CONFLUENCE OF KNOWLEDGE (COK)
(A Multidisciplinary International Peer-Reviewed/Refereed Journal)
ISSN 2320–5237 | Volume 08, Issue 01, January-December, 2021
http://cok.pratibha-spandan.org © The Author(s) 2021

DECODING MARKET BEHAVIOR: A STUDY OF WEAK FORM EFFICIENCY IN THE INDIAN SECTOR

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ABSTRACT

The efficiency of the Indian stock market is considered an essential factor when evaluating different investment opportunities. Market efficiency is an important area of research in behavioural finance, and a lot of effort has been made on improving econometric models. The objective of the present study is to evaluate the weak form efficiency of the Indian stock market in the context of banking sector. The weak form efficiency states that current stock prices fully reflect all previous price data. As a result, weak form suggests that technical analysis is unreliable and ineffective. The present study used the daily closing prices of the banking companies listed as of December 31 2019, in BSE (Bombay Stock Exchange) SENSEX. The data has been collected for the period January 1, 2015 to December 31, 2019. The run test is employed to check the randomness of the price series, and ADF unit root test is also used in this study. The result shows that the Indian stock market does not favour the weak form of market efficiency.

Key Words: *Weak Form Efficiency, Stock Market, Run Test, ADF Unit Root Test.*

INTRODUCTION

The capital market is a place for buying and selling of financial securities. It is the market where transactions are made in long-term securities such as stocks and bonds. The participants of this market include various financial institutions, mutual funds, agents, brokers, dealers, and individual investors. The capital market consists of two major parts: 1) Primary Market and 2) Secondary market. The primary market is one in which long-term money is raised by corporate directly from the public. The secondary market refers to the market where long-term financial securities which are already issued in the primary market are traded. It shows market direction and indicates day-to-day fluctuations in stock prices. The market index reflects expectations about the behaviour of the economy. It is a precursor of economic cycles. The function of a stock index is to provide investors with information regarding the average share price in the market. The stock index is a barometer of a nation's economic health as market prices reflect expectations about financial performance. To reduce the imbalances, the government of India introduced economic policy in 1991 to implement structural reforms. To structure the security market, a regulatory authority named SEBI (Securities and Exchange Board of India) was established, and the first electronic exchange National Stock Exchange was also set up. Market efficiency is a crucial idea of modern finance. Market efficiency means that market prices reflect all available, relevant information. If markets are efficient, then all information is already incorporated into prices, so there is no way to "beat" the market because there are no undervalued or overvalued securities available. In 1970, Fama classified the Efficient Market Hypothesis into three

categories according to the level of information reflected in market prices. Market efficiency is weak form, semi-strong form, and strong form efficiency. Information on past price and volume data is the type of information used in the Weak Form of Market Efficiency. Nobody should be able to outperform the market by using knowledge that everyone else is aware of, as stock prices reflect all readily available trade information. Technical trading rules cannot be employed to generate profits on a consistent basis when the markets are efficient in weak form. Publicly available information is incorporated into present stock prices under Semi Strong Form. Past price data, firm annual reports, company announcements, and several other macroeconomic elements (such as inflation, unemployment, etc.) are all examples of publicly available information. Stock prices reflect various forms of information, including insider company information and public information. Therefore, it combines public and private information that is reflected in current prices. This type means that even company management cannot benefit from insider information; they cannot utilize internal affairs, significant decisions, or market-beating plans. This paper made an attempt to test the weak form efficiency of the Indian stock market in context of banking sector. The study period spans from January 2015 to December 2019. The sample of the study includes AXIS Bank, HDFC Bank, ICICI Bank, INDUSIND Bank, KOTAK Bank and SBI. The research paper is divided into four sections. The first section represents the introduction of the capital market, the efficient market hypothesis and types of market efficiency. The second section describes the review of literature related to weak form efficiency. In the third section, the need, importance, objective and methodology of the study are presented. The last section presents the analysis and results of the paper.

