Statistical Analysis of Stock Prices of Selected Companies in Construction Industry

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Abstract
Construction industry is highly capital-intensive Industry. After economic liberalization most of the Indian company raise fund for their new projects through capital market by issuing shares. However, capital markets are highly volatile and investor needs to have close eye on the market for getting maximum return. In the present study, the stock prices of three construction companies namely DLF Ltd (DLF), Gammon India Ltd. (Gammon) and Hindustan Construction Company (HCC) were studied for their performances in the capital market of Bombay Stock Exchange (BSE). The stock price data of these companies are obtained at monthly time step from BSE website for the duration January 2008 to August 2018. The data was analyzed using various statistical methods such as descriptive statistics, simple moving average (SMA), money flow index (MFI), relative strength index (RSI) and beta Index.

The results showed that stock of DLF is best performer followed by HCC and Gammon. The analysis also provided several clues to investors for making judicious decision on holding or buying or selling the stock during a particular signal revealed from statistical indices used in the study.

Keywords: Construction Company, capital market, stock prices, statistical analysis.

Introduction

Construction Industry is highly capital-intensive Industry. The successful and timely completion of any infrastructure project is thus largely depending on available capital along with the companies.[1] The construction companies generally collect the required capital for the project through different methods. One of those methods is through stock marketing by releasing their shares. Through the selling of shares, the companies not only collect money but also establish a brand in the market and build confidence among the prospective buyers for their new projects.[2]

In general, the stock price of a company reflects its financial performance in terms of capital value. It is also established fact that both economic and noneconomic factors affect stock return behavior. A better understanding of the stock market trend will facilitate allocation of financial sources to the most profitable investment opportunity. The behavior of stock returns will enable the investors to make appropriate investment decisions.[3] The fluctuations of stock returns are due to several economic and non-economic factors. An investor can only succeed in his investment when they are able to select the right share in right sector. The investors must watch the situations keenly in the market like political, economy, company progress, industrial profile, returns and the risk involved in a share before investing in the share.[4]

Thus, it is necessary to study on fluctuations in stock market in understanding its behavior. Various statistical techniques can serve as valuable tools to explore the performance of stocks.[5] In this study, stock prices of three construction companies namely DLF Ltd (DLF), Gammon India Ltd. (Gammon) and Hindustan Construction Company (HCC) were studied. The objective of the present study is to make analysis on selected stocks of construction industry sector using historical data collected from secondary sources. The study is based on established statistical methods such as Beta index, Relative Strength Index and Simple Moving average. The analysis will help understanding if the stock is technically strong. The results will also help understanding current trend and risks involved in studied stocks which in turn help the investors in taking proper decision on selling and buying of the stocks.

The main objective of the present study is to make a comparative appraisal of stock prices of the three selected construction sector industries with following specific objectives:

- To study the characteristics of stock prices of selected companies by using descriptive statistics.
- To analyze monthly fluctuations in the stock prices using simple moving average method.
- To study the price movements in the selected stocks using money flow index.
- To study the current trend and strength of the three selected stocks using relative strength index.
- To examine the risk and volatility associated with stock prices using beta index.

Material and Methods

Data and Sources of Data: This study is aimed at analyzing the equity share price movement in three Bombay Stock Exchange (BSE) listed construction companies namely DLF Limited, Hindustan construction Company (HCC) and Gammon India Ltd using simple statistical analysis. The three companies were selected based upon the Market capitalization of the companies, minimum age of thirty years

of the company and its reputation in handling in large infrastructure projects.

The pertained data on closing, opening, high and low prices at monthly time step were collected from the secondary sources viz. BSE official website.[6] The monthly share prices of above-mentioned companies were taken for a period between Jan 2008 to Aug 2018.

Statistical Tools Used: The various statistical tools were used in this study ranging from simple descriptive statistics to some advanced statistical indices to interpret the financial soundness of the various construction companies.

Descriptive statistics: It includes mean, median, standard deviation; coefficient of variance gives a required insight and help understanding the basic characteristics of the stocks.[5]

Simple Moving Average (SMA): It is simple technique which indicates the average value of a time series of high frequency such as closing, opening, high and low security prices of a company. The high volatile nature of stock market makes these variables of high frequency. It is one of key trend lines that are plotted on a chart reflecting the variable average over period of time in a time series. It smoothens the line and converts the time series into a low frequency one. They smoothed data series make it easier to interpret trends and form the building blocks for many other technical indicators and overlays.[6,7] The moving average price moves up or down with the change in security prices. And when it moves above or below the daily chart, a signal for buying or selling of security is generated.

Money Flow Index (MFI): It is more robust indicator to measure of the strength of money flowing in and out of a security. It is computed as below:

Money Flow Index = $100 - (100) - (100/\ 1 + \text{Money Ratio})$

where Money Ratio = (Positive Money Flow/Negative Money Flow), Money Flow = (Typical price) x (volume) and Typical Price = [(Month High +Month Low + Month close)/3].

It is used to identify the strength or weakness of a trend. The MFI is measured on a $0 - 100$ scale. The MFI is based on the money ratio which compares the ratio of "positive" money flow and "negative" money flow. When typical price for a given month is greater than the same for the previous month, then it is considered to be positive money.[8]

Relative Strength Index: The Relative strength Index (RSI) is an extremely useful and popular momentum oscillator. The RSI compares the magnitude of a stock's recent gains to the magnitude of its recent losses and returns that information into a number that ranges from 0 to 100. It takes a single parameter, the number of time periods to use in the calculation.

