An Evaluation of Risk-Return Dynamics in The Indian Automobile Sector: A Study of Two-Wheeler and Four-Wheeler Companies

P. Roopa, Assistant Professor, Department of Business Management, Sri Padmavati Mahila Visvavidyalayam, Tirupati, Andhra Pradesh, India

G. Latha, Assistant Professor, Department of Business Management, Sri Padmavati Mahila Visvavidyalayam, Tirupati, Andhra Pradesh, India

Y. Suneetha, Assistant Professor, Department of Business Management, Sri Padmavati Mahila Visvavidyalayam, Tirupati, Andhra Pradesh, India

ABSTRACT

The Indian automobile industry is vital to the nation's economy, making substantial contributions to GDP, jobs, and technical development. With growing disposable incomes, a shift toward personal mobility, and increased consumer demand, the industry is expected to continue growing in 2024. This study compares companies in the two-wheeler and four-wheeler segments to examine the risk-return dynamics of equity securities in the Indian automobile industry. By examining stock performance over a five-year span (2019–2024), the study seeks to offer insightful information about the sector's investment potential, empowering investors to make better decisions. Key financial indicators including return, standard deviation, beta, and alpha are used in the study to evaluate risk and performance.

Given the sector's significance to the Indian economy and its changing environment, which includes a greater emphasis on electric cars (EVs), it is essential that investors understand these dynamics to manage risk and optimize investment strategies.

Keywords: *Automobile Industry, Alpha, Beta, GDP, Return, Standard Deviation*

Economic growth and investment decisions are significantly influenced by the Indian stock market. Because of its substantial GDP and employment contributions, the automotive industry stands out within this ecosystem as a significant indicator of economic health. The industry presents an excellent opportunity for investors to strike a balance between risk and return because of its changing technology and consumer preferences. This study compares companies in the two-wheeler and four-wheeler segments to analyse the risk-return dynamics of equity securities in the Indian automobile sector.

An important pillar of the Indian economy, the automobile sector makes a substantial contribution to GDP, employment, and technological advancement. The industry is expanding rapidly in 2024 owing to increased consumer demand, advances in technology, and strong governmental support.

Electric vehicles (EVs), two-wheelers, passenger cars, and commercial vehicles are some of the main segments of the diverse Indian automobile industry. Rising disposable incomes, a growing middle class, and a need for personal mobility have all contributed to the dominance of the two-wheeler and four-wheeler categories. Government programs that encourage the switch to electric transportation, such the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) scheme, further promote this expansion.

LITERATURE REVIEW

Aliu, F., Pavelkova, D., & Dehning, B. (2017)analyzed the risk-return tradeoffs in the Czech automotive industry. It finds that auto suppliers offer the best diversification benefits, lowest risk, and highest risk-return tradeoff. The study by Karthika, P., & Karthikeyan, P. (2011)analyzes the risk and return of selected stocks from different sectors in the BSE Sensex Index, focusing on tools like beta, standard deviation, and correlation. It highlights the risk-return trade-off and aids investors in making informed decisions based on stock performance.

The study by Khan, M. M. H., & Huq, U. R. (2012) examines the normality of risk and return distributions on the Dhaka Stock Exchange. It finds deviations from normal distribution and suggests inconsistencies in risk-return relationships, challenging the random walk theory. Lobo, S., & Bhat, G. S. (2021) in their research studied the risk-return patterns of Indian Financial Services sector stocks. It highlights India Infoline Finance Ltd's high returns and beta and demonstrates the importance of risk-return analysis for informed investment decisions. Öcal, H., & Kamil, A. A. (2021)analyze stock performance in the BIST 100 and KOMPAS 100 indices, using daily data from 2015 to 2020. Their findings suggest that portfolios based on top Sharpe ratio stocks outperform the indices, particularly when recalculated every three to six months for more reliable returns.

Patjoshi, P. K. (2016)examines the risk-return trade-off in India's stock market, focusing on banking stocks within the BSE 30. Using 15 years of secondary data, the study employs various statistical methods to analyze correlations and trends. Prabhu, R. N. (2018) in their

study analyzed the risk-return relationship in Nifty stocks, focusing on the banking sector. It finds varying volatility levels among stocks and identifies beta values that reflect stock performance relative to market movement.

