# Risk and Return : A Case of Selected Automobile Stocks Listed at the National Stock Exchange of India

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## Abstract

**Risk factors, arising due to the dynamic business environment, are expected to have a great influence on the stock market returns. Investors need to collect timely information on these risk factors so that investments can be revisited, and necessary revision should be done to reduce their impact on investment returns. This research attempted to study risk and return of segments of different automobile companies listed on the National Stock Exchange of India. Returns were measured in terms of historical stock returns and reward to risk ratio. Risk was measured as standard deviation and beta. The automobile segments selected for the study were cars, LCVs/HCVs, motorcycles, scooters, and tractors. The share price data of 15 companies were collected for a period from 2009 – 2019. The returns and risk were measured for four-time tenures, namely 1-year tenure, 3-year tenure, 5-year tenure, and 10-year tenure. The basic objective for this was to ascertain the risk and return variation across time and segments. The literature evidence showed that only a very few studies attempted to study the change in risk and returns employing different time tenures. Maruti Suzuki India Ltd. recorded the highest 5-year returns (20%) with the least risk (388%) in the passenger segment. Ashok Leyland Ltd. recorded the highest 5-year returns (18%) with the least total risk (574%) and a positive beta value of 1.11 in the LCVs/HCVs segment. Eicher Motors Ltd. recorded the highest 10-year rate of return (41%) with a total risk of 521% and market risk of 0.77 in the motorcycle segment. Atul Auto Ltd. recorded the highest 10-year returns (30%) with a total risk of 714% and market risk of 0.54 in the scooters and three-wheeler segment. Escorts Ltd. recorded a 5-year return of 41% with a least total risk of 655% and had a 5-year market risk of 1.07 in the tractors segment.**

***Keywords :*** **historical returns, standard deviation, beta, automobile segments, risk, time tenures**

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The Indian automobile industry became the fourth largest in the automobile market in the year 2019. The two-wheeler segment recorded a huge volume of sales compared to the other segments in the automobile sector during the year. The reason for this may be due to the continually growing middle-income class and youth who prefer to buy two-wheelers. Moreover, the automobile companies have penetrated the rural markets that also led to the growth of the automobile sector. As per the Society of Indian Automobile Manufacturer

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performance report (2019–20), apart from two-wheelers, there is an increasing demand for passenger, commercial, and three-wheelers vehicles too. The gross turnover of the automobile sector has increased from 47 USD million in the year 2011–12 to 67 USD million in the year 2016–17. The same report highlighted that the automobile sector recorded a CAGR of 6.94% (in vehicle sales) between the financial years 2015–16 and 2019–20.

Further, two-wheelers, passenger vehicles, three-wheelers, and commercial vehicles constituted 74%, 14%, 11%, and 1% of total automobile exports, respectively. The sales of electric vehicles, premium motorbikes, and luxury cars were also quite promising in the financial year 2019–20. Against this backdrop, it seems necessary to investigate the performance of the automobile sector stocks in terms of risk-return analysis from the investors' point of view. The present study attempts to do the same. Though there are several studies on risk and return analysis of automobile stocks in India, only a few have segregated the analysis in different timelines. To the authors' knowledge, no study has been undertaken to compare the risk and returns of firms in different automobile segments based on time intervals. This research work aims at measuring stock returns, standard deviation (total risk), and beta of selected automobile firms (listed at National Stock Exchange of India) from different segments such as two-wheeler, passenger cars, commercial vehicles, and tractors. This research also aims to identify suitable stocks to invest in, based on the risk-return analysis and the tenure of investment.

## Review of Literature

Poornima and Swathiga (2017) applied capital asset pricing model to study the relationship between risk and return of the automobile and information technology sectors. It was established that the automobile companies generated positive returns with low risk, whereas the information technology sector generated negative returns with high risk. On the contrary, a study by Gopalakrishnan and Akarsh (2017) highlighted that investment in equity shares of automobile sectors involves high returns and high expected risk. Similarly, Balaji et al. (2018) employed risk and return analysis on equity shares of five selected automobile industry companies. The analysis results, for the period of 5 years from 2012 – 2017, suggested that low-risk and high-return investors invested in Eicher Motors and Force Motors. The variance of return, standard deviation, alpha, and beta were shown to be the frequently used measures for making decisions by the investors.

