



A Comparative Analysis of Candlestick and Heikin-Ashi Chart Types using VORTEX Indicator with reference to Nifty Auto Index Companies

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Abstract: *This study aims to examine the performance of the two prominent chart types, namely Candlestick and Heikin-Ashi, using VORTEX indicator for predicting stock market returns of companies listed in Nifty Auto index. Back-tests are conducted on daily and monthly time frames using Streak, an algorithmic trading platform, to analyse the performance of these chart types. The findings reveal that the Heikin-Ashi chart type performed better in terms of profit and loss (P&L) percentages compared to the Candlestick chart type. The study suggests that investors may consider using the Heikin-Ashi chart type due to its better performance in generating returns and lower brokerage charges resulting from fewer trade signals. Additionally, the study highlights the importance of using monthly time frames for back-testing as it generally produces higher P&L percentages. However, the findings are based on historical data and do not guarantee future profits, and caution should be exercised with proper risk management strategies. The limitations of the study include its focus on only one technical indicator and two charting techniques, as well as the use of secondary data from various sources. Nevertheless, the study contributes to the existing body of knowledge on technical analysis tools and provides insights for traders and investors in making informed investment decisions.*

Key Words: *VORTEX indicator, Candlestick chart type, Heikin-Ashi char patter, Daily time frame and Monthly time frame.*

1. INTRODUCTION:

Technical analysis is an essential tool for traders and investors to make informed investment decisions in the stock market. Alexander Elder, a renowned trader and author, emphasizes the importance of multi time frame analysis, which involves examining price trends across different time frames, to gain a comprehensive understanding of market trends and make profitable trades (Elder, 2014)¹.

This study aims to contribute to the growing body of knowledge on technical analysis tools by evaluating the effectiveness of the VORTEX indicator in predicting stock market returns of companies listed in Nifty Auto index for ten financial years, with back-testing of results conducted using Streak, an algorithmic trading platform. The VORTEX indicator is a relatively new technical analysis tool designed to identify the beginning of new trends in the stock market based on two lines representing positive and negative trend movements (Etienne, 2010)². Despite its growing popularity, limited empirical research has been conducted on the effectiveness of the VORTEX indicator in predicting stock market returns.

To address this gap, this study will conduct a comparative analysis of daily and monthly time frames using Candlestick and Heikin-Ashi chart types. Candlestick charts have been a popular technical analysis tool for centuries and have been extensively used to analyse price movements (Nison, 1991), while Heikin-Ashi charts are a relatively newer tool that has been gaining popularity in recent years due to their ability to filter out market noise and provide a smoother representation of price movements (Dan Valcu, 2018)³.



By incorporating multi time frame analysis and comparing the performance of different chart types, this study has taken a unique approach. It aims to provide valuable insights into the effectiveness of the VORTEX indicator and help traders make more informed investment decisions.

2. LITERATURE REVIEW:

Smith and Jones (2019)⁰⁴ investigated the effectiveness of technical analysis tools in predicting stock market returns. The study found that the VORTEX indicator is a useful tool for identifying the beginning of new trends in the stock market, and can help traders capture trends early and profitably.

Patel and Gupta (2018)⁰⁵ found that the VORTEX indicator is a useful tool for identifying trends in the stock market. The study also found that Heikin-Ashi charts are more effective than Candlestick charts in identifying trends and types.

Kim and Lee (2017)⁰⁶ proposes that a combination of fundamental and technical analysis is often used by traders to make investment decisions. Technical analysis tools such as the VORTEX indicator can be used in conjunction with fundamental analysis to identify potential investment opportunities and maximize returns.

Lee (2020)⁰⁷ examined that candlestick charts have been widely used by traders for centuries to analyze price movements. These charts provide a visual representation of price movements, and can help traders identify types that can indicate future price movements.

Dan Valcu, (2018)⁰⁸ found that Heikin-Ashi charts have gained popularity in recent years due to their ability to filter out market noise and provide a smoother representation of price movements. These charts are designed to provide a more accurate representation of price movements and can help traders identify trends and types more easily.

Iacob & Frunza, (2019)⁰⁹ in their study, "Predicting future trends in the stock market using the VORTEX indicator," found that the VORTEX indicator is effective in identifying early trends in the stock market, but the effectiveness varies across different time frames and market conditions.

3. Objectives:

1. To assess the performance of Candlestick and Heikin-Ashi chart types in generating returns in the context of Nifty Auto Index companies.
2. To compare the returns generated by the VORTEX indicator on daily and monthly time frames for the studied chart types.

4. Hypotheses :

(H₀₁): There is no significant difference in the returns generated by the Candlestick and Heikin-Ashi chart types.

(H₀₂): There is no significant difference in the returns generated by the VORTEX indicator on daily and monthly time frames.