REVIEW OF LITERATURE

An attempt has been made in this section to review the earlier research work undertaken in capital market efficiency. It helps to understand the research problem and methodology adopted by researchers and the findings of earlier studies. Sharma & Kennedy (1977) tested weak form efficient market hypothesis on Bombay, London, and New York Stock Exchanges from 1963 to 1973 using run analysis and spectral densities. It was found that randomness in the series without systematic cyclical components. Poshakwale (1996) examined weak-form efficiency and day-of-the-week effect on Bombay Stock Exchange from 1987 to 1994. Found evidence of a day-of-the-week effect, suggesting the market needed to be stronger form efficient. Srinivasan (2010) analysed weak form efficiency for major Indian stock markets from 1997 to 2010 using unit root tests. Concluded that Indian stock market was not weak form efficient. Patel, Radadia & Dhawan (2012) evaluated weak form efficiency of selected Asian stock markets from 2000 to 2011. BSE Sensex, HANG SENG, and SSE Composite markets showed positive returns. BSE Sensex and SSE Composite were weak form efficient. Patel, Rajpal & Modi (2018) examined weak form efficiency from 2015 to 2018 using Run

test on BSE SENSEX data. Found market trends could be predicted from past data, violating the random walk hypothesis.

RESEARCH METHODOLOGY

Investors should be aware of all the market information accessible for a particular stock before investing in the stock market. They should not make investments solely based on the results of their examination of the fundamental and technical aspects of the stock and the industry. They need to be aware of how the stock's price behaviour is affected by the information that is currently accessible, specifically if the stock is moving independently of or reflecting all the information that is currently available in the market. In an efficient market hypothesis, share prices trade at their fair value and reflect all the information that is accessible on the market. When a market is efficient, share prices move independently and the prices are random. The main objective of the study is to examine the weak form efficiency of Indian stock market in context of banking sector. Based on a review of the literature and objectives of the study, the following hypotheses will be developed:

- $H_{0:}$ Daily distribution of Indian stock market returns is normally distributed.
- $H_{0:}$ Indian stock market return is not in stationary form.
- H_0: Indian stock market follows a random sequence.

The sample of the study includes AXIS Bank, HDFC Bank, ICICI Bank, INDUSIND Bank, KOTAK Bank and SBI. The data used in the study was collected from secondary sources, basically from the Bombay Stock Exchange website. The BSE SENSEX is also known as the S&P Bombay Stock Exchange Sensitive Index or simply the SENSEX. It is a free-float market-weighted stock market index of 30 well-established and financially sound companies listed on the Bombay Stock Exchange. BSE SENSEX has been taken for the study as it reflects market movement, and no other index is equivalent to the BSE SENSEX in exhibiting the market sentiments and describing the mood of the Indian Securities Market. The present study used the daily closing prices of the banking companies listed as of December 31 2019, in BSE (Bombay Stock Exchange) SENSEX.

The daily closing prices are collected from the Bombay Stock Exchange for a period of five years. The period of the study covers from January 1 2015, to December 31 2019. Market log returns are calculated as follows.

$$R_t = \ln (P_t/P_{t-1})$$

P_t = market price at time "t"

P_{t-1}= market price at time "t-1"

Jarque-Bera: Descriptive Statistics for the stock returns include the Arithmetic Mean, Median, Standard Deviation, Jarque-Bera, Variance, Kurtosis, Skewness, and Range. The Jarque-Bera statistics are used to test the normality of the data series.