Similarly, Navya and Reddy (2018) conducted risk and return analyses of selected automobile stocks by collecting data from 2012 – 2017. The findings indicated that Maruti Suzuki exhibited less risk and a positive correlation with the return. In Vikkraman and Varadharajan's (2009) study, return predictor (alpha) and systematic risk (Beta) were found to be good indicators while making an investment decision in the case of the automobile sector. Krishnaprabha and Vijayakumar (2015) carried out risk-return analysis for 25 companies, based on high market capitalization, which were listed on the Bombay stock exchange. The study focused on investors who wanted to avoid risk and maximize the returns from their investment and used closing price data of stocks from January 1, 2010 to December 31, 2014. Findings indicated that long-term investments fetched maximum benefits because of less volatility in the stock prices. Also, IT, FMCG, and pharmaceutical stocks offered better returns compared to the banking and automobile sectors. Karthika and Karthikeyan (2011) performed a comparative risk, return, and liquidity analysis of selected BSE Sensex stocks from different sectors like IT, automobiles, banking, pharmaceutical, and oil sectors. Analysis of data for the period from 2008 – 2011 suggested that banking and power sectors exhibited high risk compared to pharmaceutical, housing-related, and FMCG sectors.

It is well-acknowledged that any new investment should always be made after considering the external and internal factors in the financial and economic system. A positive relationship tends to exist between risk and returns for both the securities and the portfolios (Vijayalakshmi, 2017). In a study (Mangala & Lohia, 2017) carried out for the period from 1997–2014, stock returns significantly changed between the first half of a month

and its second half in all the nine emerging markets. Further, consistent and sustainable growth in terms of asset size and forward-looking approach were found to be very much significant in explaining the stock returns (Arora et al., 2016). The firm's size was also found to have a significant and strong effect on risk and returns in the Indian stock market; whereas the price to book ratio was found to be sensitive to only stock returns (Balakrishnan & Maiti, 2017).

Extensive research has already been carried out at the macro-level, either on a global level or on overall market indices, using different econometric tools and analysis. These kinds of research, of course, elucidated a broad picture of stock market behavior. However, from investors' point of view, investing based on the sectoral performance and different investment horizons is one of the utmost priorities, and research on this theme is still lagging. Thus, the present research work attempts to throw light on risk and return trends during different time horizons and across different companies.

Based on the review of literature, the following hypotheses have been developed:

- **$H_{01}$ :** Companies belonging to the passenger car segment do not vary significantly in terms of reward to risk ratio.
- **$H_{02}$ :** Companies belonging to LCVs/HCVs segment do not vary significantly in terms of reward to risk ratio.
- **$H_{03}$ :** Companies belonging to motorcycle segment do not vary significantly in terms of reward to risk ratio.
- **$H_{04}$ :** Companies belonging to scooter and three-wheeler segment do not vary significantly in terms of reward to risk ratio.
- **$H_{05}$ :** Companies belonging to tractor segment do not vary significantly in terms of reward to risk ratio.
- **$H_{06}$ :** Reward to risk ratio of passenger car segment companies does not vary significantly across time periods.
- **$H_{07}$ :** Reward to risk ratio of LCVs/HCVs segment companies does not vary significantly across time periods.
- **$H_{08}$ :** Reward to risk ratio of motorcycles segment companies does not vary significantly across time periods.
- **$H_{09}$ :** Reward to risk ratio of scooters and three wheelers segment companies does not vary significantly across time periods.
- **$H_{10}$ :** Reward to risk ratio of tractors segment does not vary significantly across time periods.

## Research Methodology

### *Database, Indicators, and Study Period*

The data (i.e. closing price and dividend per share) required for analysis were collected from the Capitaline database, a secondary source of data. The study period included data from January 1, 2010 to December 31, 2019.

The indicators used for the study were average return, standard deviation (S.D.), beta, and risk-reward ratio. These measures were calculated for four tenures listed in Table 1.

**Table 1.*Time Period of the Study***

| Time interval | Tenure details with abbreviation |
|---|---|
| 2010–11 | 1Y indicates 1-year tenure |
| 2010–11 to 2012–13 | 3Y indicates 3-year tenure |
| 2010–11 to 2014–15 | 5Y indicates 4-year tenure |
| 2010–11 to 2018–19 | 10Y indicates 10-year tenure |

### Stock Return Indicator

The study used historical returns of equity stocks of different automobile segments. Stock returns refer to the rate of return that compares the beginning price of the stock, the ending price of the stock, and the annual income. The formula for calculating historical returns is shown in equation (1).

$$\begin{aligned} &\textit{Annual Rate of return (or) stock return or historical return} \\ &= \left( \frac{\textit{Ending price} - \textit{Beginning Price} + \textit{Annual Income}}{\textit{Beginning Price}} \right) \times \textit{No. of Days traded} \end{aligned} \quad (1)$$

### Risk

Risk refers to the variability of the stock return from the expected returns. It is calculated with the help of S.D. The formula for calculating standard deviation is shown in equation (2).

$$\textit{Standard Deviation} = \sqrt{\frac{\sum (R_i - \overline{R})^2}{n-1}} \quad (2)$$

$R_i$ = Individual observation of stock returns,

$\overline{R}$ = Average or expected stock returns,

$n$ = no. of observations.

