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Evaluation of Market Efficiency in the Sectoral Indices of the Indian Stock Market: An Investigation on the Bombay Stock Exchange

Aanchal Kaul

Research Scholar, Department of Commerce, Punjabi University, Patiala

Dr. Rajinder Kaur

Professor, Department of Commerce, Punjabi University, Patiala

Dr. Jasmindeep Kaur

Professor, Department of Commerce, Punjabi University, Patiala

ABSTRACT-

The Stock Exchange's Sectoral Index Analysis is a method of gauging economic expansion of a nation. It measures the important aspects of a nation's economic growth. Additionally, the government and investors may use it as a reference guide to know more about the financial health of a country with the help of the studies conducted on the indices of various sectors of the economy. This paper suggests utilising the Runs Test and Autocorrelation Test to evaluate the market efficiency of the Indian market by testing the BSE's sectoral indices. The BSE Automobile Index, BSE Bankex, BSE Capital Goods Index, BSE Health Care Index, BSE Metal Index, BSE PSU Index, and BSE Realty Index indicated substantial returns at 5% level of significance during the course of the research.

Keywords- BSE, Sectoral Indices, Runs Test, Autocorrelation Test, Market Efficiency.

INTRODUCTION-

It is well known that Equity stocks and other assets can be traded on a stock exchange. Facilities for the issuance and redemption of securities and other financial instruments are also provided. Bonds, indexes, pooled investment products, and company shares are among the securities that are exchanged on a stock market. There are 6 stock exchanges in India, comprising 4 regional exchanges in addition to the two main ones, the BSE (Bombay Stock Exchange) and NSE (National Stock Exchange). The two most significant stock exchanges in India are the BSE and NSE. The Bombay Stock Exchange Limited was first founded in 1875 and is often known as the BSE and is the oldest stock market in the Asian continent. In 1992, the National Stock Exchange of India was first founded in Mumbai. Although a number of India's top banks, insurance providers, and other financial intermediaries jointly share NSE, its ownership and administration are run independently.

Investors who want to choose better stocks to buy usually use the sectoral analysis. They often pick the most promising industries, evaluate the performance of the firms in those industries, and decide which individual stocks will yield higher returns before buying them. One key idea that aids in comprehending how capital markets operate is sectoral efficiency of the markets. The link between information and share prices is explained by the phrase "market efficiency." Because there are no overpriced or undervalued stocks in an efficient market, investors' investing strategies are influenced by market efficiency (Fama, 1970). One of the three forms of market efficiency

This suggests that, for a certain risk, the stocks won't provide returns more than anticipated. On the other hand, if the market is inefficient, choosing the right stocks might result in excess profits (Selvam et. al., 2016). In order to evaluate the market efficiency of the Indian stock market, this study examined the stock prices of sectoral indices on the Bombay Stock Exchange (BSE). If the prices of securities completely reflect the implications of price returns, a stock market is considered efficient with regard to an information item.

The BSE Sectoral Indices are the main subject of this study. Investing in the stock market, particularly in sectoral indexes, allows investors, stakeholders, and policy makers to increase their earnings. This study's sectoral analysis examines the market efficiency of the economy's various sectors (Sectoral Index). Since the BSE Sectoral Indices are regarded as significant, this study uses daily Index Returns to assess the market efficiency across the Sectoral Indices posted at the BSE.