Average gain = Total of gains during the past 14 periods/114
Average Loss = Total of Losses during the past 14 periods /114
RS = Average Gain/Average Loss
RSI = $100- (100/(1 + RS))$

The values of RSI are marked high and low when its values are over 70 (over brought) and below 30 (oversold) respectively. Similarly, RSI designated as extreme high and low when its values are above 80 and below 20. RSI provides signals that tell investor to buy when security is oversold and to sell when it is over brought.[9,10]

Beta Index: Beta index of a firm refers to the sensitivity of its share price with respect to a bench mark index (e.g. BSE or NSE sensex). Although beta can be seen as a measure of risk, but its value highly depends on duration of the period taken into account in its computation. Moreover, there are various methods of beta computation, which may portray a different picture. In this study, it is calculated using following formula:

$$\beta = covariance(P_i, P_{bm})/variance(P_{bm})$$

where P_i = price of security 'i' and P_{bm} = price of benchmark index (i.e. BSE sensex).

Covariance measures how two stocks move together. A positive covariance means the stocks tend to move together when their prices go up or down. A negative covariance means the stocks move opposite of each other.

Variance, on the other hand, refers to how far a stock moves relative to its mean. For example, variance is used in measuring the volatility of an individual stock's price over time. Covariance is used to measure the correlation in price moves of two different stocks.[11] The beta index value of benchmark index is generally considered as one. And any value of beta greater than one indicates the security price of a company is more volatile than the market itself. Thus, a company with a beta of greater than one will tend to amplify market movements in either positive or negative direction. It means a company with high beta may offer higher return during certain period of time but that comes along with higher risk caused by volatility.[12]

Results and Discussion

The comparative assessment of the stock price dynamics of the three construction companies was analyzed statistically for the period of 10.66 yrs (Jan 2008 – Aug 2018) and presented.

Analysis basic Characteristics: The basic statistics of all the closing prices of all the three stocks are presented in the figures 1-3. The basic statistical features of security price of DLF are presented in the figure 1. The spread of maximum and minimum closing prices of the stocks during the study periods indicates that there is decline in the values of all the

three stocks. However, it is maximum for DLF (723.5) followed by Gammon (558.04) and HCC (174.23). In terms of percentage decline, Gammon India suffered highest erosion in stock price amounting 99.7% of its maximum value followed by HCC which suffered a decline of 95.64%. DLF suffered a least loss amounting to 88.09% among the investigated companies during the study period. It indicates that HCC has lost comparatively less capital per share while in true sense DLF had suffered least capital in absolute term during the period of study.

However, this decline was not confined to construction sector companies alone, but it was due to overall market trend (BSE sensex has fallen proportionately) during the study period. Figures 1-3 indicate that the average security prices of DLF was more (233.84) than Gammon India (82.42) and HCC (46.27) during the study period. The HCC had lowest mean during the same period. But at the same time, coefficient of variation (CV), derivatives of mean and standard deviation of HCC had medium value (86.63) and highest for Gammon. These observations indicate that fluctuations are more in case of Gammon and DLF as compared to HCC. The above inference is further substantiated by the average spread of opening and closing prices of this equity for the study period.

The median along with maximum and minimum values of stocks also helps interpreting the fact that the price of Gammon India was falling very steadily (Max price is 18 times that of median price) and rapidly as compared to other stocks. The stock price of DLF was relatively stable (Max closing price is gust 4 times of median price) during the period. But, if the mean and standard deviation/CV are sufficient to describe the dispersion of stock price, checks for normality using histogram distributions, normal P-plot and box plot were used. The box plot also indicates a skewed distribution for all the three stocks, as lower end the whiskers show negative value of closing prices of stocks.

The histogram plots of all the three stocks show that none of them has symmetrical distributions along the central values. Moreover, the normal distribution curve (red line) also indicates a deviation from normal. The normal P-plot for all three stocks also showed deviation of the closing price from normal distribution. However, deviation is observed to be least for HCC. The above observation pointed out that the modeling stock prices cannot be possible by simply assuming that a large sample would follow normal distribution. It needs either detrending if any trend is there, or some other statistical distribution has to be sought for.[13]