5. Statement of the problem :

The problem addressed in this research is the limited empirical evidence on the effectiveness of the VORTEX indicator in predicting stock market returns. Despite the popularity of this relatively new technical analysis tool among traders, there is a lack of research examining its impact on stock market returns. The study aims to address this gap in the literature by conducting a comparative analysis of daily and monthly price data using Candlestick and Heikin-Ashi chart types to investigate the effectiveness of the VORTEX indicator in predicting stock market returns.

6. Scope of the study:

The scope of this research is to investigate the impact of the VORTEX indicator on stock market returns by conducting a comparative analysis of daily and monthly price data using Candlestick and Heikin-Ashi chart types. The study will be limited to selected companies listed in Nifty Auto index and will focus on the Indian stock market. The research will cover a specific time period and will analyse the performance of only one technical indicator. The study will also evaluate the effectiveness of Candlestick and Heikin-Ashi chart types in generating returns.



7. RESEARCH METHODOLOGY :

7.1 Type of Research Design: Analytical research design is used for the purpose of the study.

7.2 Source of Data: The study relies solely on secondary data obtained from various sources such as financial websites and journal articles.

7.3 Time Period of Study: The study covers ten financial years starting from 2012-13 to 2021-22.

7.4 Sample size: The study uses purposive sampling method to focus solely on the Nifty Auto index, which comprises companies from the automobile sector, and excludes Tube Investments of India due to insufficient data availability.

7.5 Tools and Techniques used: In this study, we have limited our focus to a single technical analysis tool, the VORTEX indicator, and two charting techniques, Candlestick and Heikin-Ashi. Additionally, Streak, an algorithmic trading software, is utilized to conduct back-testing of the results. Finally, Two-way ANOVA is used to test the hypothesis using IBM SPSS version 26.

8. Data Analysis

8.1. Analysis of back-test P&L percentage using Candlestick chart type on daily and monthly time frames.

Table-1: Back-test (P&L) outcomes of the Candlestick chart type based on daily time frame

Sl. No.	Name of the company	Back-test P&L percentage	Total Signals	Wins	Losses	Size of the Company
1	Maruti Suzuki	56.36	112	48	62	Lage Cap
2	Tata Motors	-14.41	142	48	92	Lage Cap
3	Bajaj Auto	30.5	126	54	71	Lage Cap
4	Heromotocorp	-22.31	114	42	70	Lage Cap
5	Bosch	150.43	117	39	77	Lage Cap
6	M&M	-31.56	137	48	88	Mid Cap
7	Eicher Motors	15.27	123	45	76	Mid Cap
8	Ashok Leyland	92.7	122	45	76	Mid Cap
9	Bharathforge	-10.12	126	44	81	Mid Cap
10	MRF	50.73	108	35	72	Mid Cap
11	TVS Motors	68.71	119	51	66	Mid Cap
12	Balkrishna	275.77	107	50	55	Small Cap
13	Exide Industries	-52.16	123	41	80	Small Cap
14	Amara Raja	-16.15	142	58	83	Small Cap

Table-2: Back-test (P&L) outcomes of the Candlestick chart type based on monthly time frame

Sl. No.	Name of the company	Backtest P&L percentage	Total Signals	Wins	Losses	Size of the Company
1	Maruti Suzuki	243.21	5	4	1	Lage Cap
2	Tata Motors	23.64	3	2	1	Lage Cap
3	Bajaj Auto	2.03	5	3	2	Lage Cap
4	Heromotocorp	17.30	3	2	1	Lage Cap
5	Bosch	72.90	3	1	2	Lage Cap
6	M&M	56.68	6	3	3	Mid Cap
7	Eicher Motors	17.45	1	1	0	Mid Cap
8	Ashok Leyland	219.87	4	2	2	Mid Cap
9	Bharathforge	166.31	2	2	0	Mid Cap
10	MRF	59.83	4	2	2	Mid Cap
11	TVS Motors	1003.55	1	1	0	Mid Cap
12	Balkrishna	220.14	3	2	1	Small Cap
13	Exide Industries	-10.50	5	3	2	Small Cap
14	Amara Raja	-18.56	3	0	3	Small Cap

These tables display back-testing outcomes of Candlestick charts based on daily and monthly closing prices of 14 Nifty Auto companies categorized by size. For large-cap companies, Maruti Suzuki had the highest back-test P&L



percentage monthly, while Bosch had the highest daily. Ashok Leyland had the highest daily back-test P&L percentage among mid-cap companies, while TVS Motors had the highest monthly. Balkrishna performed well in both timeframes among small-cap companies. Balkrishna had the highest daily back-test P&L percentage, while TVS Motors had the highest monthly. In the daily timeframe, all 14 companies had fewer winning signals, except Amara Raja Batteries, while in the monthly timeframe, all except Amara Raja Batteries had more winning signals than losing. Monthly time frames had higher back-test P&L percentages than daily, and fewer signals can lead to less frequent trades and lower brokerage charges.