Augmented Dickey-Fuller (ADF): The augmented Dickey-Fuller (ADF) test is applied to test the presence of unit root in the time series of stock price changes in the indices. It is mainly used to test the stationary of the time series. It is inferred from the OLS as follows:

$\Delta R_t = b_0 + b_1 + \pi_0 R_{t-1} + \sum^{j}_{t=1} \psi i \, \Delta R_{it-1} + \epsilon_t$

R_t= the price at time t,

ΔR_t = change in price

Run test: The run test is used to analyze the serial independence in the returns stream. It searches out whether succeeding price variations are autonomous of each other as it happens under the random walk null hypothesis. If the number of runs is being observed and the forthcoming price variations (or returns change) are with a similar sign. In that case, the null hypothesis can be tested in a series of consecutive price variations (or returns change). It is notable that it is a nonparametric test and does not entail the normally distributed returns. The runs test stands upon the argument that if price changes or returns are random then actual number of runs (Runs) must be near to the expected number of runs.

ANALYSIS AND RESULTS OF DATA

NORMALITY TEST: One of the assumptions of the random walk model is that the distribution of the return series should be normal. The null hypothesis for the normality test is that the daily distribution of Indian stock market returns is normally distributed. To test the distribution of the series, the descriptive statistics of the log of the market returns are calculated and presented in the table below. The calculated values of Jarque-Bera and p values are used to test the null hypothesis for normal distribution.

It is found from the table no.1 that only HDFC-bank (0.000603) showed positive mean returns, and AXIS bank (-0.000307), ICICI bank (-0.000526), INDUSIND bank (-0.000196), KOTAK Bank (-0.001579) And SBI (-3.10E-05) Have Showed Negative Mean Returns. The values for skewness 0 and kurtosis value 3 represent that the observed distribution is perfectly normally distributed. It is found from the table that the values of skewness and kurtosis are not equal to 0 and 3, respectively. It is found from the table that skewness values are negative for all the selected banks, which indicates that all series are negatively skewed. It is found from the table that all p values are less than 0.05 at 5% level of significance, it suggests that the null hypothesis cannot be accepted. So, it is found that the daily distribution of stock market returns is not normally distributed.

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Table No.1: Descriptive Statistics of 6 Banks Involved in the Formation of BSE SENSEX

Table No.1 Descriptive Statistics Result.						
	AXIS Bank	**HDFC Bank**	**ICICI Bank**	**INDUSIND Bank**	**KOTAK Bank**	**SBI**
Mean	-0.000307	0.000603	-0.000526	-0.000196	-0.001579	-3.10E-05
Median	0.016437	0.010849	0.020921	0.031105	0.016933	0.017028
Maximum	3.924554	2.016864	3.239250	4.634172	5.497531	1.007607
Minimum	-3.911384	-2.125832	-3.544281	-3.917743	-6.352453	-1.254450
Std. Dev.	0.783592	0.399384	0.774130	0.926858	1.205669	0.253265
Skewness	-0.176295	-0.225722	-0.235445	-0.040286	-0.099306	-0.194336
Kurtosis	6.147296	7.024991	4.557606	5.959420	5.439405	5.323521
Jarque-Bera	515.6986	843.4570	136.1448	450.6494	307.9933	285.3529
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	-0.378628	0.744174	-0.649202	-0.242421	-1.949075	-0.038289
Sum Sq. Dev.	757.0820	196.6724	738.9088	1059.229	1792.336	79.08876
Observations	1234	1234	1234	1234	1234	1234

$H_{0:}$ Daily distribution of Indian stock market returns is normally distributed.

STATIONARITY TEST

The data collected from the websites of the BSE Ltd. Before applying the run test and other tests to examine efficiency of the stock market indices, the data series must be tested for the unit root existence. The null hypothesis for the ADF (Augmented Dicky Fuller) is that the Indian stock market return is not in stationary form. If the unit root exists, then it indicates that the data is not in stationary form. To test the existence of the unit root, the ADF (Augmented Dicky Fuller) test is applied. The results of the test are presented in Table No. 2.

The results of the ADF test, as shown in table no.2, reflect that the original values of the Bankex data are stationary at level. It is found from the table that the p-value is less than 0.05 at a 5% level of significance, suggesting that the null hypothesis cannot be accepted. So, we reject the null hypothesis. The table shows that the Indian stock market return is stationary.