Price Fluctuation Analysis using SMA: The fluctuation in stock Price is a gauge of the affinity of security to rise or fall suddenly within a short period of time. It is generally assumed that a higher fluctuation tends towards greater price swings and wide range of fluctuation in invested in money.[14] To explore the fluctuations in stock prices of studied companies, simple moving average was used on range of opening -closing price (figure 4), closing price (figures 5-8). The moving average was carried out with the help of window size of five.
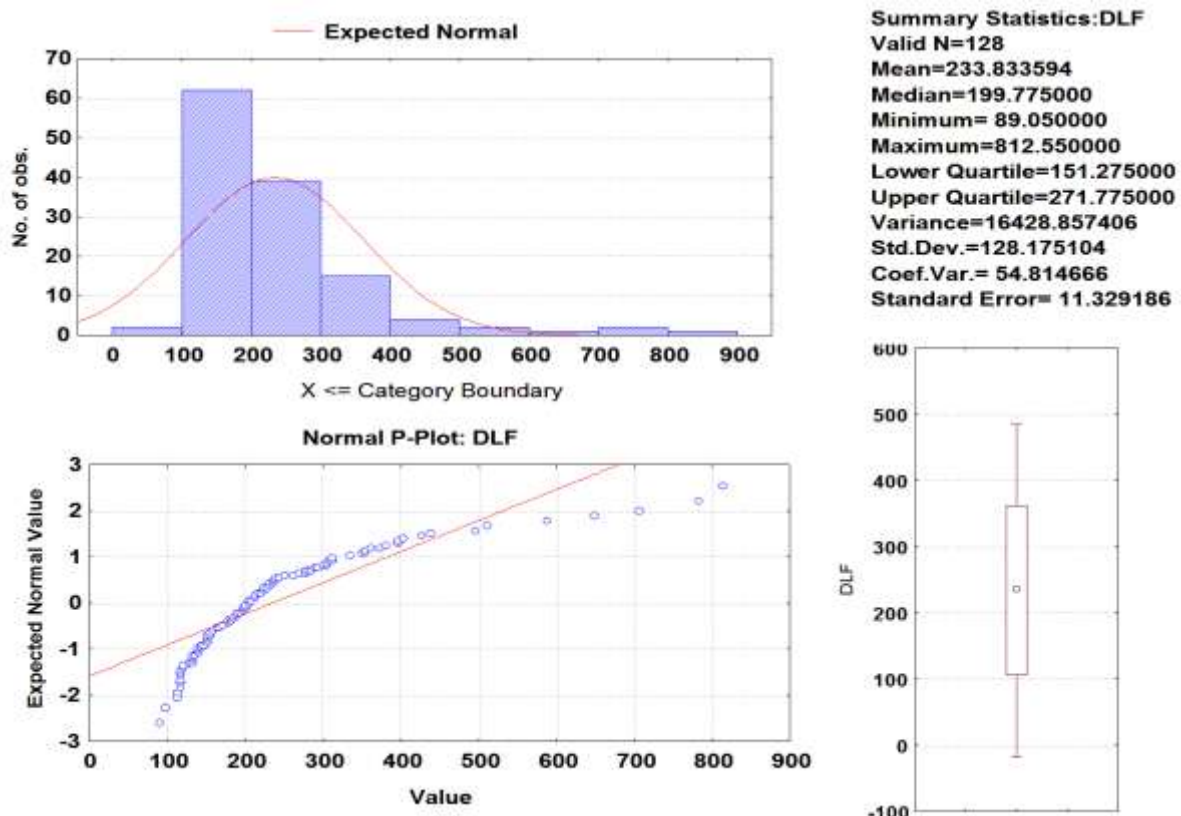

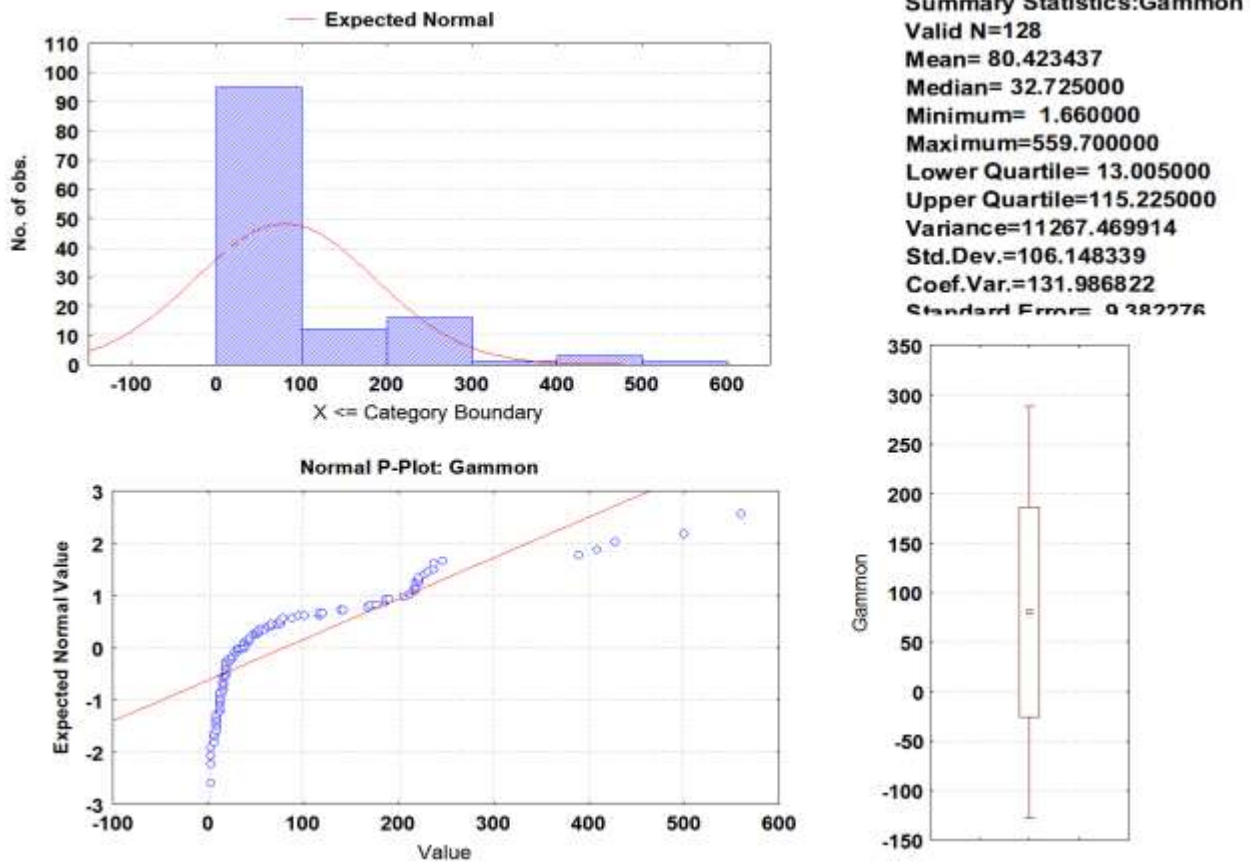Figure 1: Summary statistics along histogram, normal P-Plot and box plot for DLF