The study by Pushpalatha, M., Srinivasan, J., & Shanmugapriya, G. (2019)analyzes the volatility and return relationship of selected financial service companies in the Nifty 50 index. It also evaluates market efficiency using Kolmogorov-Smirnov and Run tests. Savsani, M., & Rathod, U. (2018) in their paper analysed the risk-return relationship between the BSE Sensex and banking stocks (HDFC, ICICI, Axis, and SBI). Using data from 2005-2017, it explores the risk-return trade-off and beta constancy for these stocks. Subramanyam, P., & Kalyan, N. B. (2018) examines the risk and return analysis of selected securities in the Indian infrastructure sector, focusing on equity performance, risk assessment, and investment recommendations. The research suggests favouring long-term investments in Reliance and Unity infrastructure.

NEED FOR THE STUDY

A company's financial health and general economic trends can be inferred from the performance of the stock market. The risk-return characteristics of equity securities from selected automobile companies are examined in this study, and their investment potential is assessed by comparing them with benchmark returns. The information it provides on risk assessment, portfolio management, and return optimization enables investors to make informed decisions.

By bridging the gap between investment strategies and economic policy, this research contributes to both individual financial planning and the development of a robust financial ecosystem.

SCOPE OF THE STUDY

This study focuses on analysing the equity securities of six selected automobile companies, categorized into two segments: four-wheelers and two-wheelers. The four-wheeler segment includes Tata Motors Ltd, Maruti Suzuki India Ltd, and Mahindra Ltd, while the two-wheeler segment comprises TVS Motors Ltd, Bajaj Finance Ltd, and Hero MotoCorp Ltd.

The analysis is conducted for the five-year period from April 1, 2019, to March 31, 2024. The NSE Nifty index has been utilized as a benchmark to represent market returns, providing a basis for comparing the risk-return profiles of the selected securities.

OBJECTIVES OF THE STUDY

1. To analyze the risk-return performance and price fluctuations of selected two-wheeler and four-wheeler automobile companyshares during the study period.
2. To compare the performance of these stocks and identify the best-performing stock among those selected for the study.

HYPOTHESIS

H_0: There is no significant difference in the stock market performance of the companies selected for the study.

H_1: There is no significant difference in the stock market performance of the companies selected for the study.

RESEARCH METHODOLOGY

This study is primarily based on secondary data collected from reliable sources, including financial websites such as Yahoo Finance, NSE India, and BSE India. Additional data has been obtained from books, academic journals, newspapers, government records, and other credible online platforms.

To calculate market returns, the S&P CNX Nifty index was used as a benchmark. The risk-free rate of return was derived from the interest rate on SBI savings accounts. The study covers a period of five years, from April 1, 2019, to March 31, 2024. Analytical tools and techniques were employed to evaluate the data comprehensively.

