A Study on Formation of Candlestick Chart Patterns with Respect to the Indian Automobile Sector

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Abstract

The Indian economic scenario is changing and so are the spending and investment habits of Indian citizens. The investment choices of individual investors have switched from traditional physical assets such as gold, real estate, as well as bank deposits to stocks and other similar assets like bonds, debentures, and derivatives because of increased awareness of alternative investment options, improved technical analysis tools, ease of holding the investment, technological advancements in the form of user-friendly trading platforms, decreasing interest rates on traditional investment options, and the effect of a pandemic such as salary cuts, job losses, and an uncertain economic future, etc. According to a recent survey, the participation of retail investors in NIFTY alone grew to 45% in 2021 from 33% in 2016. The study intended to assist investors in the automobile sector by analyzing the success rate of some selected frequently occurring candlestick patterns and stating the patterns that have a high degree of reliability. The simple percentage analysis of the formations of the selected patterns over five years depicted that the bearish engulfing pattern and the bullish engulfing pattern were the most reliable patterns with a higher rate of success in comparison with the other selected patterns.

Keywords : **automobile sector, behavioural finance, candlestick patterns, investment decision, market efficiency, technical analysis.**

JEL Classification Codes : G11, G14, G41

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Along with the high risk and high return factor, the stock market is also known for its uncertainty. Historically, there was a preconceived notion that market movements cannot be predicted. But thanks to the research trials and the continuous studies that are going on in this field, investors are now able to identify profitable opportunities. Patience and proper analyzing tools have been recognized as the most crucial things for any investor who is seeking investing or trading opportunities in the stock market. Because of this change in the investors' behaviour, their participation in the stock markets has become active and thereby leading to the expansion of the Indian equity market in terms of listed companies and market capital; eventually resulting in widening the scope for brokerage firms and growth of new products segments such as derivative trading (Hirnandani, 2020). Improved trading methods and low returns on conventional savings and investment alternatives like FDs, RDs, bank rates, etc. are motivating the majority of investors to turn toward capital markets. Investors are also able to mitigate the risk to some extent by the use of such tools and techniques offered by the

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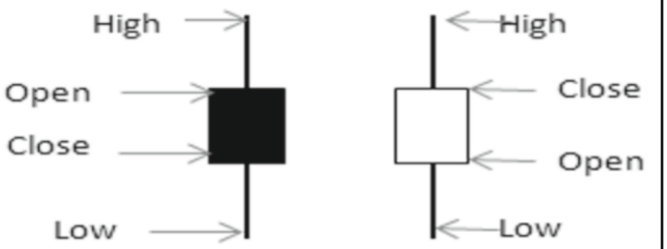
Figure 1. ***Basic Structure of a Candlestick Chart***



technical analysis. One such tool, that act as a leading indicator, is a candlestick chart. Notably, the candlesticks were the results of the continuous efforts of a Japanese Rice Trader Munehisa Homma, who used them to predict rice prices in the 16th century and were introduced to the western world by Steve Nison in the 18th century. These charts delineate all four vital price information for a stock, viz., open, high, low, and close for a particular time in a single frame. These lines look similar to the candles and hence the name candlestick charts. Each candle consists of a body that is rectangular and is made by joining the opening and closing prices for a particular time frame. Moreover, it has wicks or shadows on the upper side and on the lower side of the body which represents the period of high and low prices respectively. The body of the candle maybe green/white or red/black. A green/white bodied candle represents a day/period for which the closing price was more than the opening price. A red/black bodied candle indicates a day in which the opening price was more than the closing price. Figure 1 shows the structure of the candle.

Candlestick charts are gaining much popularity in recent days because they portray market sentiments. Another reason is that they are believed to have the predictive ability of the market trend ahead to some extent. But even then, they cannot be right all the time. There are also cases where these patterns have failed to show the expected behavior of the market. In such a scenario, the main concern for any investor is whether to depend on these patterns for making trading decisions. And if yes, then to what extent are they dependable? The present study was undertaken to know the success rates of some selected frequently occurring candlestick patterns concerning the automobile sector to help them in investment decision-making.

The main objectives of the study are:

(1) To study the ability of the selected candlestick patterns in portraying the expected market movement.

(2) To rank the selected candlestick patterns based on their successful formations.

(3) To compare and rank the selected single-line and two-line candlestick patterns separately based on their performance accuracy to facilitate Indian investors in trading in the automobile sector.