Summary Statistics:Gammon
Valid N=128
Mean= 80.423437
Median= 32.725000
Minimum= 1.660000
Maximum=559.700000
Lower Quartile= 13.005000
Upper Quartile=115.225000
Variance=11267.469914
Std.Dev.=106.148339
Coef.Var.=131.986822
Standard Error= 9.382276

Figure 2: Summary statistics along histogram, normal P-Plot and box plot for Gammon

Summary Statistics:HCC
Valid N=128
Mean= 46.273906
Median= 33.450000
Minimum= 7.920000
Maximum=182.150000
Lower Quartile= 19.325000
Upper Quartile= 45.475000
Variance=1606.893807
Std.Dev.= 40.086080
Coef.Var.= 86.627828
Standard Error= 3.543142
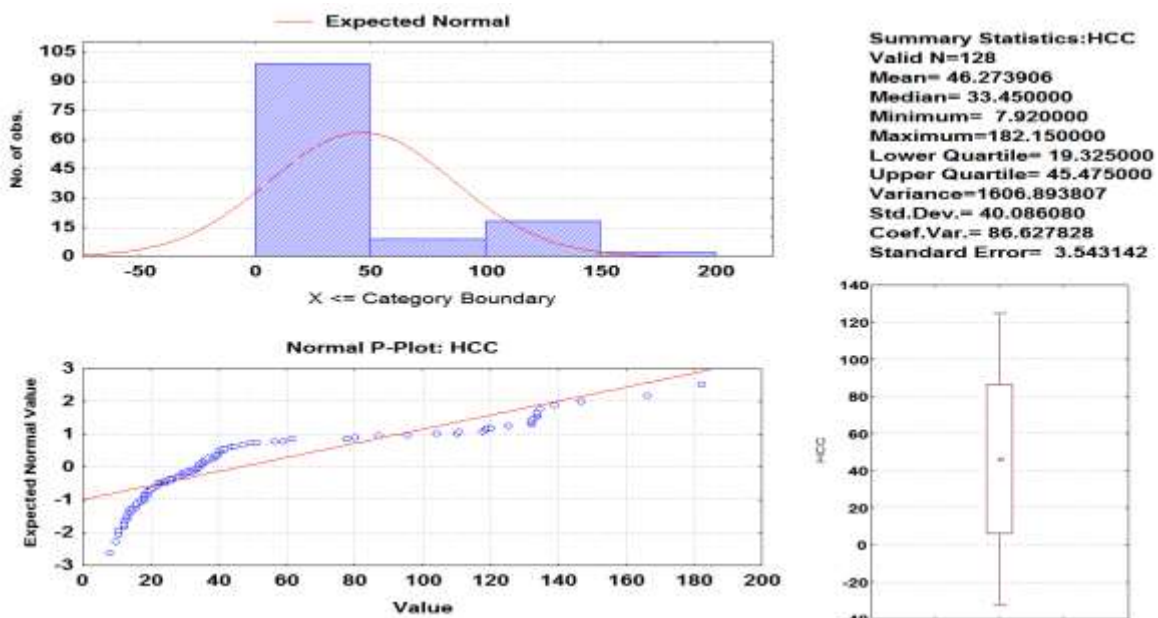
Figure 3: Summary statistics along histogram, normal P-Plot and box plot for HCC

Figure 4 reveals that the stock price of all the companies experienced different magnitudes of fluctuations along with broader market index (BSE Sensex).

It is further reveled that stock of DLF experienced greater fluctuations due to its comparatively high stock prices. The fluctuations for HCC are low while stock price of Gammon witnessed negative values for most of the time during the study period indicating continuous depreciation of its stock price.

Figure 5 shows the comparative fluctuation in the closing price of stocks of the three companies during the entire study period. It indicates a general decline in the stock price of the

companies. However, the decline was most severe for Gammon India, as it stock price was higher than HCC in the beginning of the study period but after Sep 2013 its stock price went below that of HCC. Moreover, at the end of the study period, both DLF and HCC recovered a little but there was no sign of recovery for Gammon.