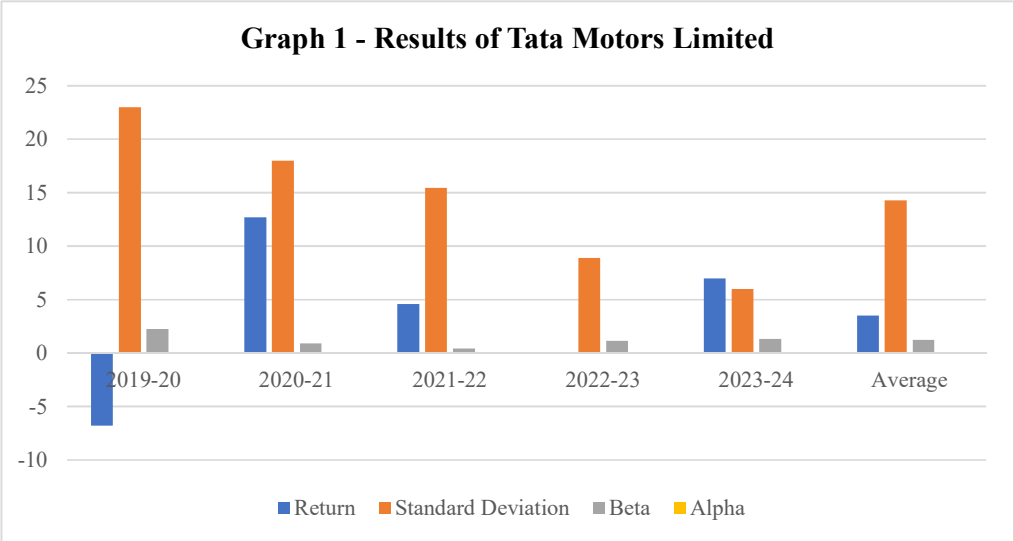
ANALYSIS AND INTERPRETATION

In the analysis of stock performance, various tools are used to assess risk and return. Monthly compounded annual average returns help calculate the price change of a stock over a month. Standard deviation measures risk, with higher values indicating greater volatility. Betaquantifies a stock's sensitivity to market movements, reflecting its systematic risk, while

alpha gauges the excess return compared to a market index like the S&P CNX Nifty. Additionally, statistical methods such as one-way ANOVA and averages are utilized to analyse and interpret the data, providing a comprehensive understanding of stock behaviour and performance of selected companies in the automobile industry.

Table 1 –ResultsofTataMotorsLimited

Variables	2019-20	2020-21	2021-22	2022-23	2023-24	Average
Return	-6.8	12.7	4.6	0.04	7	3.508
Standard Deviation	23	18	15.47	8.9	6	14.274
Beta	2.2306	0.9286	0.44	1.1439	1.341	1.21682
Alpha	-0.01	0.09	0.04	-0.002	0.04	0.0316



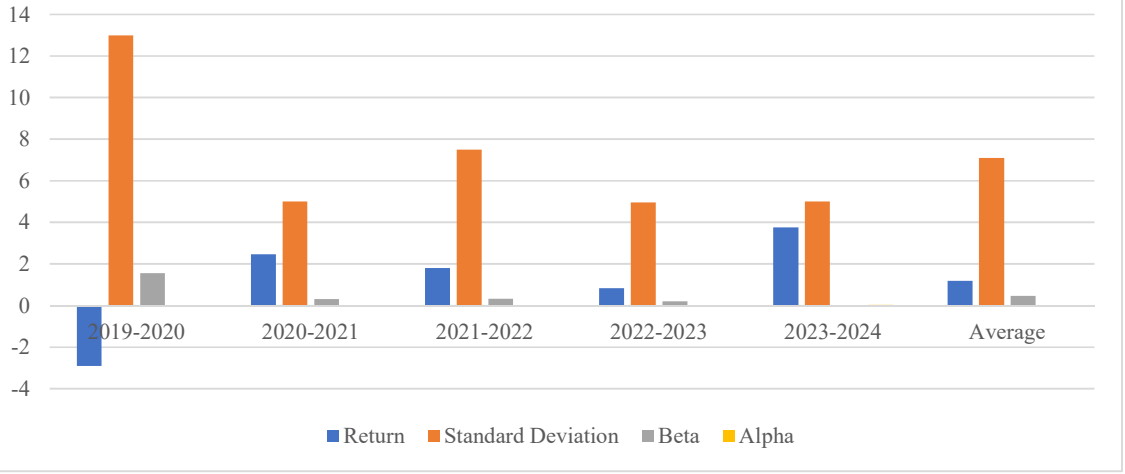
Source: Computed from data collected from finance.yahoo.com & nseindia.com

The table and graph present the performance of Tata Motors Ltd. from 2019 to 2024. Over this period, returns varied significantly, ranging from -6.8% in 2019-2020 to 12.7% in 2020-2021, with an average return of 3.51%. Volatility (standard deviation) showed a decreasing trend, indicating reduced risk. Beta values suggest high market sensitivity in the earlier years (2.23) but lower sensitivity in recent years (1.34). The average alpha of 0.0316 indicates slight outperformance relative to market expectations. Overall, Tata Motors exhibited moderate risk and modest returns with some periods of outperformance.