### Beta/Systematic Risk Indicator

Beta measures the sensitivity of stock returns to changes in the stock index returns. Higher the beta, higher is the sensitivity of stocks to stock market changes and vice-versa. The formula to calculate beta value is shown in equation (3).

$$\beta = \frac{\textit{Covariance (market return, stock return)}}{\textit{variance (market return)}} \quad (3)$$

### Reward to Risk Ratio Indicator

Reward to risk ratio is measured as average returns generated per unit of risk. The higher the ratio, the better the returns generated from the investment. The formula to calculate reward to risk ratio is shown in equation (4).

$$\textit{Reward to Risk Ratio} = \frac{\textit{Average returns}}{\textit{Standard deviation}} \quad (4)$$

### Sample Size

The listed automobile companies, whose data were available for the calendar years 2009–2019, were considered for the study. The same criterion was applied to select segment-wise companies too. The sampled firms are shown in Table 2.

**Table 2.** ***Sample Firms Considered for the Study***

| Segment | Name of the Company | Abbreviation |
|---|---|---|
| Auto Cars | Hindustan Motors Ltd. | HM |
| | Mahindra and Mahindra Ltd. | MM |
| | Maruti Suzuki Ltd. | MS |
| Auto LCVs/HCVs | Ashok Leyland Ltd. | AL |
| | Force Motors Ltd. | FM |
| | SML ISUZU Limited | SML |
| | Tata Motors Ltd. | TM |
| Auto – Motorcycles | Eicher Motors Ltd. | EM |
| | Hero Moto Corp. Limited | HMCL |
| | TVS Motors co Ltd. | TVS |
| Auto Scooters | ATUL Auto Limited | ATUL |
| | Bajaj Auto Limited | BAL |
| | Scooters India Limited | SIL |
| Auto Tractors | Escorts Ltd. | ES |
| | VST Tillers Tractors Ltd. | VST |

## Data Analysis and Results

### *Average Return of Passenger Car Equity Stocks*

Table 3 exhibits the risk and return of automobile stocks in the passenger car segment. It can be observed that MSL recorded the highest positive stock returns throughout the study period when compared to the other two companies MM and HL. The return of this company gradually increased over a period, recording the highest return of 20% during ten-year and five-year periods followed by 15% during three-year tenure and 5% during one-year time period.

HM recorded a negative return of 5% during one-year tenure and a positive return of 6%, 7%, and 1% during three-year, five-year, and 10-year tenures respectively. When moved from one-year to 10-year tenure, the return of this company was found to be gradually decreasing. MM recorded negative returns of 36 %, 15 %, 8 %, and 1% during one-year, three-year, five-year, and 10-year tenure, respectively.

### *Total Risk (Standard Deviation) of Passenger Car Equity Stocks*

MSL recorded lesser risk and higher return compared to other securities during three-year, five-year, and 10-year tenures. HM recorded the highest standard deviation among all the three companies, followed by MM. Overall, the risk of investment in MM and HM is relatively higher than MSL and correspondingly, their returns were not encouraging from an investment point of view. The data relating to the risk of the passenger segment is shown in Table 3.

### *Beta (Systematic Risk) of Passenger Car Equity Stocks*

As can be noted in Table 3, all the companies recorded positive beta values. This means that the stock returns