The simple moving average of monthly closing price and closing was compared and presented in figures 6-8. These figures revealed short term trend in stock prices which in turn help investor to decipher short term selling and purchasing of stocks. Figure 6 shows that the monthly closing price of DLF is found to be higher, though marked with few lower values, as compared to moving average which indicates the stock is proceeding in an uptrend, there is a buy or sell signal for investor. The moving average value is trending at par with the mean value at the end of the study period indicating a buying signal.
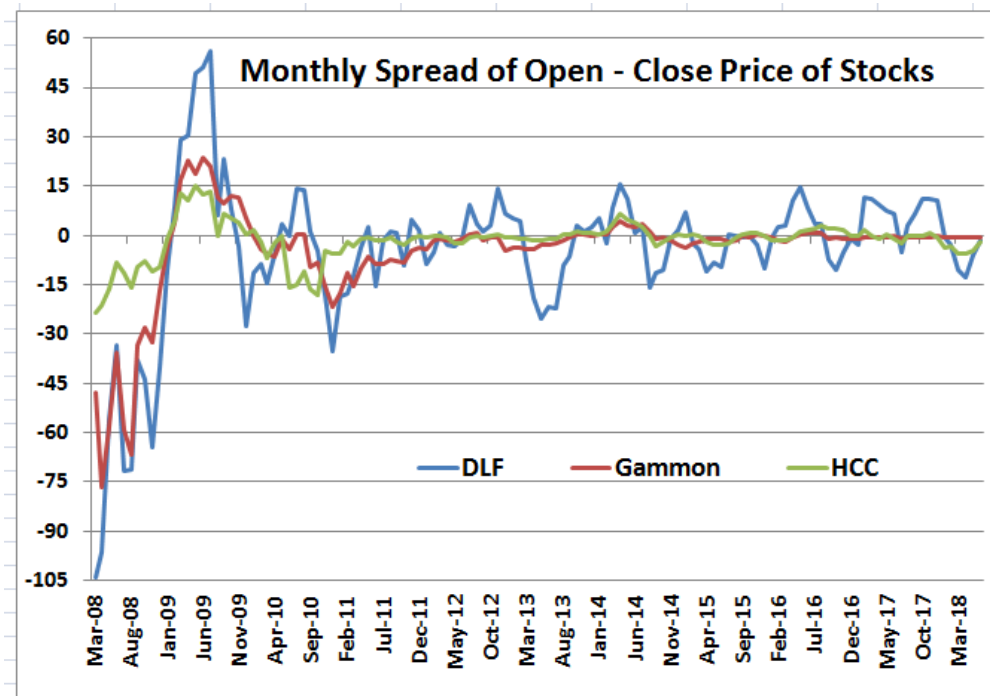

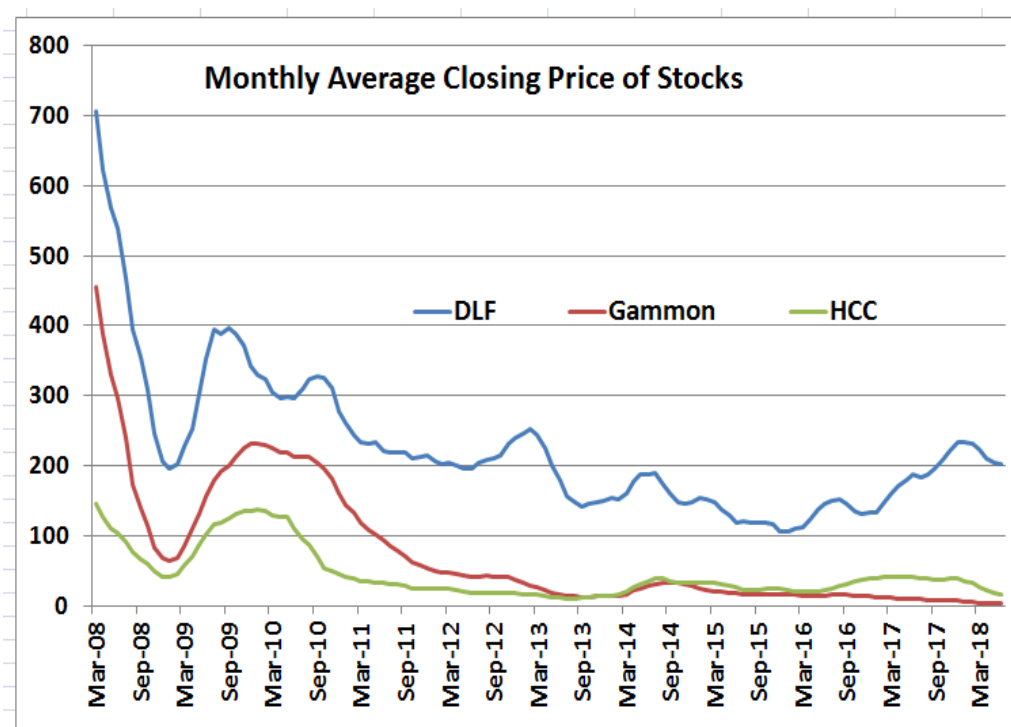**Figure 4: Simple moving average of spread of opening-closing price of three stocks**

Figure 5: Simple moving average of closing price of three stocks

Figure 7 shows that the monthly closing price of Gammon is found to be higher at the beginning of the study period but at the later stage moving average and monthly closing values coincide with each other which indicate that the stock price is proceeding in a down trend with no sign of recovery. It is really alarming situation for the investors and it is better to sell the stock early to face further depreciation in the invested capital. The moving average value is trending below the mean value at the end of the study period indicating signal for sell for short term investor or stay for long period with considerable risk factor.[15]

Figure 8 shows that the monthly closing price of HCC is found to be higher for considerable period of study, though marked with few lower values, as compared to moving average. It points out that the stock is proceeding in an uptrend, there is a buy or sell signal for investor. The moving average value is trending just below the mean value at the end of the study period indicating a buying signal.