Table 2: ResultsofMaruthiSuzukiIndia Limited

Variables	2019-20	2020-21	2021-22	2022-23	2023-24	Average
Return	-2.9	2.47	1.8	0.84	3.75	1.192
Standard Deviation	13	5	7.5	4.96	5	7.092
Beta	1.55	0.31	0.33	0.2	-0.07	0.464
Alpha	0.01	0.01	0.01	0.01	0.04	0.016

Graph 2: Results of Maruthi Suzuki India Limited



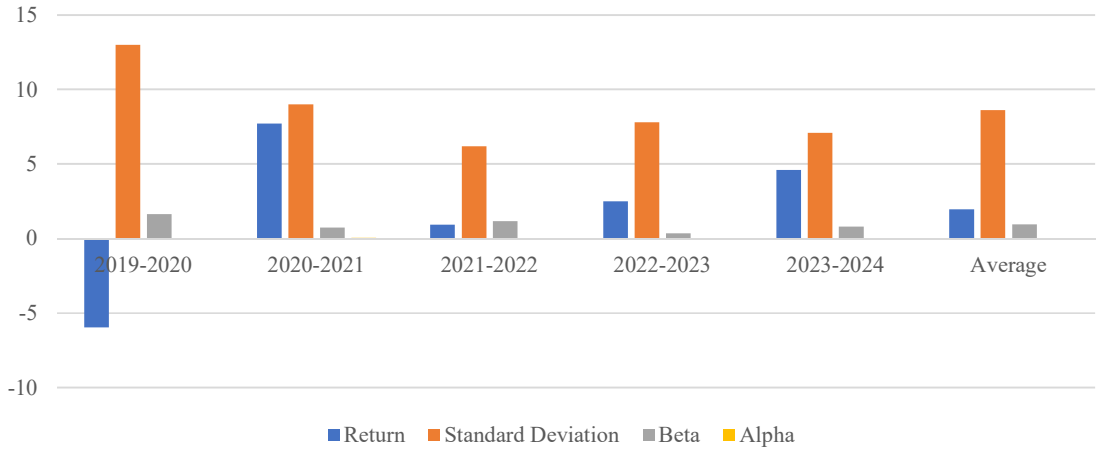
Source: Computed from data collected from finance.yahoo.com & nseindia.com

The table and graph present the financial performance of Maruti Suzuki Ltd. from 2019 to 2024. The company's returns were relatively modest, ranging from -2.9% in 2019-2020 to 3.75% in 2023-2024, with an average return of 1.19%. Volatility decreased over time, with standard deviation dropping from 13% in 2019-2020 to 5% in 2023-2024, indicating lower risk. Beta values suggest the company became less sensitive to market fluctuations, particularly in recent years, with an average beta of 0.464. Alpha remained positive but small, indicating slight outperformance relative to market expectations. Overall, Maruti Suzuki exhibited low risk and modest returns.

Table 3: Results ofMahindra&MahindraLimited

Variables	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	Average
Return	-5.95	7.7	0.93	2.49	4.6	1.954
Standard Deviation	13	9	6.2	7.8	7.1	8.62
Beta	1.63	0.75	1.17	0.34	0.81	0.94
Alpha	-0.02	0.05	-0.01	0.02	0.03	0.014

Graph 3: Results of Mahindra & Mahindra Limited



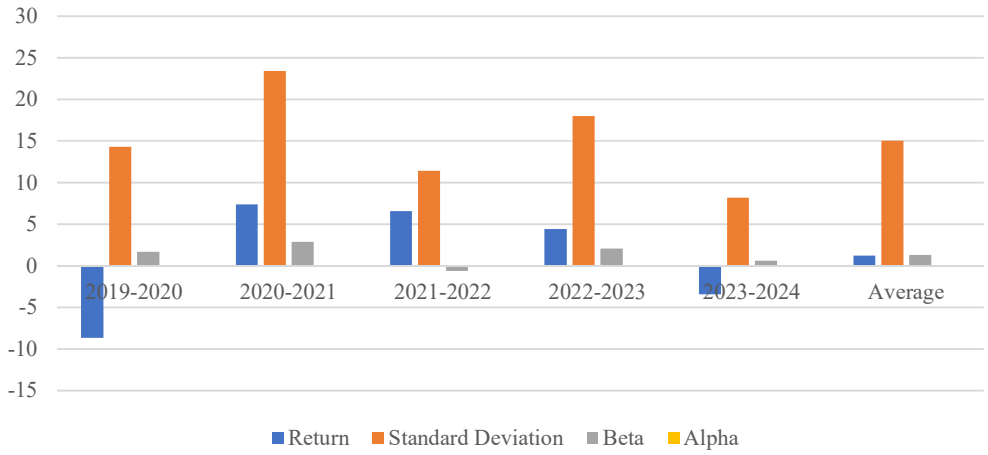
Source: Computed from data collected from finance.yahoo.com & nseindia.com

