

Weak Form Market Efficiency of Indian Stock Market: Evidence from Indian Metal & Mining Sector

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Abstract

Indian Capital Market is one of the fastest growing markets among developing countries in terms of participation, technology, investment strategies and trade volume. It witnessed increased individual investors in the last few years. Individual small investors invest their excess money (saving) into listed companies' shares to earn profit and at the same time, it helps listed corporates to raise funds for longer period by selling their shares. For selecting right stock, investors use various techniques to reduce the risk and maximize profit. The market is called efficient when all the currently available private, public and historical information is reflected fully by the share price in the market and market is weak form efficient, when current market price of share is reflected by the historical price, this mean investors can't earn abnormal profit with the use of historical data. Present study test weak form of market efficiency of the selected metal & mining companies of India on daily, weekly and monthly basis from 1st April 2017 to 31st March 2019 using Run test and Z-value. The overall results reveal that the Indian Metal & Mining companies' daily, weekly and monthly returns are moving randomly, indicating that the past share prices of the companies are not affecting the future one and supports the Weak Form of Market Efficiency or Random Walk Theory.

Keywords: Efficient Market Hypothesis, Weak Form Market Efficiency, Indian Capital Market, Run Test, Random Walk Theory.

Introduction

A share market is a marketplace where ownership of securities/shares/stocks is transferred between related parties (buyer and seller, interested parties) at a particular price. A stock consists of different type of securities listed on a stock exchange as well as those traded privately (freely, openly). A trade in the stock market simply means the transfer of shares for money between interested parties (buyer and seller). Different types of investors deal in the stock market according to their need; small investors deal in small amount and less number of shares but large or institutional investors deal in large amount and more number of shares.

Indian Capital Market is one of the fastest growing markets among developing countries in terms of participation, technology, investment strategies and trade volume. It has been observed that in last few years individual investors have increased in the market. The risk taking capacity has also been increased among individual investors. Stock

market is a way by which one individual small investor can invest his excess money (saving) into listed companies' shares. And at the same time, it helps listed corporates to raise funds for longer period by selling their shares. The selection of the best stock is very important for the investors for trading and investment strategies. For selecting right stock, investors consider or use various approaches/techniques, so that they can reduce risk and maximize profit.

When all the currently available private, public and historical information is reflected fully by the share price in the market, is known as Efficient Market. In other words, actual worth of the shares is fully reflected by their prices in an efficient market. In efficient market, stock prices are at their intrinsic value, which means current market price of stock is exactly equals to its intrinsic value and investors can't earn super profit with the help of currently available information.

"The efficient-market hypothesis emerged as a prominent theory in the mid-1960's. Paul Samuelson had begun to circulate Bachelier's work among economists. In 1964 Bachelier's dissertation along with the empirical studies mentioned above were published in an anthology edited by Paul Cootner. In 1965 Eugene Fama published his dissertation arguing for the random walk hypothesis, and Samuelson published a proof for a version of the efficient-market hypothesis. In 1970 Fama published a review of both the theory and the evidence for the hypothesis. The paper extended and refined the theory, included the definitions for three forms of financial market efficiency: weak, semi-strong, and strong." ("Market Efficiency | Boundless Finance," 2012)

When current market price is reflected by the historical price, this means investor can't earn abnormal profit with the use of historical data, is known weak form of efficient market. In semi-strong efficient market, current share price reflect not only by historical price but also publicly available information related to the companies, so that one can't earn super profit from this. When current stock prices reflect all possible information which does not necessarily have to public. This form of market efficiency is known as strong form. (Malkiel, 2011)

Metal Sector in India

India is one of the fastest growing developing country in the world. The Indian industry has been one of the major contributor to India's developing growth rate. One of the important contributing industry is Metal Industry, which is the fastest growing sector in India and it has been a major contributor to India's manufacturing output. India stands second in the world in terms of steel production at 106.5

MT in the year 2018. Steel industry and mining and metallurgy sectors have witness number of developments in the recent years in terms of technology development, investments etc. Investment has been increased in last few years, according to the data Foreign Direct Investments (FDI) has gone up to US\$ 11.30 billion in the year 2000-2019.

Literature Review

Kelikumeet al. (2020) investigated the weak axiom of the Efficient Market Hypothesis (EMH) of fifteen African leading stock exchanges using wavelet unit root analysis-tool and concluded that past historical stock prices are relevant to predict the current earnings at stock markets in Africa, with a negation of efficient market hypothesis.

Agwuet al. (2020) in their study used Unit Root test, GARCH Model and Autocorrelation cum Partial Autocorrelation Method for settling the controversy on Efficient Market Hypothesis (EMH) and Nigerian Stock Market. The results reveal that series of stock price don't follow random walk process, indicating that Nigerian stock market is not efficient in weak form.

Dias et al. (2020) analyzed the financial integration and tested weak form of efficient market hypothesis in sixteen international financial markets of Europe, Asia, Latin America and US. The results of the study reveal that global financial crisis has intensified the integration level of international financial markets and markets are not efficient in weak form.