Money Flow Analysis: The money flow into out of the capital market is another robust indictor of health of the stock. It is analyzed for all three stocks with the help money flow index (MFI) and is presented in figure 9. The MFI values for all the three stocks invariable show negative values of different magnitudes indicating the money is flowing out of the market.
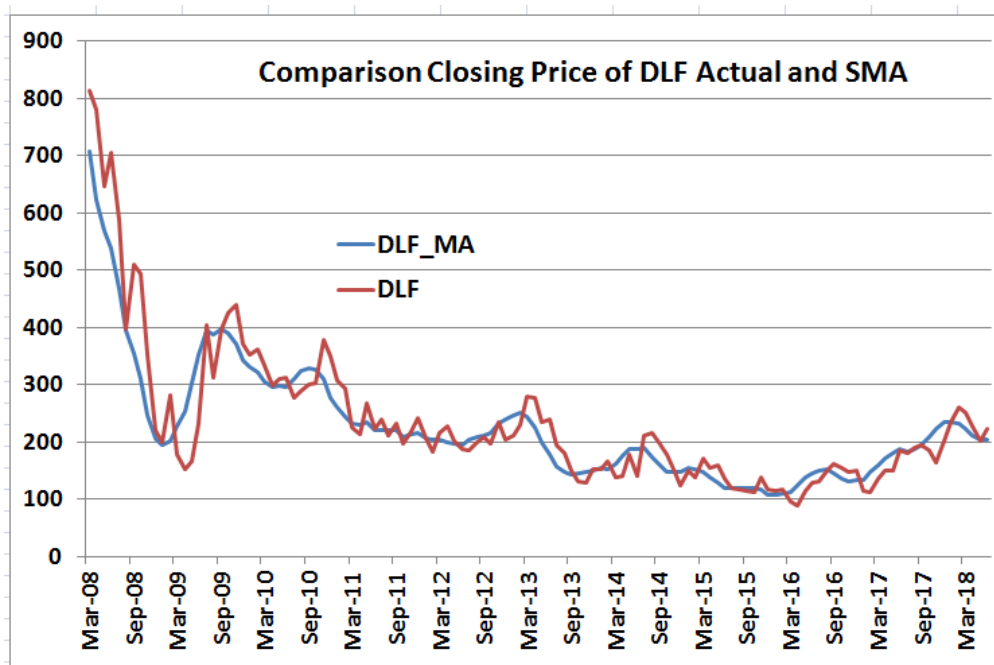

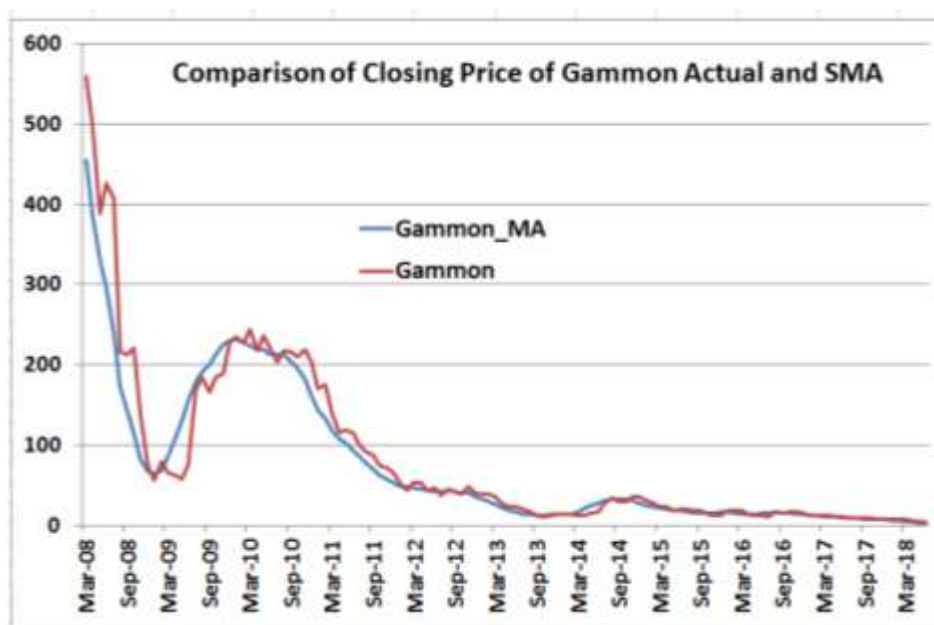**Figure 6: Actual and Simple moving average of closing price of DLF**

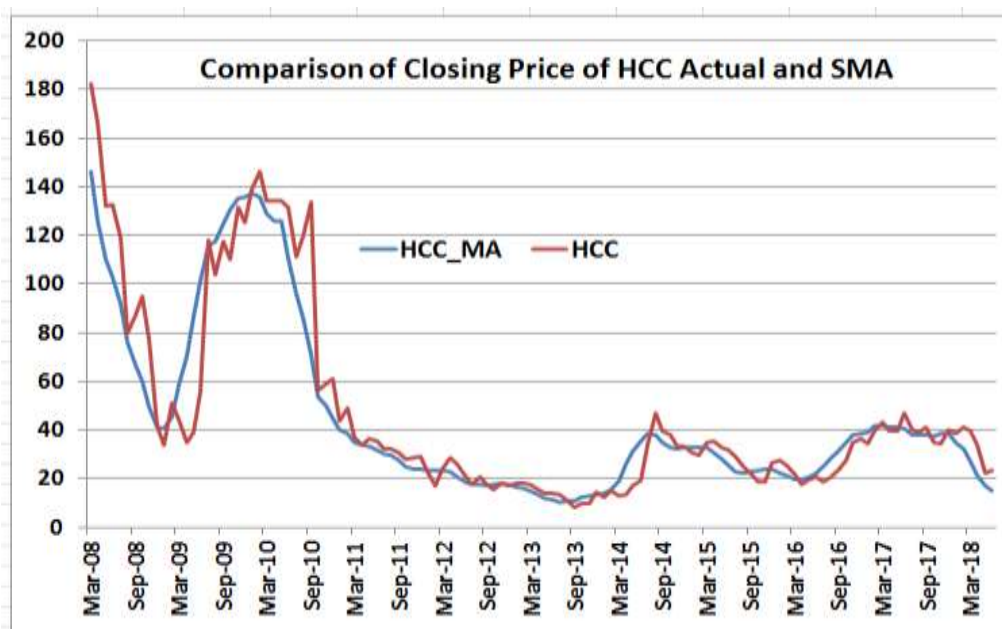**Figure 7: Actual and Simple moving average of closing price of Gammon**