**Table 3.** ***Risk and Return Analysis of Equity Stocks of Passenger Car Companies***

| Indicators | Tenure/ Term | Hindustan Motors Ltd. (*HM*) | Mahindra and Mahindra Ltd. (*MM*) | Maruti Suzuki Ltd. (*MSL*) |
|---|---|---|---|---|
| Average Returns (%) | 1Y | (18) | (36) | 5 |
| | 3Y | 6 | (15) | 15 |
| | 5Y | 7 | (8) | 20 |
| | 10Y | 1 | 1 | 20 |
| *S.D.* (%) of Returns | 1Y | 789 | 457 | 477 |
| | 3Y | 788 | 613 | 388 |
| | 5Y | 830 | 542 | 393 |
| | 10Y | 825 | 557 | 424 |
| Beta –Systematic Risk | 1Y | 0.55 | 0.98 | 1.10 |
| | 3Y | 0.65 | 0.98 | 1.06 |
| | 5Y | 0.75 | 0.92 | 0.97 |
| | 10Y | 0.75 | 0.96 | 0.99 |
| Reward to Risk Ratio | 1Y | (0.02) | (0.08) | 0.01 |
| | 3Y | 0.01 | (0.02) | 0.04 |
| | 5Y | 0.01 | (0.02) | 0.05 |
| | 10Y | 0.00 | 0.00 | 0.05 |

***Note.*** Figures in brackets indicate negative values.

move in the same direction as that of stock market returns. MSL recorded the highest beta during all tenures of the study, followed by MM and HM.

### *Reward to Risk Ratio of Passenger Car Equity Stocks*

Reward to Risk ratio values of passenger car segments for different periods is displayed in Table 3. Reward to risk ratio is found to be positive and maximum for MSL during all the tenures. However, for the other two companies, it is lower and not much encouraging from an investment point of view.

Table 4 shows the comparison of reward to risk ratio for passenger segment across time and across companies as well. The *p*-value for variation of reward to risk ratio among passenger car companies is less than 0.05 level of significance. Thus, $H_{01}$ is rejected. This indicates that variation in reward to risk ratio is statistically significant across *different companies* in the passenger segment. Further, the *p*-value for variation in reward to risk ratio of passenger car segment across periods is also less than 0.05 level of significance and therefore, even $H_{02}$ is rejected. This means that reward to risk ratio of the passenger car segment varies significantly across time periods.

### *Average Return of LCVs/HCVs Equity Stocks*

Table 5 exhibits the risk and return of automobile stocks in the LCVs/HCVs segment. It can be highlighted that AL recorded the highest positive stock returns during different tenures of three-year, five-year, and 10-year when compared to the other three companies FM, SM, and TM. FM recorded positive returns during the tenures of five-year and 10-year. It also recorded the highest return of 23% during the tenure of 10-year. AL and SM recorded a similar return of 15% each during the 10-year tenure. AL, SM, and FM are seen to generate much better returns in the 10-year period compared to the other tenures.

**Table 4.** ***Mean Comparison of Reward to Risk Ratio for the Passenger Car Segment***

| Source of Variation | *SS* | *Df* | *MS* | *F* | *p*-value | *F* - crit |
|---|---|---|---|---|---|---|
| Companies | 0.0087 | 2 | 0.004 | 28.45 | 0.00 | 5.143253 |
| Time period | 0.0043 | 3 | 0.001 | 9.48 | 0.01 | 4.757063 |
| Error | 0.0009 | 6 | 0.000 | | | |
| Total | 0.0140 | 11 | | | | |

***Note.*** SS stands for sum of squares, *df* stands for degrees of freedom, and MS stands for Mean Square.

**Table 5.** ***Risk and Return of Automobile – Equity Stock of LCVs/HCVs Companies***

| Indicators | Tenure/ Term | Ashok Leyland Ltd.(*AL*) | Force Motors Ltd. (*FM*) | SML ISUZU Limited (*SM*) | Tata Motors Ltd. (*TM*) |
|---|---|---|---|---|---|
| Average Returns (%) | 1Y | (11.00) | (31.00) | (7.00) | 22.00 |
| | 3Y | 10.00 | (35.00) | (15.00) | (23.00) |
| | 5Y | 18.00 | 9.00 | 1.00 | (12.00) |
| | 10Y | 15.00 | 23.00 | 15.00 | 1.00 |
| *S.D.* (%) of Returns | 1Y | 677.00 | 648.00 | 684.00 | 875.00 |
| | 3Y | 582.00 | 531.00 | 541.00 | 647.00 |
| | 5Y | 574.00 | 654.00 | 641.00 | 628.00 |
| | 10Y | 637.00 | 714.00 | 670.00 | 726.00 |
| Beta –Systematic Risk | 1Y | 1.29 | 0.67 | 0.56 | 1.56 |
| | 3Y | 1.18 | 0.71 | 0.53 | 1.49 |
| | 5Y | 1.11 | 0.84 | 0.77 | 1.49 |
| | 10Y | 1.03 | 0.77 | 0.63 | 1.52 |
| Reward to Risk Ratio | 1Y | (0.02) | (0.05) | (0.01) | 0.03 |
| | 3Y | 0.02 | (0.07) | (0.03) | (0.04) |
| | 5Y | 0.03 | 0.01 | 0.00 | (0.02) |
| | 10Y | 0.02 | 0.03 | 0.02 | 0.00 |