Kumar and Ruhi (2019) made an attempt to test the SENSEX listed companies for weak form of Efficient Market Hypothesis using both parametric and non-parametric tools and concluded that the price movement of shares of the companies on the SENSEX are random and nobody can be successful in predicting the future prices on the basis of historical data only.

Sarkar (2019) made an attempt to test the weak form of market efficiency of Bombay Stock Exchange and National Stock Exchange and the results of the study support the previous conclusion that the Indian stock market is not efficient in the weak form and security prices do not reflect all past information and it is possible to earn super-normal gain by utilizing past information.

Agustin (2019) examined the weak form of Efficient Market Hypothesis in Indonesia Sharia Stock Index using daily closing stock price index and concluded that efficient market hypothesis is not applicable for Indonesia Sharia Stock Index.

Patel et al. (2018) studied the weak form of market

efficiency on Indian stock market wherein future market trend can be predicted using past data, the result shows that market can be outperform and thus violates random walk theory.

Angelovska (2018) investigated the efficiency of emerging Macedonian Stock Exchange (MBI10) in weak form using Random Walk Model and GARCH (1, 1) model and concluded that Macedonian Stock Market is not weak form efficient.

Kumar and Sagar (2016) investigated the level of market efficiency in selected automobile stocks in India using Runs test. The results of the study shows that Daily return of selected stocks do not follow random walk means market is inefficient for that period, but weekly and monthly return of selected stocks follow random walk during the study period which means market is efficient.

Kalsie and Kalra (2015) studied the efficiency of Indian stock markets in weak form during the period 2001-2011 and results state that Indian markets are not weak form efficient.

Iqbal and Mallikarjunappa (2008, 2010, and 2011) conducted studies on Indian Stock Market and findings provided that Indian stock market is not efficient in weak and semi-strong form.

Statement of the Problem

Many researches have been conducted by the researches nationally and globally on market efficiency; some work on strong form, some on semi-strong form and some on weak form of market efficiency using different statistical models. But the results of those studies are mixed. In this study, the focus is on checking the weak form of market efficiency of Indian stock market. Many studies have been conducted previously in Indian context, but the results are diverse. Sharma et al. (2009), Kumar and Sagar (2016) and Kumar and Ruhi (2019) found the Indian stock market efficient in weak form while Iqbal and Mallikarjunappa (2008, 2010, and 2011), Pradhan et al. (2009), Kalsie and Kalra (2015), Patel et al. (2018) and Sarkar (2019) stated in their studies that Indian stock market was not efficient in weak form. The present study seeks to examine the market efficiency of NSE-NIFTY METAL Index listed companies

in weak form.

Objectives of the Study

To test weak form of market efficiency of the selected metal & mining companies.

Research Methodology

Present study seeks to test weak form of market efficiency of NSE listed metal & mining companies, for which top six NSE-NIFTY METAL Index listed companies have been taken, namely, Coal India Limited, TATA Steel Limited, Vedanta Limited, Hindalco Industries Limited, JSW Steel Limited and NMDC Limited, which have been selected on the basis of market capitalization as on 1st April, 2017. JSW Steel Limited has been dropped-out from the data because of lack of some accessible information.

Closing share prices of selected companies have been collected from the database of NSE on daily, weekly and monthly basis from 1st April 2017 to 31st March 2019. The sample of this study consisted of 495 observations of daily share price, 104 observations of weekly share price on the basis of last day of the week and 24 observations of monthly share price on the basis of last day of the month.

Market efficiency in weak form is tested by using Run test and Z-value. Run test is a non-parametric test; it has been used to judge the randomness in the behaviour of the Indian stock market.

Hypothesis

H0: Price change of selected metal & mining companies' shares is random.

Data Analysis& Interpretation

In Run test, a series of price change over a certain period of time are considered and each price change is either designated as a plus (+) if it is an increase in price, or a minus(−) if it is a decrease in price. A run exits when two consecutive changes are same (*i.e.*, ++ or −−). When price changes in a different direction, such as + − then run ends and a new run may begin. To test the independence, the number of runs for a given series of price changes is compared with the number in a table of expected values for the number of runs that should occur in a random series. To test the independence of stock prices, Total number of Runs (r), Number of Positive Price Changes (n_1) and Number of Negative Price Changes (n_2) are required.

The mean and the standard deviation are calculated by using the formula given below:

$$\text{Mean, } \mu = \frac{2n_1n_2}{n_1+n_2} + 1$$

$$\text{Standard Deviation, } \sigma = \frac{(2n_1n_2)(2n_1n_2 - n_1 - n_2)}{(n_1+n_2)^2(n_1+n_2-1)}$$

Lower limit and Upper limit are calculated as:

$$\text{Lower limit: } \{\mu - 1.96*(\sigma)\}$$

$$\text{Upper limit: } \{\mu + 1.96*(\sigma)\}$$

Table 1: Result of Run Test

Company	Time Period	N	N ₁	N ₂	Run	μ	σ	Lower Limit	Upper Limit	Hypothesis Testing at 5% level of significance
Coal India Ltd.	Daily Returns	486	242	244	242	244	11.01	222.41	265.58	H ₀ is accepted
	Weekly Returns	102	42	60	57	50.41	4.67	41.25	59.56	H ₀ is accepted
	Monthly Returns	23	12	11	14	12.5	2.33	7.93	14.066	H ₀ is accepted