Literature Review

Though the history of candlestick charting techniques dates back to the 16th century, the application of this charting technique can be seen across the markets worldwide. Hence the studies also have shown equivocal results regarding the effectiveness and efficiency in anticipating the upcoming market trend and profitability.

The history of candlestick charting techniques dates back to the 16th century. However, the concept has gained momentum recently and is applied in capital market transactions worldwide. Past studies show equivocal results regarding the effectiveness and efficiency of the technique in anticipating upcoming market trends and profitability. A study, conducted to measure the effectiveness of candlestick chart analysis for the group of 10

stocks of Bovespa at the Brazilian stock market using the binomial distribution, found that nine out of 16 patterns were consistent and relatively frequent and that the "Harami Bullish Pattern" had shown the greatest predictive ability over the "Hanging Man Pattern" (Do Prado et al., 2013). Lu's (2014) research on the Taiwan Stock markets concluded that only four patterns (one bullish reversal, two bearish reversals, and one bearish continuation) were profitable for the Taiwan Stock market. It was also found that the performance of candlestick charts can be improved when used along with the Moving Averages. Among the numerous studies conducted to check the effectiveness of bullish engulfing and bearish engulfing patterns on the S&P 500 Index, Heinz et al. (2021) found that bearish engulfing patterns had a higher forecasting ability for short-term investments. Chin et al. (2016) found that reversal patterns were more significant in comparison to continuation patterns in Malaysian Stock markets. However, the results of the study done by Marshall et al. (2006) had a different story to tell. They studied candlestick technical trading strategies for individual stock data of the companies of the Dow Jones Industrial Index and concluded that trading on the signals generated by candlestick technical analysis was not beneficial for the US stock market. Research by Son et al. (2018) on the Vietnamese Stock Exchange suggested that the reversal candlestick patterns failed to predict the market trend and generated low profitability.

In respect of the Indian stock market, a few studies were also undertaken to examine the effectiveness of the candlestick charts. A study, conducted by Joseph et al. (2015), assessed the formation of candlestick patterns concerning the NIFTY Index and found that out of 16 patterns, ten of them occurred frequently and the investors should consider the other factors to improve the profitability. Laxman (2015)'s study on four different candlestick patterns elucidated that these patterns were helpful and thus proved the predictability. Prasad and Murugaiah (2018) observed that candlestick chart patterns were profitable and dependable in the Indian markets. A study conducted on selected candlestick chart patterns found that hammer, long engulfing pattern, and rising top window were the top three efficient candlestick patterns among the patterns chosen for the study (Manoharan & Mamilla, 2019). Another study on a total of 18 single-line and two-line candlestick patterns concluded that there is no significant difference in the returns earned using the candlestick strategies on a standalone basis and along with a momentum indicator. He also found that the bullish belthold line, above stomach, and hammer have been the top three bullish reversal strategies, and the bearish belthold line, dark cloud cover, and bearish engulfing patterns have been the top three bearish reversal patterns.

As can be observed, there is a gap in the literature with regard to studies that have embarked upon the formation and predictive power of candlestick chart patterns with respect to the automobile sector in the Indian capital markets. Thus, the current study intends to fulfill the gap and study the formation and performance of candlestick charts in the Indian automobile sector.

Rationale for the Study and Research Methodology

Candlestick charts are one of the tools of technical analysis which are used by investors to understand market movement and sentiment. Experts predict that the online trading value, which presently is $6.4 billion, could reach a value of $14.3 billion in India by 2025. In this light, this study is undertaken to help the investors of the Indian automobile sector to take cautious investment decisions and to know about reliable candlestick patterns for making such decisions.

The current study followed a descriptive research design as it involved studying the formation of selected candlestick patterns in various companies and analyzing these patterns based on their success rates. Further, the Indian Automobile sector is one of the fastest-growing sectors with a growth rate of 4.9 %. The Nifty Auto sector yielded 40% returns in the financial year 2020–2021. Moreover, the introduction of electric vehicles, the launching of safe driving and less polluting vehicles, and continuous improvement in technologies have made the automobile sector one of the most promising investment sectors for investors. With the aim of helping investors in taking investment decisions, this study takes into consideration the Nifty Auto Index for analyzing the

performance of candlestick patterns. The Nifty Auto index comprises 15 Automobile companies listed at NSE. The companies forming part of Nifty Auto as of July 1, 2021 constitute the sample unit for the study, which are provided as follows:

(1) Maruti Suzuki India Ltd.