Figure 8: Actual and Simple moving average of closing price of HCC
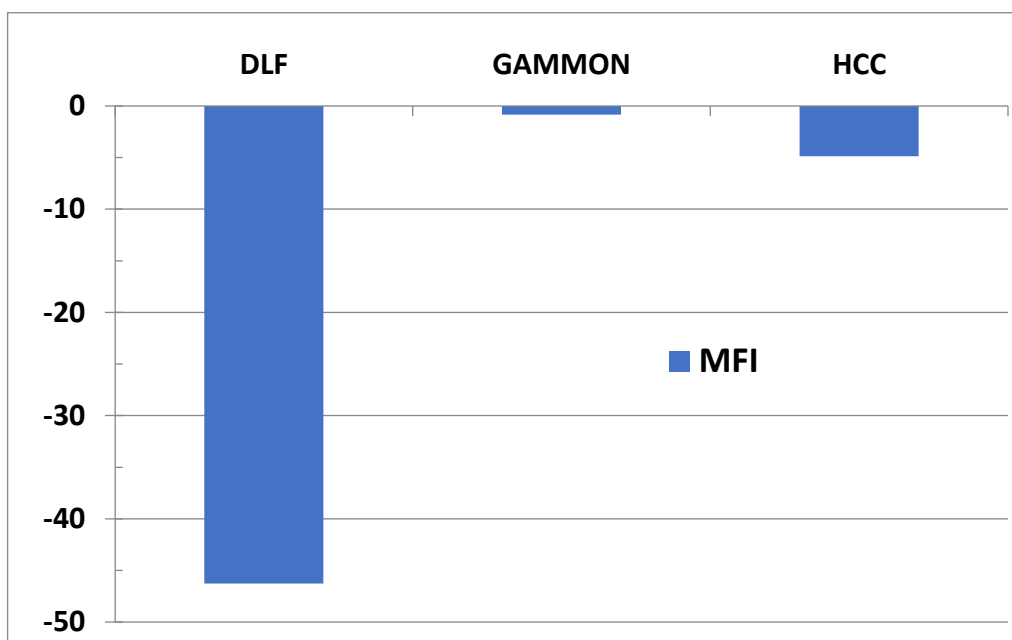

Figure 9: Money Flow Index of stocks of studied industries

This has happened because of the overselling stocks either get short term profit or protect from further erosion invested capital. The MFI value of DLF was found to be highest fooled by HCC and Gammon. However, MFI values of individual companies are following the trend of overall capital market (BSE). Thus, it can be expected that in long term the trend would be reversal creeping of money in market. Thus, investors may follow a bearish trend with those companies which are still good in their fundamental.[16]

Relative Strength Analysis: Figure 10 shows the relative strength index of the three companies. It is quite obvious from the figure that although the trend is almost similar for three companies, but the stocks of DLF remain consistently within the limit of overbought (70) and oversold (30). RSI

for Gammon was kept below over sold line for maximum duration of study period which made it poorest stock among the three. The same trend is also expected in near future for Gammon. For HCC, the RSI value remains above the oversold region for considerable period of time and it can be suggested that a bearish trend may be helpful as over the time the stock is expected to regain. The average values of RSI for DLF, HCC and Gammon are 47.42, 42.45 and 32.82 respectively. It also reconfirms that for Gammon RSI is very close to oversold region (30) during the study period.