The table and graph show the financial performance of Mahindra & Mahindra Ltd. from 2019 to 2024. The company's returns ranged from -5.95% in 2019-2020 to 7.7% in 2020-2021, with an average return of 1.95%. Standard deviation decreased from 13% in 2019-2020 to 7.1% in 2023-2024, indicating a reduction in volatility. Beta values suggest that the company's sensitivity to market movements varied, with an average beta of 0.94, indicating lower-than-market volatility. The alpha remained relatively small, with an average of 0.014, suggesting slight underperformance compared to market expectations over the period.

Table 4: Results of TVS Motors Company Limited

Variables	2019-20	2020-21	2021-22	2022-23	2023-24	Average
Return	-8.65	7.38	6.56	4.42	-3.43	1.256
Standard Deviation	14.3	23.4	11.4	18	8.2	15.06
Beta	1.67	2.86	-0.6	2.06	0.61	1.32
Alpha	-0.04	-0.03	0.08	0.039	-0.05	-0.0002

Graph 4: Results of TVS Motors Company Limited



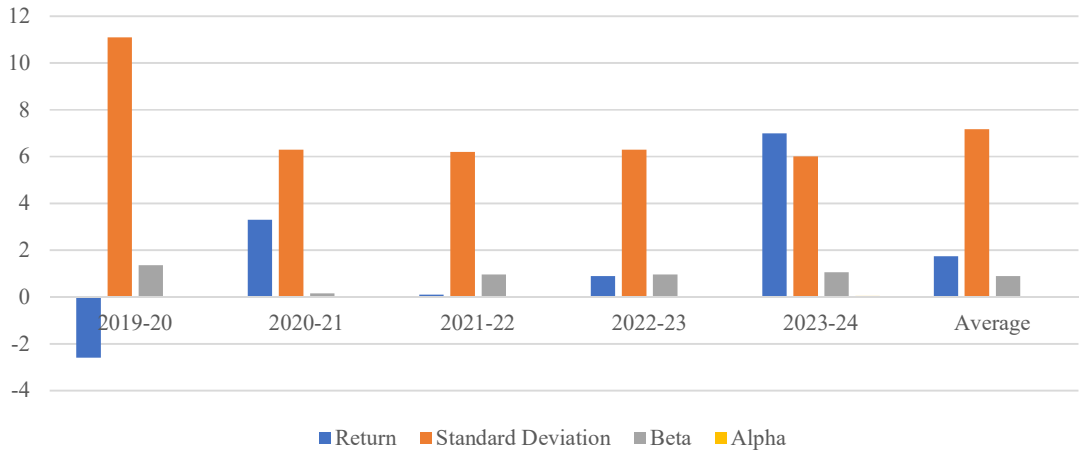
Source: Computed from data collected from finance.yahoo.com & nseindia.com

The table and graph show the financial performance of TVS Motors Ltd. from 2019 to 2024. The company experienced significant fluctuations in returns, ranging from -8.65% in 2019-2020 to 7.38% in 2020-2021, with an average return of 1.26%. Volatility, indicated by standard deviation, was notably high, peaking at 23.4% in 2020-2021, with an average of 15.06%, reflecting substantial risk. Beta values showed a high market correlation in most years, with an average of 1.32. The average alpha of -0.0002 suggests slight underperformance relative to the market, indicating that the returns did not meet risk-adjusted expectations.