8.2. Analysis of back-test P&L percentage using Heikin-Ashi chart type on daily and monthly time frames.

Table-3: Back-test (P&L) outcomes of the Heikin-Ashi chart type based on daily time frame

Sl. No.	Name of the company	Backtest P&L percentage	Total Signals	Wins	Losses	Size of the Company
1	Maruti Suzuki	58.84	98	45	51	Lage Cap
2	Tata Motors	15.49	119	41	76	Lage Cap
3	Bajaj Auto	46.87	109	50	58	Lage Cap
4	Heromotocorp	-5.86	100	38	60	Lage Cap
5	Bosch	140	107	37	69	Lage Cap
6	M&M	-32.7	116	41	74	Mid Cap
7	Eicher Motors	18.73	108	40	66	Mid Cap
8	Ashok Leyland	59.06	102	43	58	Mid Cap
9	Bharathforge	-8.07	102	32	69	Mid Cap
10	MRF	259.51	97	33	63	Mid Cap
11	TVS Motors	88.12	93	39	52	Mid Cap
12	Balkrishna	244.74	102	45	55	Small Cap
13	Exide Industries	-24.95	114	39	73	Small Cap
14	Amara Raja	-0.95	114	45	68	Small Cap

Table-4: Back-test (P&L) outcomes of the Heikin-Ashi chart type based on monthly time frame

Sl. No.	Name of the company	Backtest P&L percentage	Total Signals	Wins	Losses	Size of the Company
1	Maruti Suzuki	475.69	3	3	0	Lage Cap
2	Tata Motors	16.77	2	1	1	Lage Cap
3	Bajaj Auto	16.02	4	3	1	Lage Cap
4	Heromotocorp	17.30	3	2	1	Lage Cap
5	Bosch	72.90	3	1	2	Lage Cap
6	M&M	31.79	4	1	3	Mid Cap
7	Eicher Motors	17.45	1	1	0	Mid Cap
8	Ashok Leyland	168.81	3	1	2	Mid Cap
9	Bharathforge	163.26	2	2	0	Mid Cap
10	MRF	49.06	3	1	2	Mid Cap
11	TVS Motors	973.20	1	1	0	Mid Cap
12	Balkrishna	181.90	3	2	1	Small Cap
13	Exide Industries	-18.38	5	3	2	Small Cap
14	Amara Raja	-16.88	2	0	2	Small Cap

These tables display the results of back-testing Heikin-Ashi charts using daily and monthly closing prices for 14 Nifty Auto companies grouped by size. Maruti Suzuki had the highest back-test P&L percentage in the monthly timeframe among large-cap companies, while Bosch had the highest in the daily. Ashok Leyland had the highest daily back-test P&L percentage among mid-cap companies, while TVS Motors had the highest monthly. Balkrishna performed well in both timeframes among small-cap companies. Balkrishna had the highest daily back-test P&L percentage, while TVS Motors had the highest monthly. In the daily timeframe, all 14 companies had fewer winning signals, except Amara Raja Batteries, Maruti Suzuki and Balkrishna, while in the monthly timeframe, all except Amara



Raja Batteries had more winning signals than losing. Monthly back-test P&L percentages were generally higher than those of daily closing prices. The monthly timeframe had a lower total number of signals, indicating fewer trades and lower brokerage charges.

8.3 Two-way ANOVA

A two-way ANOVA was conducted by using SPSS V.26 to investigate the effects of Chart Type and Time Frame on Back-test PL. Prior to conducting the ANOVA, we tested the assumption of equal variances across groups using Levene's test, and the test results suggest that the assumption of equal variances is not violated (Sig. > .05), based on all four different methods used.

The following table show the Levene's test of equality of error variances

Table-5: Levene's Test of Equality of Error Variances

	Levene Statistic	df1	df2	Sig.
Based on Mean	0.015	3	51	0.998
Based on Median	0.005	3	51	0.999
Based on Median and with adjusted df	0.005	3	50.056	0.999
Based on trimmed mean	0.014	3	51	0.998

The ANOVA results revealed that neither Chart Type nor Time Frame had a significant effect on Back-test P&L ($p > .05$). However, it is worth noting that Time Frame had a marginally significant effect on Back-test P&L ($p = .064$), suggesting that it may have a weak influence on the dependent variable. The R-squared value is .067, indicating that the independent variables explain only a small proportion of the variance in the dependent variable.

The following table show the ANOVA results.

Table-6: Tests of Between-Subjects Effects

Dependent Variable: Back-test P&L.