Sensitivity Analysis: The sensitivity or volatility of the stocks are studied and compared using beta index which are presented in figure 11.
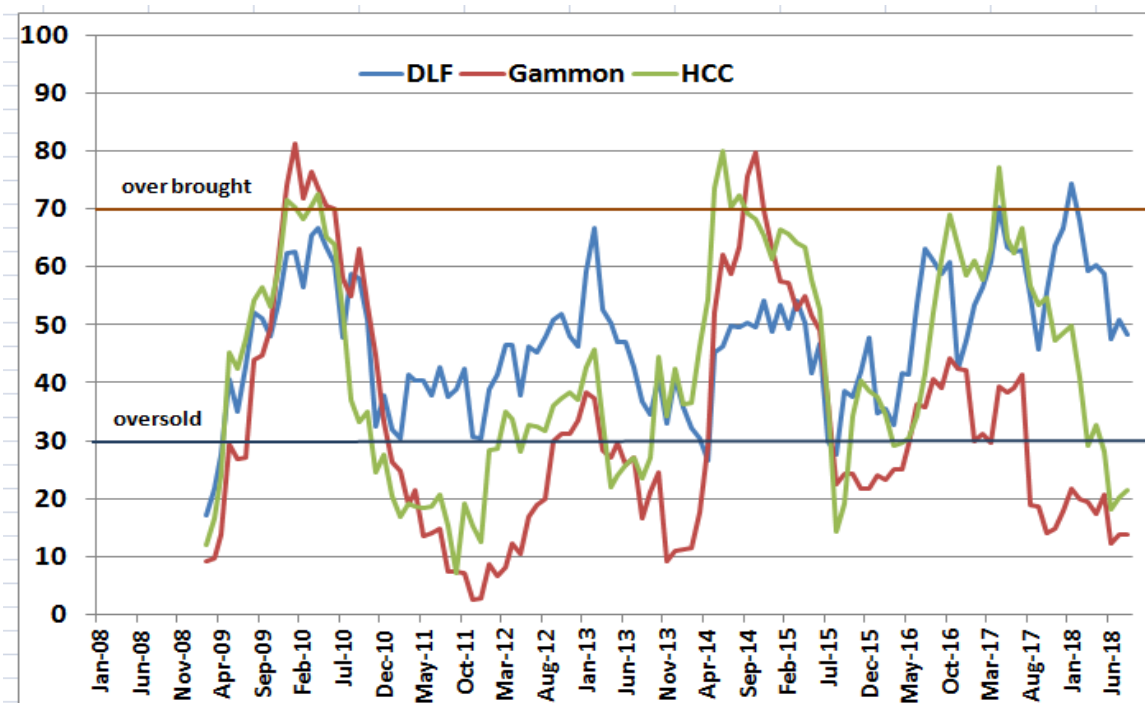
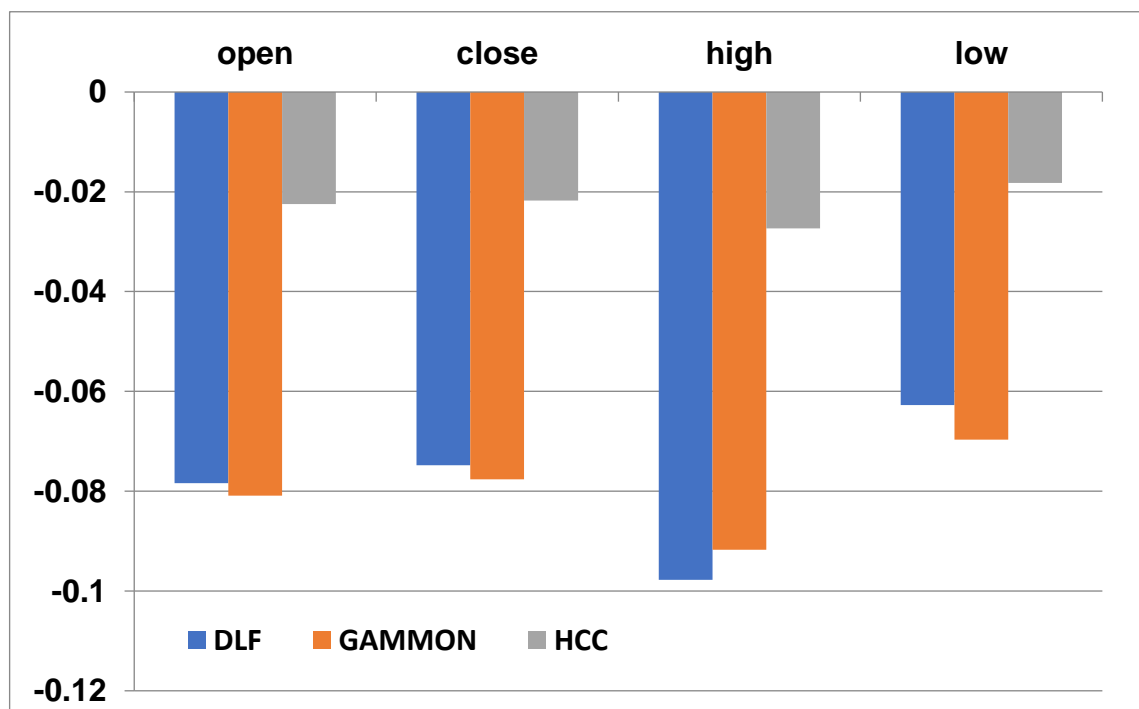**Figure 10: Relative strength Index of stocks of studied companies**

Figure 11: Beta index of stocks of studied companies

Stock markets are characterized by volatile nature due to wide price fluctuations and imbalance trade owing to heavy trading in one direction. High volatility is often seen as a sign of worry for investor.[17,18] In the present study, beta index is calculated as an indicator of volatility for studied stocks presented in figure 11. The values of beta index for all the companies for stock opening, closing, high and low in all situations are relatively small (0.01) and negative. It indicates that all stocks are relatively less volatile in comparison to overall market index i.e. BSE Sensex. The

negative values, however, reveal an inverse relationship between the stock prices of studied companies and overall market index.

Among all types of stock, monthly high is most volatile and monthly low is least volatile. However, stock closing price is logically more important from investor point of view. Herein, Gammon is observed to be most volatile followed by DLF and HCC.

Conclusion

The present study discussed the stock prices of the construction companies using statistical method. The basic statistics along with box plot, histogram diagram and normal p-plot helped deciphering the dynamics of the stock prices during the studied period. It is found that stock prices are not normally distributed and the stock price of Gammon is the poorest performer among all the three. Simple moving average is applied to spread of open-close prices and close price of the stocks which also showed a decreasing trend in stock prices in general. However, it also gave certain clue for investor to take necessary decisions with stocks.

The negative money flow index (MFI) pointed out that money was draining out from the capital market continuously. Similarly, relative strength index (RSI) reveled that the DLF is strongest performer followed by HCC. The RSI value for Gammon indicated a very griming condition of its stock. RSI values too help investor in taking decision on if they should hold the stock, sell or buy the stock. It is suggested that the investors can invest in the shares showing a definitive signal of buy or sell by recovering out of either over brought or oversold condition. However, the suggestion made here may have certain limitation due to fact that the study has been carried out with limited monthly data.

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