Table No.2: ADF Test on Six Banks Involved in the Formation of BSE SENSEX.

Unit Root: ADF Test Result.		
	INTERCEPT	
	t-Statistic	**Prob.***
AXIS bank	-19.25163	0.0000
HDFC bank	-22.54966	0.0000
ICICI bank	-19.82022	0.0000
INDUSIND bank	-19.25163	0.0000
KOTAK bank	-17.29797	0.0000
SBIN	-18.91638	0.0000

$H_{0:}$ Indian stock market return is not in stationary form.

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RUN TEST

The run test is considered more appropriate than the parametric autocorrelation test since all observed series do not follow the normal distribution. The null hypothesis for the run test is that the Indian stock market follows a random sequence. If the Z value is greater than or equal to ± 1.96, reject the null hypothesis at 5% level of significance. The calculated value of Z is compared with the critical value of ± 1.96 at 5% level of significance. If the value of test statistic Z is more than ± 1.96 at 5% level of significance, then the null hypothesis is rejected. In Table no.3, the weak form efficiency of the SBIN, HDFC BANK, KOTAK BANK, ICICI BANK, AXIS BANK and INDUSIND BANK are checked through the nonparametric runs test. It is found from the table that the p-value is less than 0.05 at 5% level of significance, suggesting that the null hypothesis cannot be accepted. It is found that the value of test statistic Z is more than ±1.96 at 5% level of significance, so the null hypothesis is rejected in all these cases. It is concluded from the table that the price movements in share prices of SBIN, HDFC BANK, KOTAKBANK, ICICIBANK, INDUSINDBANK, AXIS BANK and INDUSINDBANK are not random in behaviour.

Table No.3: Run Test on Six Banks Involved in the Formation of BSE SENSEX.

	AXIS bank	HDFC bank	ICICI bank	INDUSIND bank	KOTAK bank	SBI
Test Value	.0164	.0108	.0209	.0311	.0169	.0170
Cases < Test Value	617	617	617	617	617	617
Cases >= Test Value	617	617	617	617	617	617
Total Cases	1234	1234	1234	1234	1234	1234
Number of Runs	788	789	790	755	811	778
Z	9.683	9.740	9.797	7.803	10.993	9.113
Asymp. Sig. (2-tailed)	.000	.000	.000	.000	.000	.000

H_0: Indian stock market follows a random sequence.

FINDINGS AND CONCLUSION

The normality test Jarque-Bera has been conducted to examine whether Indian stock market returns are normally distributed. The results of the analysis revealed that only HDFC-BANK (0.000603) showed positive mean returns and AXISBANK (-0.000307), ICICIBANK (-0.000526), INDUSINDBANK (-0.000196), KOTAKBANK (-0.001579) and SBIN (-3.10E-05) have shown negative mean returns and the values of skewness and kurtosis are not equal to 0 and 3 respectively. So, this leads to the conclusion that the daily distribution of stock market returns is not normally distributed. The examination of stationarity reveals that the original values of the Bankex data are stationary at level. It is found from the table that the p-value is less than 0.05 at 5% level of significance, suggesting that the null hypothesis cannot be accepted. Thus, it is concluded that the Indian stock market return is stationary. The results of the run test for finding out the randomness of Indian stock market return reveal that the value of test statistic Z is more than ±1.96 at a 5% level of significance, and the p-value is

less than 0.05 at a 5% level of significance, suggesting that the null hypothesis cannot be accepted. So, this leads to the conclusion that the price movements in share prices of SBIN, HDFC BANK, KOTAKBANK, ICICIBANK, INDUSINDBANK, AXIS BANK and INDUSINDBANK are not random in behaviour. So, it can also be concluded that investors can use historical data to predict future prices. The implication of rejecting weak form efficiency for investors is that investors can earn abnormal returns by holding a well-diversified portfolio while investing in the Indian stock market.

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