***Note.*** Figures in brackets indicate negative values.

### *Risk/Standard Deviation of LCVs/HCVs Equity Stocks*

Table 5 displays risk values of LCVs/HCVs equity stocks. TM recorded the highest risk during one-year tenure, followed by SM, AL, and FM. TM also recorded the highest risk during three-year tenure, followed by AL, SM, and FM. But, FM recorded the highest risk during five-year tenure, followed by SM, TM, and AL. Again, TM recorded the highest risk during 10-year tenure, followed by FM, SM, and AL.

### *Beta (Systematic Risk) of LCVs/HCVs Equity Stocks*

Table 5 shows the beta values of LCVs/HCVs equity stocks. It can be found that all the stocks in this segment recorded positive beta values. AL and TM have recorded beta values of more than 1, which means that these stocks carry higher market risks compared to other stocks. FM and SM have recorded beta values lesser than 1, meaning that comparatively carry lesser market risks as compared to other firms.

**Table 6.** ***Mean Comparison of Reward to Risk Ratio for LCVs/HCVs Car Segment***

| Source of Variation | *SS* | *Df* | *MS* | *F* - value | *p*-value | *F* - crit |
|---|---|---|---|---|---|---|
| Companies | 0.008 | 2 | 0.004 | 28.45 | 0.00 | 5.143 |
| Time period | 0.004 | 3 | 0.001 | 9.48 | 0.01 | 4.76 |
| Error | 0.000 | 6 | 0.000 | | | |
| Total | 0.013 | 15 | | | | |

***Note.*** SS stands for sum of squares, *df* stands for degrees of freedom, and MS stands for mean square.

### *Reward to Risk Ratio of LCVs/HCVs Equity Stocks*

Reward to Risk ratios, for different tenures, is encompassed in Table 5. Reward to risk ratio is negative in the case of one-year and three-year tenures for the majority of the firms. Except for TM in five-year tenure, all firms recorded positive reward to risk ratio during five-year and 10-year periods.

Table 6 shows the comparison of reward to risk ratio for LCVs/HCVs car segment across time and companies. The *p*-value for variation of reward to risk ratio among LCVs/HCVs car companies is less than 0.05 level of significance. Thus, $H_{03}$ is rejected. This indicates that reward to risk ratio is statistically significant and different across different companies in LCVs/HCVs segment. Further, the *p*-value for variation in reward to risk ratio of LCVs/HCVs car segment across periods is also less than 0.05 level of significance, implying rejection of $H_{04}$. This means that reward to risk ratio of LCVs/HCVs car segment varies significantly across time periods.

### *Average Return of Motorcycles / Mopeds Equity Stocks*

Table 7 exhibits the risk and return of automobile stocks in the Motorcycles / Mopeds segment. EM recorded positive returns during all tenures of the study. Moreover, its returns gradually increased from 5% in one-year tenure to 41% in 10-year tenure. HMC generated maximum losses (–16%) in one-year period. But, it soon generated positive returns in the subsequent tenures. TVS recorded negative returns in the tenure of one-year, followed by a gradual increase in returns between three-year tenure and 10-year tenure.

### *Risk/Standard Deviation of Motorcycles / Mopeds Equity Stocks*

Table 7 displays risk values of Motorcycles/ Mopeds equity stocks. EM recorded the highest risk during both one-year tenure and three-year tenure, followed by TVS and HMC.TVS recorded the highest risk during both five-year tenure and 10-year tenure, followed by EM and HMC.

### *Beta (Systematic Risk) of Motorcycles / Mopeds Equity Stocks*

It can be observed, in Table 7, that all the stocks in this segment recorded positive beta values. EM recorded beta values of more than one during the majority of the tenures, which suggests that this stock carries higher risks compared to the other stocks. Similarly, FM and SM have recorded beta values lesser than 1, implying that they carry, relatively, lesser risks compared to the other firms.