Review of Literature-

Anand Pandey (2003) used the Runs Test and the Autocorrelation Function of ACF to evaluate the effectiveness of the three well-known stock indices of the Indian stock market. The Indian Stock Market's stock index time series were determined to be biased random time series using the Autocorrelation and Runs Test. The application of aggregate index volatility behaviour to sectoral indices was investigated by Kin-Yip Ho and Albert K. C. Tsui (2004). The study questioned how leverage affects equity returns and how it affects portfolio diversification strategies across different industries. The monetary transmission mechanism in Pakistan was examined at the sectoral level by Tasneem Alam and Muhammad Waheed (2004). The study evaluated whether or not the monetary transmission mechanism was significantly impacted by the reform process. The study discovered that throughout the post-reform era, there were notable shifts in the transfer of monetary stock to the real sector of the economy. In 2004, Mufeed Rawashdeh and Jay Squalli examined market efficiency in the four sectors of the Amman Stock Exchange (ASE): banking, industry, insurance, and services. The investigation discovered that for every sample sector, the weak form efficiency and random walk hypotheses were disproved. n addition, the mean value returns were extremely erratic, and a bubble effect was created by inflated stock prices and frequent market corrections. It suggests that short-term investments in any of the ASE's sectors might be extremely dangerous. Chin Wen Cheog (2008) used the daily return of nine industry indices in the Malaysian stock market to study weak form market efficiency. These empirical findings stood in stark contrast to the conventional unit root test, which disregarded currency control and the economic crisis. The analysis discovered that, with the exception of the property index, the sectoral indexes of the Malaysian stock markets were weak-form inefficient. Dharani and P. Natarajan.M (2010) used the Alpha and Beta Coefficients to examine the effectiveness of Nifty Benchmark Schemes. According to the analysis, the Nifty BeEs outperformed the Nifty Index. Rajesh Ramkumar, Selvam M, and Indhumathi G.R examined the sample firms' market efficiency that were included in the BSE PSU Index. According to the study, investors in PSU businesses had the highest return from stock market activities, and the PSU Index did well during the study period. Kim et. al. (2011) provided substantial proof regarding time – sensitive return forecasting about the Dow Jones Industrial Index ranging from 1900 to 2009. Nurunnabi (2012) assessed the growing States's weak form efficiency, the findings could not be standardized as they varied drastically in political and socio – cultural environments especially the investment habits and the size of the stock markets.

STATEMENT OF THE PROBLEM-

The Stock Market is an essential institution of a country because it promotes economic growth. It is true that a lot of people are curious about the efficiency of the stock market and that encourages them to trade on the stock exchanges. Only when their assets are priced adequately, the small and medium-sized investors would be encouraged to save and make investments in the stock market. However, many investors are unaware of how to put their money into the right Indian stock market index. Furthermore, investors are unaware of which Indian companies and indices are the finest and would be profitable for them. The efficiency of the global stock market—that is, the stock markets in Ghana, Palestine, and Russia—as well as the random walk for a number of well-known indexes were evaluated in earlier researches. However, very few studies in India have looked at the daily, weekly, and monthly returns of the stock market in specific stock indices of the BSE and the NSE. Therefore, the primary issue which the investors face is their lack of knowledge on how the money should be invested in performing indices. Furthermore, only a few thorough investigations have been conducted to evaluate the efficiency of a stock exchange's various sectors and sectoral indices in the Indian context. Therefore, utilising the most regularly traded indices on the Bombay Stock Exchange (BSE) and the Index Returns, the current study aims to examine the efficiency of the sectoral indices.

OBJECTIVE -

To examine the weak form market efficiency of the sectoral indices posted on BSE India

HYPOTHESES -

The following null hypotheses are tested in this study:
NH1: There is no normal distribution in the returns of the Sectoral Indices in BSE.
NH2: The returns of the BSE's sectoral indices do not significantly differ from one another.

METHODOLOGY-

The goal of the study is to evaluate how sectoral indices behave in terms of daily index returns. The following are the twelve sample indices selected for the study from the BSE Sectoral indexes - these are BSE Capital Goods, BSE Auto Index, BSE Bankex, and BSE Consumer Durables Index, BSE Fast Moving Consumer Goods Index, BSE Health Care Index, BSE Information Technology Index, BSE Metal Index, BSE Oil and Gas Index, BSE TECk Index, BSE Realty Index and BSE PSU Index.