(2) Mahindra and Mahindra Ltd.

(3) Tata Motors Ltd.

(4) Bajaj Auto Ltd.

(5) Hero MotoCorp Ltd.

(6) Eicher Motors Ltd.

(7) Motherson Sumi Systems Ltd.

(8) Ashok Leyland Ltd.

(9) MRF Ltd.

(10) Bharat Forge Ltd.

(11) TVS Motors Ltd.

(12) L G Balakrishna and Brothers Ltd.

(13) Bosch Ltd.

(14) Exide Industries Ltd.

(15) Amara Raja Batteries Ltd.

The Patterns

The candlestick patterns can be classified as reversal and continuation patterns. The patterns which indicate the forthcoming trend reversal is known as the reversal patterns and the one which demonstrates the subsistence of the existing trend are classified as the continuation patterns. Further, the reversal candlestick patterns can be divided into bullish reversal patterns and bearish reversal patterns. Bullish reversal patterns are the ones that indicate the upcoming bull market. Since investors are keen on entering the markets at lower prices and exiting at higher prices, the reversal patterns have gained a lot of importance. Patterns that denote the nearing downtrend or bear market are the bearish reversal patterns. Therefore, this study attempts to check the ability of the candlestick reversal patterns to depict the expected market movements. For this purpose, ten candlestick patterns, i.e., Four Single lines and Six Two Line Candlestick Patterns are selected based on their frequency of occurrence. Following are the selected reversal patterns considered for study:

Bullish Reversal Pattern:

(1) Hammer

(2) Inverted hammer

(3) Bullish engulfing pattern

(4) Bullish harami

(5) Piercing pattern

Bearish Reversal Pattern :

(1) Hanging man

(2) Shooting star

(3) Bearish engulfing pattern

(4) Bearish harami

(5) Dark cloud cover

Data

The daily data were collected for 5 years, that is, from April 1, 2016 to March 31, 2021, from the website of NSE and the daily charts available on www.tradingview.com using a structured observation method, where the formation of selected candlestick pattern is observed and checked for its success or failure.

The Study

To study the performance accuracy of the candlestick patterns, the ten candlestick patterns were chosen based on their frequency of occurrence and popularity. Theoretically, the patterns are identified or are said to be formed only if the following conditions are fulfilled:

- The bullish reversal patterns are considered to be formed only when they have occurred in the downtrend, i.e. any bullish reversal pattern that has formed in the uptrend is ignored.
- The bearish patterns are considered to be formed only when it has formed in an uptrend, any bearish reversal pattern that has formed in a downtrend is ignored.
- The market is to be treated in an uptrend or a downtrend if it has a continuously higher closing or lower closing respectively for a minimum of 3 days.
- A pattern is considered to be successful if the market moves sideways or completely reverses after the formation.

For conducting the study, the number of times a pattern is formed for a particular company was collected and then analyzed to figure out whether the pattern has generated the intended behavior or not. If the pattern led to the intended behavior then it was considered as successful or else it was considered a failed observation. To reiterate, successful patterns are those which reverse the trend completely or lead to a sideways market. If the existing trend is continued even after the formation of the pattern then such an observation is considered a failed observation. Based on these observations, the success rate of patterns was calculated. To find out the success rate, the number of successful formations is divided by the total number of formations for a particular pattern. These patterns were, then, ranked on the basis of their success rate.

Analysis and Results

Table 1 gives the consolidated results of all the companies with respect to the number of times the particular pattern occurred and the number of successful and failed formations. The outcomes are as follows:

Table 1. ***Ranking of Patterns Overall***

Sl. No	Pattern	No. of Occurrences	Success	Failure	Success Rate (%)	Ranks
1	Hammer	202	148	54	73.2673267	6
2	Inverted Hammer	118	79	39	66.9491525	9
3	Hanging Man	143	88	55	61.5384615	10
4	Shooting Star	136	94	42	69.1176471	8
5	Bullish Engulfing	161	130	31	80.7453416	2
6	Bearish Engulfing	278	234	44	84.1726619	1
7	Bullish Harami	291	217	74	74.5704467	4
8	Bearish Harami	179	131	48	73.1843575	7
9	Piercing Pattern	132	97	35	73.4848485	5
10	Dark Cloud cover	181	138	43	76.2430939	3