Table 5: The Results of Bajaj Auto Limited

Variables	2019-20	2020-21	2021-22	2022-23	2023-24	Average
Return	-2.6	3.3	0.1	0.9	7	1.74
Standard Deviation	11.1	6.3	6.2	6.3	6	7.18
Beta	1.36	0.16	0.96	0.97	1.05	0.9
Alpha	0.01	0.03	-0.02	0.01	0.05	0.016

Graph 5: The Results of Bajaj Auto Limited

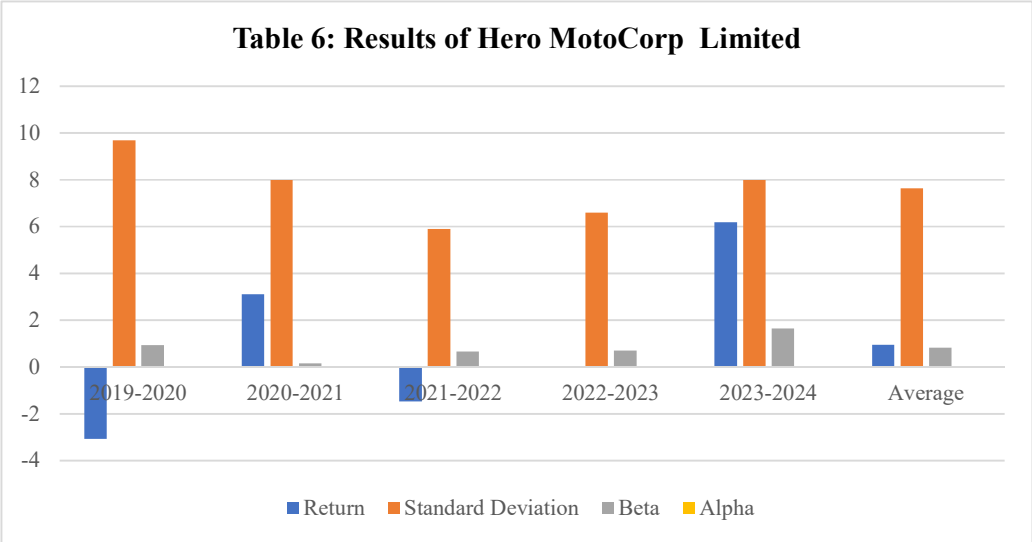


Source: Computed from data collected from finance.yahoo.com & nseindia.com

The table and graph illustrate the performance of Bajaj Auto Ltd. over the period 2019-2024. Returns showed some fluctuation, with a low of -2.6% in 2019-2020 and a high of 7% in 2023-2024, yielding an average return of 1.74%. The standard deviation, reflecting volatility, averaged 7.18%, indicating moderate risk, with relatively consistent volatility across the years. Beta values suggest a lower sensitivity to market movements, averaging 0.9, meaning the stock was less volatile than the broader market. The positive average alpha of 0.016 indicates a slight outperformance compared to market expectations, though the outperformance was modest.

Table 6: Results of Hero Moto Corp Limited

Variables	2019-20	2020-21	2021-22	2022-23	2023-24	Average
Return	-3.07	3.11	-1.46	-0.03	6.19	0.948
Standard Deviation	9.7	8	5.9	6.6	8	7.64
Beta	0.94	0.15	0.65	0.71	1.64	0.818
Alpha	-0.01	0.03	-0.03	0	0.03	0.004



Source: Computed from data collected from finance.yahoo.com & nseindia.com

The table and graph show the financial performance of Hero MotoCorp Ltd. from 2019 to 2024. The company experienced fluctuating returns, ranging from -3.07% in 2019-2020 to 6.19% in 2023-2024, with an average return of 0.95%. Volatility, as indicated by standard deviation, averaged 7.64%, suggesting moderate risk, with slight variations in volatility over the years. Beta values indicate relatively low market sensitivity, with an average of 0.82, meaning the stock was less volatile than the broader market. The average alpha of 0.004 suggests minimal outperformance relative to market expectations, indicating the company's returns were broadly in line with risk.

Table 7: Consolidated Results of the Companies from 2019-20 to 2023-24

Company Name	Average Return	Average Standard Deviation	Average Beta	Average Alpha
Four-Wheeler Segment				
Tata Motors	3.508	14.274	1.22	0.0316
Maruti Suzuki	1.192	7.092	0.46	0.016
Mahindra	1.954	8.62	0.94	0.014
Two-Wheeler Segment				
TVS Motor Company	1.256	15.06	1.32	-0.0002
Bajaj Auto Ltd	1.74	7.18	0.9	0.016
Hero MotoCorp Ltd	0.948	7.64	0.82	0.004