Secondary data is the study's primary source of information. The official website of the BSE - www.bseindia.com provided the necessary information on the daily index results of the BSE Sectoral Indices. The remaining necessary information was gathered from a variety of books, periodicals, and journals. From January 1, 2020, to December 31, 2025, the study examined the Daily Index Returns to test the market efficiency of Sectoral Indices listed on the BSE. The statistical tools for the analysis are SPSS and EViews.

TECHNIQUES USED-

1. RUNS TEST- It is used for measuring market performance. It does not require specification of the probability distribution as it depends only on the share price and is essentially concerned with direction of changes in price.
2. AUTOCORRELATION- It is the statistical tool used for measuring the indices successive terms in given time series and dependence of the successive share price changes.

Evaluation of BSE's Market Efficiency (Sectoral Indices)

The market efficiency analysis is organised as follows-

1.Market Efficiency Analysis: Runs Test
2. Market Efficiency Analysis: Autocorrelation Test

RUNS TEST-

Runs Test Analysis with Mean Base for Bombay Stock Exchange Sectoral Indices

Table 1 The randomness of selected sectoral indices of the Bombay Stock Exchange was examined using the Runs Test. The test statistic (Z) and corresponding p-values reveal whether the movements in each index are random or exhibit a systematic pattern.

At the 5% level of significance ($p < 0.05$), the null hypothesis of randomness is rejected for several indices. The **BSE Realty Index** shows the highest deviation from randomness with a Z value of **–4.876** and a p-value of **0.000**, indicating strong non-randomness in its movement. Similarly, the **BSE Capital Goods Index** (Z = –4.019, p = 0.000) and **BSE Bankex** (Z = –3.842, p = 0.000) also demonstrate highly significant results, confirming pronounced patterns or trends in these sectors.

Further, the **BSE PSU Index** (Z = –3.412, p = 0.001), **BSE Health Care Index** (Z = –2.921, p = 0.004), and **BSE Metal Index** (Z = –2.664, p = 0.008) show statistically significant deviations from randomness. The **BSE Auto Index** (Z = –2.137, p = 0.033), though comparatively lower in magnitude, still falls within the rejection region, suggesting the presence of mild but significant non-random behavior. In contrast, several indices exhibit p-values greater than 0.05, indicating that the null hypothesis of randomness cannot be rejected. The **BSE TECk Index** (Z = –0.712, p = 0.476) and **BSE Oil and Gas Index** (Z = –0.845, p = 0.398) show the highest p-values, suggesting strong randomness in their movements. Similarly, the **BSE Consumer Durable Index** (Z = –1.276, p = 0.202), **BSE Information Technology Index** (Z = –1.389, p = 0.165), and **BSE FMCG Index** (Z = –1.563, p = 0.118) also exhibit non-significant results, indicating no detectable pattern in their time series.

Table 1 - Results of Runs Test with Mean Base for Bombay Stock Exchange Sectoral Indices

Indices Name	Z	Significant value
BSE Auto index	-2.137	.033*
BSE Bankex	-3.842	.000*
BSE Capital Goods Index	-4.019	.000*
BSE Consumer Durable Index	-1.276	0.202
BSE FMCG Index	-1.563	0.118
BSE Health Care Index	-2.921	.004*
BSE Information Technology Index	-1.389	0.165
BSE Metal Index	-2.664	.008*
BSE Oil and Gas Index	-0.845	0.398
BSE PSU Index	-3.412	.001*
BSE Realty Index	-4.876	.000*
BSE TECk Index	-0.712	0.476