Table 2. ***Ranking of Single Line Candlestick Patterns***

Sl. No	Pattern	No. of Occurrences	Success	Failure	Success Rate (%)	Ranks
1	Hammer	202	148	54	73.27	1
2	Inverted Hammer	118	79	39	66.95	3
3	Hanging Man	143	88	55	61.54	4
4	Shooting Star	136	94	42	69.12	2

Table 3. ***Ranking of Two Line Candlestick Patterns***

Sl. No	Pattern	No. of Occurrences	Success	Failure	Success Rate (%)	Ranks
1	Bullish Engulfing	161	130	31	80.75	2
2	Bearish Engulfing	278	234	44	84.17	1
3	Bullish Harami	291	217	74	74.57	4
4	Bearish Harami	179	131	48	73.18	6
5	Piercing Pattern	132	97	35	73.48	5
6	Dark Cloud cover	181	138	43	76.24	3

- 'Bullish Harami' is observed the highest number of times (291 times) and 'Inverted Hammer' occurred the least number of times (118 times).
- The bearish engulfing pattern is ranked first with a success rate of 84.17% followed by bullish engulfing (80.75%), and the dark cloud cover pattern (76.24%).
- Hanging man is at the last position among the 10 patterns with a success rate of 61.5% only.

Although the bullish harami occurred the highest number of times, it is ranked fourth because the number of successful formations is less compared to the bearish engulfing pattern. Moreover, even if the inverted hammer is the least occurring pattern among the selected patterns, the success rate of inverted hammer is more as compared to the hanging man. This suggests that, though the candlestick charts can be considered as one of the leading indicators, the reliability of such indicators completely depends on the pattern that occurred due to the differences in the accuracy or success rates of these patterns.

Table 2 and Table 3 give the rankings of the single-line and two-line patterns separately. The following observations are made with respect to these tables:

- Hammer is ranked first among the other single-line patterns with a success rate of 73.27% and hanging man is ranked last with an accuracy rate of 69.12 %.
- Among Two-line candlestick patterns, the bearish engulfing pattern is ranked first and bearish harami is ranked least.

The results clearly show that the two-line candlestick patterns have better dependability when compared to single line candlestick patterns.

Conclusion and Research Implications

While scholars are still debating on the relevance of fundamental and technical analysis, the latter is gaining much popularity among investors due to several reasons – a) the newly discovered tools and techniques have paved the way for better returns; b) the data suggest that investors are interested in trading, rather than making long-term investments in the stock market; and ; c) the techniques like RSI, Volume, etc. help to predict the trend of the market ahead and thus, are considered as the leading indicators. Candlestick chart is also one of the techniques. But our study suggests that the investors should be careful while considering indications of these patterns for taking trading decisions as not all the patterns are equally likely reliable and profitable. Therefore, the success of the trades taken up by the investors depends on the patterns they are looking for. The study, further, suggests that the bearish engulfing and bullish engulfing patterns are comparably dependable, with the highest rates of success respectively. However, in the cases of the formation of hanging man and inverted hammer patterns, the investor must wait for the confirmation on the next trading sessions as their accuracy levels are low when compared to other patterns considered in this study. Finally, the two-line candlestick patterns give better surety of market movements than the single-line patterns.

In the changing economic scenario, more investors are taking interest in investing in stock markets. Hence, the usage of technical tools for stock analysis is increasing day by day. In this light, the current study briefs investors in the automobile sector about successful and reliable candlestick formations to facilitate investment decisions.

Limitations of the Study and Scope for Further Research

The candlestick charts have varied applications, that is, they can be applied for equities, futures and options, derivatives, ETFs, exchange rates, etc. While this study considers purely equity prices of stocks for the analysis, future studies can be undertaken to assess the profitability and reliability of candlestick charts for the other trading and investment options. Moreover, this study considers only the selected candlestick patterns. Future research can be conducted on different candlestick patterns.

Authors' Contribution

Anusha S. Sangondimath conceived the idea to undertake an empirical study on the formation of candlestick charts. She extracted research papers with high repute, filtered these based on the keywords, and generated concepts relevant to the study design. The data collection and chart analysis were also done by Anusha S. Sangondimath. Prof. S B Kamashetty verified the analytical methods and supervised the study.

Conflict of Interest

The authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

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