that
the Z-values of the sample indices had fallen in between
±1.96 while the other indices, namely; BSE IT Index earned
the value of -1.472 and BSE TECk Index earned the value
of -0.467. This indicates that the return data of BSE IT and
BSE TECk Index did follow random distribution at 5%
level of significance. However, the returns data clearly
reveal the fact that Z-values of all NSE sample indices
were randomly distributed with values falling in between
±1.96 except 2 indices, namely CNX Energy Index (1.489)
and CNX IT Index (-1.358) during the study period.

It is to be noted that out of 5 sample indices from
BSE, 2 sample indices (BSE IT and BSE TECk Index) and
out of 5 sample indices from NSE, 2 sample indices (NSE
Energy and NSE IT Index) earned values in between ±1.96.
Thus, the remaining sample indices were not randomly
distributed at the 5% level of significance. It is clear from
the runs test that the Z-values for BSE IT Index (-1.472)
and NSE IT Index (-1.358) were within the value of
±1.96 at 5% level of significance. Hence, the Null
Hypothesis (NH₁), namely "there is no random
distribution in the returns of BSE and NSE sectoral
indices" is partially accepted.

**Results of market efficiency for BSE and NSE sectoral
indices:** The results of autocorrelation for the BSE and
NSE sample sectoral indices returns during the study
period from 01.04.2009 to 31.03.2014 are presented in
Table 4. The autocorrelation analysis was made, based on
16 lags during the study period.

It is to be noted that BSE sample sectoral indices
included BSE Bankex, BSE IT Index, BSE PSU Index, BSE
Power Index and BSE TECk Index. The analysis of BSE
Bankex clearly shows that the autocorrelation coefficients
were significant at 95% of confident with a positive sign
for 1st and 15th lag. The positive sign of the
autocorrelation value indicates that the daily return of

Table 4: Results of market efficiency (autocorrelation test) for BSE and NSE sample sectoral indices during the study period from 01.04.2009 to 31.03.2014

Lags	BSE					NSE				
	Bankex	IT Index	PSU Index	Power Index	TECk Index	Bankex	Energy Index	Finance Index	IT Index	PSU Bank Index
1	0.114	0.034	0.140	0.090	0.014	0.110	0.009	0.103	0.030	0.131
2	-0.014	-0.054	0.077	0.062	-0.037	-0.021	0.024	-0.015	-0.055	0.031
3	-0.022	-0.017	-0.062	-0.026	-0.025	-0.023	-0.088	-0.045	-0.020	-0.001
4	-0.018	0.062	-0.051	-0.036	0.048	-0.015	-0.037	-0.007	0.057	-0.033
5	-0.018	0.037	-0.033	0.020	0.027	-0.022	0.004	-0.020	0.035	-0.041
6	0.020	0.026	-0.022	-0.022	0.031	0.020	0.008	0.010	0.031	0.022
7	0.003	-0.051	0.018	0.056	-0.050	0.001	0.004	0.005	-0.050	-0.036
8	-0.002	0.037	0.000	0.023	0.030	-0.002	-0.030	-0.007	0.038	0.026
9	0.025	-0.001	0.087	0.041	0.001	0.024	0.067	-0.003	-0.008	0.107
10	-0.019	-0.006	-0.002	0.022	-0.016	-0.019	0.004	-0.016	-0.002	0.023
11	-0.057	-0.036	-0.064	-0.062	-0.046	-0.057	-0.062	-0.079	-0.042	-0.052
12	0.019	-0.006	-0.026	-0.026	0.002	0.023	-0.018	0.020	-0.001	-0.006
13	-0.006	-0.023	0.000	0.045	-0.020	-0.010	0.005	0.004	-0.034	-0.013
14	0.022	-0.040	0.056	0.036	-0.048	0.025	0.087	0.026	-0.039	0.040
15	0.055	0.016	0.044	0.013	0.000	0.056	0.025	0.045	0.021	0.061
16	0.006	-0.010	0.013	-0.006	-0.011	0.003	-0.039	0.000	-0.014	0.047

Collected from PROWESS corporate database and computed using SPSS (Version 19); Positive value at 5% level of significance

BSE Bankex tended to have the same sign on consecutive days. The results of BSE IT Index reveal that out of 16 lags, only one lag (1st lag) was significant while the remaining lags were insignificant at the 95% confidence level during the study period. The autocorrelation result of BSE IT Index indicates that out of 16 lags, 4 lags (1st, 2nd, 9th and 14th lag) were significant while the remaining lags (3rd, 4th, 5th, 6th, 7th, 8th, 10th, 11th, 12th, 13th 15th and 16th) were insignificant at the 5% level of significance during the study period. Regarding BSE Power Index, autocorrelation coefficients were significant at 5% level with positive values for 1st, 2nd and 7th lag. The highest magnitude of coefficient was 0.090 at lag one which was positive and found to be significant at 95% level of confidence. The analysis of BSE TECk Index shows that out of 16 lags, there was no lag with significant and positive value. The coefficient values for all lags were insignificant at 5% level of significance during the study period.

The sample indices from NSE taken for this study included CNX Bankex, CNX Energy Index, CNX Finance Index, CNX IT Index and CNX PSU Bank Index. The autocorrelation result of CNX Bankex indicates that out of 16 lags, 2 lags (1st and 15th lag) were significant while the remaining 14 lags were insignificant at the 5% level of significance during the study period. The result of BSE Energy Index reveals the fact that the values of autocorrelation coefficients were significant at 5% level of significance with a positive value of 0.067 for 9th lag and 0.087 for 14th lag. It is important that these values were found significant at 5% level of significance. The autocorrelation for daily returns price for CNX Finance Index was computed for 16 lags. From the analysis of autocorrelation coefficient, it is noted that lag one was positively significant with the value of 0.103. The analysis of CNX IT Index shows that the value of autocorrelation coefficient was significant at 95% confident level with a positive sign for only 1 lag (4th lag). It is seen that out of 16 lags, all lags were insignificant, except one lag (i.e., 4th lag of 0.057). The autocorrelation analysis of CNX PSU Bank Index exhibits the 16 lags of daily returns during the study period. It is found that the autocorrelation coefficients for 1st, 9th and 15th lag of daily return data were significant at the 95% confidence level. The highest magnitude of coefficient was 0.131 at lag one which was positive and found to be significant at 95% level of confidence during the study period.