Source: Computed from SPSS

Note: Significant at 5% Significance level

Runs Test Analysis with Median Base for Bombay Stock Exchange Sectoral Indices

The Runs Test based on the median was applied to examine the randomness in the movement of sectoral indices of the Bombay Stock Exchange. The results indicate that a majority of the indices exhibit non-random behavior, as evidenced by significant p-values at the 5% level. The BSE Realty Index shows the highest deviation from randomness with a Z-value of –4.918 ($p = 0.001$), followed by the BSE Capital Goods Index ($Z = –4.282$, $p = 0.000$) and BSE Bankex ($Z = –3.976$, $p = 0.000$), indicating strong and statistically significant patterns in their movements. Similarly, the BSE PSU Index ($Z = –3.529$, $p = 0.000$), BSE Metal Index ($Z = –2.953$, $p = 0.003$), and BSE Health Care Index ($Z = –2.745$, $p = 0.006$) also demonstrate significant non-randomness, suggesting the presence of trend persistence. The BSE Auto Index ($Z = –2.491$, $p = 0.013$) further supports this observation, while the BSE Consumer Durable Index ($Z = –1.982$, $p = 0.047$) represents a borderline case, yet still indicates deviation from randomness. In contrast, indices such as BSE FMCG ($Z = –1.338$, $p = 0.181$), BSE Information Technology ($Z = –1.174$, $p = 0.240$), BSE Oil and Gas ($Z = –0.768$, $p = 0.442$), and BSE TECk ($Z = –0.534$, $p = 0.593$) show non-significant results, implying that their movements are random in nature. Overall, with 8 out of 12 indices displaying non-random behavior, the findings suggest that a large proportion of sectoral indices deviate from randomness, indicating possible predictability and partial inefficiency, while a smaller group of sectors follows random movement consistent with weak-form efficiency.

Table 2 - Runs Test Analysis with Median Base for Bombay Stock Exchange Sectoral Indices

Indices Name	Z	Significant value
BSE Auto Index	-2.491	.013*
BSE Bankex	-3.976	.000*
BSE Capital Goods Index	-4.282	.000*
BSE Consumer Durable Index	-1.982	.047*
BSE FMCG Index	-1.338	0.181

BSE Health Care Index	-2.745	.006*
BSE Information Technology Index	-1.174	0.24
BSE Metal Index	-2.953	.003*
BSE Oil and Gas Index	-0.768	0.442
BSE PSU Index	-3.529	.000*
BSE Realty Index	-4.918	.001*
BSE TECk Index	-0.534	0.593

Source: Computed from SPSS

Note: Significant at 5% Significance level

ANALYSIS OF MARKET EFFECIENCY USING AUTOCORRELTION TEST –

The autocorrelation analysis of sectoral indices of the Bombay Stock Exchange reveals mixed patterns of dependence across different lags during the study period. The indices marked with significance (BSE Auto, BSE Bankex, BSE Capital Goods, BSE Consumer Durables, BSE Health Care, BSE Metal, BSE PSU and BSE Realty) exhibit **very low p-values (mostly 0.000 to 0.007) across almost all lags from 1 to 10**, indicating statistically significant autocorrelation and hence strong serial dependence in their movements. This suggests that past values have a consistent influence on current prices, reflecting non-random behavior. In particular, indices such as BSE Auto, BSE Bankex, BSE Capital Goods, BSE Metal, BSE PSU and BSE Realty show **uniformly significant p-values (0.000) across all ten lags**, highlighting a persistent pattern over time.

In contrast, the **BSE FMCG Index** displays **high autocorrelation coefficients ranging from 0.412 at lag 1 to as high as 0.899 at lag 10**, indicating a very strong and increasing degree of positive autocorrelation, which implies pronounced trend persistence in this sector. The **BSE IT Index** shows moderate autocorrelation at lag 1 (0.487), which sharply declines in subsequent lags (0.002 to 0.018), suggesting that the influence of past values diminishes quickly over time. Similarly, the **BSE TECk Index** reflects moderate initial autocorrelation (0.298 at lag 1) followed by low but gradually increasing values up to 0.035 at lag 10, indicating weak but persistent dependence.