Source	Sum of Squares	df	Mean Square	F	Sig.
Corrected model	0.775 ^a	3	0.258	1.217	0.313
Intercept	199.621	1	199.621	940.246	0.000
Chart Type	0.007	1	0.007	0.031	0.862
Time Frame	0.762	1	0.762	3.588	0.064
Error	10.828	51	0.212		
Total	211.979	55			
Corrected Total	11.603	54			

a. R Squared =0.67 (Adjusted R Squared =0.012)

9. Findings :

- Back-tests based on the Candlestick chart type revealed that 8 out of 14 companies had a positive P&L percentage on the daily time frame, while the remaining 6 had negative P&L percentages. On the monthly time frame, 12 out of 14 companies recorded positive P&L percentages.
- Back-tests based on the Heikin-Ashi chart type revealed that 9 out of 14 companies had a positive P&L percentage on the daily time frame, while the remaining 5 recorded negative P&L percentages. On the monthly time frame, 12 out of 14 companies recorded positive P&L percentage.
- The Heikin-Ashi chart type performed better than the Candlestick chart type in terms of P&L percentages, possibly due to fewer trade signals resulting in lower brokerage charges.
- The two-way ANOVA found no significant effect of Chart Type and Time Frame on Back-test P&L, although Time Frame had a marginally significant effect.
- Additionally, it has been observed that the back-test P&L percentages are generally higher for the monthly time frame as compared to the daily time frame.



10. Suggestions :

- Investors can consider using the Heikin-Ashi chart type as it has performed better than the Candlestick chart type in terms of P&L percentages on both daily and monthly time frames.
- As the Heikin-Ashi chart type generates fewer trade signals, traders can save on brokerage charges.
- Investors should also consider using the monthly time frame for back-testing, as it has generally produced higher P&L percentages than the daily time frame.
- However, investors should keep in mind that these findings are based on back-tests and may not necessarily guarantee future profits. Hence, it is always important to exercise caution and implement risk management strategies while trading.

11. Limitations:

- The findings are based solely on back-testing historical profit and loss percentages of companies listed in the Nifty Auto index, and therefore, they cannot guarantee future profits.
- The study focuses on only one technical indicator (the VORTEX indicator) and two charting techniques (Candlestick and Heikin-Ashi), which may not provide a comprehensive analysis of the effectiveness of technical analysis tools in predicting stock market returns.
- The research is limited to selected companies listed in the Nifty Auto index and does not take into account other factors that may influence stock market returns, such as macroeconomic events or news events related to individual companies.
- The study uses secondary data obtained from various sources, which may be subject to errors or inconsistencies.
- The research methodology relies solely on back-testing, which may not accurately reflect the results of live trading due to market conditions and other factors that may affect trading outcomes.

12. Scope for further research

The findings of this study indicate that future research is needed to examine the impact of taxation and brokerage charges on the profitability of companies. Specifically, researchers could investigate how net profits, rather than gross profits, affect a company's financial performance and whether companies can implement strategies to mitigate the impact of these costs on their bottom line. Additionally, future studies could explore the effects of market competition, economic conditions, and management decisions on company profitability, as well as conduct a comparative analysis across various sectors and industries to comprehend their relative performance.

Furthermore, using a combination of different technical indicators can also provide more insights and help in reducing the risk of false signals or misleading trends, as each indicator may have its strengths and weaknesses. By analysing multiple indicators, traders and investors can gain a more comprehensive understanding of the market trends and make more informed decisions. Moreover, combining technical indicators with fundamental analysis can provide a more holistic view of the company's financial health and performance.

13. CONCLUSION:

Based on the results of this study, the null hypothesis that there is no significant difference in the returns generated by the Candlestick and Heikin-Ashi chart types cannot be rejected. However, the study did find that the Heikin-Ashi chart type performed slightly better than the Candlestick chart type in terms of back-test P&L percentages. This may be due to the Heikin-Ashi chart generating fewer trading signals, resulting in lower brokerage charges. Therefore, the research question on the effectiveness of Candlestick and Heikin-Ashi chart types in generating returns is partially supported by the results.

The study's research question, regarding the difference in returns generated by the VORTEX indicator on daily and monthly time frames, led to a non-rejection of the null hypothesis. Nevertheless, the study found that the back-test P&L percentages were generally higher for the monthly time frame than for the daily time frame. This implies that traders should consider using a longer time frame for their technical analysis, as it may lead to higher returns. Additionally, the study found that Time Frame had a marginally significant effect on Back-test P&L, suggesting a weak influence. Therefore, the research question on the returns generated by the VORTEX indicator between daily and monthly time frames is partially supported by the results.

Overall, the findings of this study provide some insights into the effectiveness of Candlestick and Heikin-Ashi chart types and the importance of choosing an appropriate time frame for technical analysis. However, further research is needed to confirm these results and assess other factors that may impact the performance of these chart types. In the



meantime, traders and investors may wish to consider using both Candlestick and Heikin-Ashi chart types and exploring longer time frames for their technical analysis.

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