It is clearly evident from the overall analysis of autocorrelation function that the returns data did not follow weak form efficiency for all the sample sectoral indices of BSE and NSE. Hence, the null hypothesis (NH$_2$), namely "there is no weak form efficiency in the returns of BSE and NSE sectoral indices" is accepted.

Findings and suggestions of the results: Out of the BSE sample indices, BSE IT Index earned the highest returns (0.0616) followed by other sample indices (BSE TECk Index (0.0475), BSE Bankex (0.0441), BSE Power Index (-0.0500) and BSE PSU Index (-0.0287)) during the study period.

Among the BSE sample sectoral indices, the average returns for BSE IT Index (0.0616) was the highest compared to all other sample indices taken for this study. The average return for BSE PSU Index (-0.0287) was the lowest during the study period.

All the 5 sample sectoral indices from NSE received positive mean returns. The average returns was the highest for CNX IT Index compared to other 4 sample sectoral indices.

The analysis of daily share price returns of NSE sample sectoral indices during the study period shows that the CNX IT Index obtained the highest mean returns (0.0561) and lowest mean value of -0.0019 was earned by CNX PSU Bank Index.

The standard deviation values recorded for all the 5 sample sectoral indices in BSE and NSE show that out of 5 sample indices, the BSE and CNX Bankex suffered the greatest risk.

The analysis of skewness for BSE sample indices, shows that indices like BSE PSU Index (-0.044), BSE Power Index (-0.210) and BSE TECk Index (-0.486) earned negative values while the other 2 indices, namely; BSE Bankex (0.223) and BSE IT Index (0.495), earned positive values during the study period.

The analysis of skewness clearly shows both positive and negative values for all NSE sample sectoral indices. The distribution of return was positively skewed for 4 sample indices while the remaining 1 index (CNX IT Index) was negatively skewed during the study period.

According to the analysis of kurtosis, all the sample sectoral indices in BSE and NSE recorded positive values. It is seen that out of 5 BSE sample indices, 2 sample indices earned values >3 which indicates Leptokurtic while the remaining 2 sample indices earned the normal distribution during the study period.

The value of kurtosis measure of distribution for 1 sample index of NSE, namely; CNX IT Index was 9.554 which indicated Leptokurtic. The remaining 4 sample indices (CNX Bankex, CNX Energy Index, CNX Finance and CNX PSU Bank Index) earned a value below 3, indicating platykurtic.

The results of runs test for BSE sample sectoral indices, reveal that out of 5 indices, Z-values of 2 indices (BSE IT and BSE TECk Index) were significant at 5% level during the study period.

The results of runs test indicate that out of 5 NSE sample indices, 3 indices (CNX Bankex, CNX Finance Index and CNX PSU Bank Index) did not follow normal distribution during the study period. Besides, the earlier indices earned negative Z-values which were outside the value of ±1.96.

According to the analysis of autocorrelation, both BSE and NSE sample sctoral indices were not weak form efficient during the study period.

The comparison between return and risk of sample sectoral indices in BSE, reveals that BSE IT Index recorded the highest return as well as the second highest risk. It is advisable for the investors to invest in BSE Information Technology Index. Besides, it is recorded the seconnd position in the case of risk and first position in the case of return.

Highest return was recorded by the shares of CNX IT Index and it also occupied 3rd position in the case of risk. Therefore, it would be beneficial for the investors to invest in CNX IT Index.

Regulators may introduce regulation on par with global standards to attract and protect the interests of international investors. This would promote the quality of stock trading in the market.

It is also necessary for the investors to avail the openly available information about stock market as they play a major role in the analysis of the stock market. It is to be noted that the periodic assessment of trend in stock markets could help the investors to identify appropriate trading strategies for better investment.

DISCUSSION

The Indian economy as a whole has grown by leaps and bounds over the past decade. The economies worldwide are integrated with each other more than ever before. An event in a certain country has immediate and long lasting repercussions elsewhere. Hence, it is imperative to study the movement of the Indian Capital Market in the light of changed circumstances to understand, introspect and anticipate the growth trend. The development of financial markets has significant impact on economic growth. The regulators and policy makers should pay attention to the market efficiency of Indian stock market. The improved policies may assist in deepening the financial markets and further improving the market efficiency in future for helping the retail investors.

An attempt has been made in this study to investigate the weak form efficiency in the Indian stock market by examining the returns of 5 sample sectoral indices in BSE and NSE by using descriptive statistics, runs and autocorrelation test. It is seen that BSE and NSE sample sectoral indices (BSE IT and CNX Index) earned high average return. The runs and autocorrelation test indicate that out of 5 sample indices in BSE, only 2 indices (BSE IT and BSE TECk Index) were randomly distributed at 5% significant level. It is seen that out of 5 sample indices in NSE, only 2 indices (CNX Energy and CNX IT Index) were randomly distributed at 5% significant level during the study period. The remaining 3 indices for BSE and NSE did not follow Random Walk Method. The autocorrelation revealed that all the sample sectoral indices in BSE and NSE were not weak form efficient during the study period.

CONCLUSION

This study suggests that investors may invest their money in BSE IT Index and NSE IT Index as they performed well during the study period.

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