Tata Steel Ltd.	Daily Returns	493	250	243	268	246.2	11.08	224.71	268.18	H ₀ is accepted
	Weekly Returns	103	53	50	50	51.45	5.04	41.57	61.32	H ₀ is accepted
	Monthly Returns	23	11	12	11	11.47	2.33	6.9	16.03	H ₀ is accepted
Vedanta Ltd.	Daily Returns	493	233	260	239	246.7	11.05	224.34	267.65	H ₀ is accepted
	Weekly Returns	103	50	53	48	51.45	5.04	41.57	61.32	H ₀ is accepted
	Monthly Returns	23	12	11	12	11.47	2.33	6.9	16.03	H ₀ is accepted
Hindalco Industries Ltd.	Daily Returns	494	240	254	245	247.8	11.09	226.06	269.53	H ₀ is accepted
	Weekly Returns	103	55	48	58	52	5.02	42.16	61.83	H ₀ is accepted
	Monthly Returns	23	10	13	13	12.3	2.3	7.79	16.808	H ₀ is accepted
NMDC Ltd.	Daily Returns	493	255	238	224	247.2	11.77	223.48	268.91	H ₀ is accepted
	Weekly Returns	103	45	58	47	57.73	5.88	46.205	69.25	H ₀ is accepted
	Monthly Returns	23	11	12	12	12.47	2.33	7.9	17.03	H ₀ is accepted

The result of Run test for daily, weekly and monthly returns has been presented in Table 1 which shows that Run of all selected metal & mining companies lies between lower and upper limit, which means share price of selected metal & mining companies do not follow the past trend. On the basis of only technical and statistical analysis of past data, estimation of share price could not be possible because

other information also affect the share price of the company. The result of runs test support the randomness of daily, weekly and monthly returns and proved that the metal & mining companies' has Weak Form of Market Efficiency or can say that Random Walk Theory is applicable.

Table 2: Z-Values Calculation through Run Test $(Z = \frac{R - \mu}{\sigma})$

Company	Time Period	Run	μ	σ	Z-Values	Hypothesis Testing at 5% level of significance
Coal India Ltd.	Daily Returns	242	244	11.01	-0.18	H ₀ is accepted
	Weekly Returns	57	50.41	4.67	1.41	H ₀ is accepted
	Monthly Returns	14	12.5	2.33	0.64	H ₀ is accepted
Tata Steel Ltd.	Daily Returns	268	246.2	11.08	1.94	H ₀ is accepted
	Weekly returns	50	51.45	5.04	-0.28	H ₀ is accepted
	Monthly Returns	11	11.47	2.33	-0.20	H ₀ is accepted
Vedanta Ltd.	Daily Returns	239	246.7	11.05	-0.69	H ₀ is accepted
	Weekly Returns	48	51.45	5.04	-0.68	H ₀ is accepted
	Monthly Returns	12	11.47	2.33	0.22	H ₀ is accepted
Hindalco Industries Ltd.	Daily Returns	245	247.8	11.09	-0.25	H ₀ is accepted
	Weekly Returns	58	52	5.02	1.19	H ₀ is accepted
	Monthly Returns	13	12.3	2.3	0.30	H ₀ is accepted

NMDC Ltd.	Daily Returns	224	247.2	11.77	-1.97	H ₀ is accepted
	Weekly Returns	47	57.73	5.88	-1.82	H ₀ is accepted
	Monthly Returns	12	12.47	2.33	-0.20	H ₀ is accepted

After conducting the Run Test, Z-Values have also been calculated (in Table 2) to know whether the daily, weekly and monthly returns are mutually independent or not. The Z-values have been compared with the critical value at 5% level of significance. The calculated Z-values of all the metal & mining companies for daily, weekly and monthly returns have been found less than critical value, i.e., ± 1.96 at 5% level of significance. So the Null Hypothesis (H₀: Price change of selected metal & mining companies' shares is random) can't be rejected. It means daily, weekly and monthly returns of metal & mining companies are mutually independent or random and supports the weak form of market efficiency.

The results of both Run test (in Table 1) and Z-value calculated through Run test (in Table 2) are similar and proved that the weak form of market efficiency is available in the Indian stock market.

Conclusion

This research has been done to test the weak form of market efficiency in Indian Metal & Mining Sector companies. For this purpose, researcher has used the Run Test and Z-values calculated through Run test. The results of both the tests reveal that the Indian Metal & Mining companies' daily, weekly and monthly returns are moving randomly, indicating that the past share prices of the companies are not affecting the future one. Additionally, supports the Weak Form of Market Efficiency or Random Walk Theory, so the investors cannot earn super profit from the available historical share price.

From this study, we can conclude that while doing investment in the Indian Metal & Mining Sector companies' investors should not only consider the historic price but should also consider all the relevant information relating to the company.

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