On the other hand, the **BSE Oil and Gas Index** demonstrates relatively low autocorrelation values across all lags (ranging from 0.001 to 0.058), suggesting weak dependence and a tendency toward random movement. Overall, the results indicate that while several sectoral indices exhibit strong and statistically significant autocorrelation (supporting predictability and market inefficiency), others such as BSE FMCG, BSE IT, BSE Oil & Gas, and BSE TECk display varying degrees of dependence, with some showing strong trends and others aligning more closely with random walk behavior. This highlights the presence of **sector-specific dynamics** in the behavior of stock prices.

TABLE 3 - Autocorrelation Results for Bombay Stock Exchange Sectoral Indices during the study period

Name of the Indices	Lag1	Lag2	Lag3	Lag4	Lag5	Lag6	Lag7	Lag8	Lag9	Lag10
BSE Auto*	0	0	0	0	0	0	0	0	0	0
BSE Bankex*	0	0	0	0	0	0	0	0	0	0
BSE CG*	0	0	0	0	0	0	0	0	0	0
BSE CD*	0.002	0.001	0.002	0	0	0	0	0.001	0.001	0.002
BSE FMCG	0.412	0.438	0.521	0.688	0.702	0.829	0.587	0.75	0.88	0.899
BSE HC*	0.002	0.002	0.003	0.007	0.012	0.019	0.004	0.005	0.007	0.006

BSE IT	0.487	0.003	0.002	0.002	0.004	0.005	0.009	0.009	0.015	0.018
BSE Metal*	0	0	0	0	0	0	0	0	0	0
BSE Oil& Gas	0.021	0.058	0.049	0.043	0.049	0.035	0.016	0.001	0.002	0.004
BSE PSU*	0	0	0	0	0	0	0	0	0	0
BSE Realty*	0	0	0	0	0	0	0	0	0	0
BSE TECk	0.298	0.012	0.018	0.021	0.025	0.028	0.03	0.026	0.033	0.035

Source: Computed from EViews

CONCLUSION-

The overall findings of the study on sectoral indices of the Bombay Stock Exchange reveal a mixed but largely inefficient market behavior across sectors during the study period. The results of the Runs Test (both mean- and median-based) indicate that a majority of indices—particularly BSE Realty, BSE Capital Goods, BSE Bankex, BSE PSU, BSE Metal, BSE Health Care, and BSE Auto—exhibit non-random movements, suggesting the presence of underlying patterns and trend persistence. This is further reinforced by the autocorrelation analysis, where several indices show statistically significant serial dependence across multiple lags, implying that past price movements influence current values.

In particular, sectors such as BSE Realty, BSE Capital Goods, BSE Bankex and BSE PSU demonstrate strong and consistent deviations from randomness along with significant autocorrelation, indicating a higher degree of predictability and thus deviation from weak-form market efficiency. Additionally, the BSE FMCG sector shows very high and increasing autocorrelation coefficients (0.412 to 0.899), reflecting strong trend-following behavior. On the other hand, sectors like BSE Information Technology, BSE Oil and Gas, and BSE TECk display relatively random and weakly correlated movements, suggesting partial adherence to weak-form efficiency.

Overall, the study concludes that while some sectors of the Bombay Stock Exchange exhibit characteristics consistent with efficient markets, a larger proportion demonstrates predictable patterns and serial dependence, indicating sector-wise inefficiency. These findings imply that investors may exploit such patterns for forecasting and decision-making in certain sectors, while others remain largely unpredictable. Hence, the behavior of the market is not uniform and varies significantly across sectors, highlighting the importance of sector-specific analysis in understanding stock market dynamics.

LIMITATIONS-

The following are the drawbacks the study -

1. Because the study relied on secondary data, it had a number of limitations that are inevitably related to secondary data.
2. Only 12 BSE Sectoral Indices were examined in this study.
3. The study duration was limited to five years.
4. This study is subject to all of the constraints associated with different instruments, such as the Runs Test and Autocorrelation Test.

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