Source: Computed from data collected from finance.yahoo.com & nseindia.com

Four-Wheeler Segment: In the four-wheeler segment, Tata Motors stands out as the best-performing company, delivering the highest average return (3.508%) and a positive alpha (0.0316), indicating significant outperformance relative to market expectations. However, this comes with the highest risk, as evidenced by its standard deviation and beta, suggesting high sensitivity. Maruti Suzuki, with the lowest average return, demonstrates the least risk in this segment, with a standard deviation of 7.092% and a beta of 0.46, making it a stable choice for risk-averse investors. Mahindraoffers moderate returns (1.954%) with a balanced risk profile, performing close to market expectations with a slightly positive alpha (0.014). Overall, while Tata Motors delivers the highest returns, investors must weigh its higher risk against Maruti Suzuki's stability or Mahindra's balanced profile.

Two-Wheeler Segment: In the two-wheeler segment, Bajajemerges as the best performer, achieving a favourable balance between returns and risk while maintaining a positive alpha, indicating consistent outperformance relative to market expectations. TVS Motors, despite

having the highest risk (standard deviation of 15.06% and beta of 1.32), provides moderate returns but underperforms the market slightly with a negative alpha. Hero MotoCorp, while delivering the lowest average return, offers a stable investment option with low standard deviation of 7.64% and a beta of 0.82, showing less sensitivity to market changes. Bajaj stands out for combining steady returns with low risk, while TVS Motors appeals to risk-tolerant investors, and Hero MotoCorp caters to those seeking stability overgrowth.

Table 8:Table Showing One Way ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	25.09681	5	5.019361	0.211655	0.953121	2.772853
Within Groups	426.8664	18	23.7148			
Total	451.9633	23				

Source: Computed from data collected from finance.yahoo.com & nseindia.com

From the above table of the one-way ANOVA, it is inferred that, the difference between the groups has a sum of squares of 25.10, an F-statistic of 0.21, and a P-value of 0.953. There is not a significant distinction between the group means, since the P-value is significantly higher than the usual significance level of 0.05, preventing us from rejecting the null hypothesis. The total of squares for the within-group variation is 426.87, which represents the variation within each group. The overall analysis suggests that the H_0 is accepted. It implies that that there is no significant difference in the performance of the companies selected for the study.

RESULTS AND DISCUSSION

1. In the four-wheeler segment investors seeking higher returns but willing to take on greater risk may consider Tata Motors. For conservative investors prioritizing stability, Maruti Suzuki is a suitable option. Mahindra presents a balanced choice for moderate risk-return expectations.

2. In two-wheeler segment Bajaj Auto offers the best balance of returns and risk, making it an attractive choice for long-term investments. TVS Motors may appeal to risk-tolerant investors, while Hero MotoCorp is recommended for those prioritizing low risk and steady performance.
3. To improve investors' comprehension of stock performance, it is also recommended that regulatory agencies promote openness and effective disclosures. Retail investors can also make better decisions by supporting financial literacy initiatives that emphasize risk assessment and portfolio diversification.

SCOPE FOR FUTURE RESEARCH

1. A more comprehensive knowledge of the performance of the automotive industry would be obtained by broadening the analysis to include a larger variety of businesses from the commercial vehicle, electric vehicle (EV), and ancillary industries sectors.
2. A more thorough understanding of market behaviour may be obtained by looking at how macroeconomic factors like GDP growth, inflation, interest rates, and fuel costs affect the stock performance of automakers.
3. An analysis of the competitive advantages, global market positioning, and investment potential of Indian automobile companies can be aided by comparing them to their international counterparts.

CONCLUSION

The risk-return characteristics of a few selected companies in the two- and four-wheeler divisions of the Indian automobile industry are examined in this study. Overall, the four-wheeler segment performs better than the two-wheeler segment, providing greater returns and more reliable performance in comparison to market expectations. This suggests that the four-wheeler category is experiencing a more robust growth trajectory and improved resilience to market changes.

With growing urbanization, increased disposable incomes, and government subsidies for electric cars (EVs), the Indian auto industry has bright prospects for the future. Companies that make investments in digital transformation, sustainability, and innovation are well-positioned to take advantage of new opportunities and strengthen their position in a sector that is evolving rapidly.

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