### *Reward to Risk Ratio of Motorcycles / Mopeds Equity Stocks*

Reward to risk ratio values for different periods are displayed in Table 7. Reward to risk ratio is positive for EM during all tenures of the study. HMC recorded a negative reward to risk ratio during the tenure of 1-year and

**Table 7.** ***Risk and Return of Automobile – Equity Stocks of Motorcycle Companies***

| Indicators | Tenure/ Term | Eicher Motors Ltd. (*EM*) | Hero Moto Corp. Ltd. (*HMC*) | TVS Motors Ltd. (*TVS*) |
|---|---|---|---|---|
| Average Returns (%) | 1Y | 5 | (16) | (13) |
| | 3Y | 6 | (1) | 14 |
| | 5Y | 13 | 1 | 17 |
| | 10Y | 41 | 11 | 29 |
| *S.D.* (%) of Returns | 1Y | 584 | 497 | 565 |
| | 3Y | 483 | 407 | 481 |
| | 5Y | 496 | 396 | 503 |
| | 10Y | 521 | 428 | 650 |
| Beta –Systematic Risk | 1Y | 1.12 | 1.01 | 1.13 |
| | 3Y | 1.07 | 0.93 | 1.06 |
| | 5Y | 1.02 | 0.83 | 0.95 |
| | 10Y | 0.77 | 0.78 | 0.98 |
| Reward to Risk Ratio | 1Y | 0.01 | (0.03) | (0.02) |
| | 3Y | 0.01 | 0.00 | 0.03 |
| | 5Y | 0.03 | 0.00 | 0.03 |
| | 10Y | 0.08 | 0.03 | 0.04 |

***Note.*** Figures in brackets indicate negative values.

**Table 8.** ***Mean Comparison of Reward to Risk Ratio for the Motorcycle Segment***

| Source of Variation | *SS* | *Df* | *MS* | *F* | *p*-value | *F*-crit |
|---|---|---|---|---|---|---|
| Companies | 0.0023 | 2 | 0.0011 | 6.27 | 0.034 | 5.14 |
| Time period | 0.0065 | 3 | 0.0021 | 11.80 | 0.006 | 4.76 |
| Error | 0.0011 | 6 | 0.0002 | | | |

***Note.*** SS stands for sum of squares, *df* stands for degrees of freedom, and MS stands for mean square.

3-year, zero in five-year tenure, and positive in 10-year tenure. The majority of the firms recorded a positive reward to risk ratio in five-year and 10-year tenures. Except for one-year tenure, TVS recorded a positive reward to risk ratio during all the other tenures.

Table 8 shows the comparison of reward to risk ratios for motorcycles / mopeds segment across time and companies. The *p*-value for variation of reward to risk ratio among motorcycles / moped companies is less than 0.05 level of significance. Thus, $H_{05}$ is rejected. This indicates that reward to risk ratio is statistically significant and different across different companies in the motorcycles/mopeds segment. Further, the *p*-value for variation in reward to risk ratio of motorcycles / mopeds segment across tenures is less than 0.05 level of significance. Thus, $H_{06}$ is also rejected. This means that reward to risk ratio of motorcycles / mopeds segment varies significantly across time periods.

### *Average Return of Scooters and Three Wheeler Equity Stocks*

Table 9 exhibits the risk and return of automobile stocks in the scooters and three-wheelers segment. BA and SI

**Table 9.** ***Risk and Return of Equity Stocks of Scooters and Three Wheeler Companies***

| Indicators | Tenure/ Term | ATUL Auto Limited (*ATU*) | Bajaj Auto Limited (*BA*) | Scooter India Limited (*SI*) |
|---|---|---|---|---|
| Average Returns (%) | 1Y | (6) | 604 | 12 |
| | 3Y | (10) | 494 | 7 |
| | 5Y | (13) | 532 | 12 |
| | 10Y | 30 | 714 | 15 |
| *S.D.* (%) of Returns | 1Y | 20 | 342 | 880 |
| | 3Y | 11 | 341 | 830 |
| | 5Y | 10 | 363 | 793 |
| | 10Y | 13 | 459 | 833 |
| Beta –Systematic Risk | 1Y | 12 | 880 | 0.5 |
| | 3Y | 7 | 830 | 0.46 |
| | 5Y | 12 | 793 | 0.34 |
| | 10Y | 15 | 833 | 0.34 |
| Reward to Risk Ratio | 1Y | 0.00 | (0.07) | 0.01 |
| | 3Y | 0.05 | (0.02) | 0.01 |
| | 5Y | 0.06 | 0.00 | 0.02 |
| | 10Y | 0.04 | 0.03 | 0.02 |

***Note.*** Figures in brackets indicate negative values.

recorded positive returns during all tenures of the study. ATU recorded negative returns during one-year, three-year, and five-year timelines and the highest positive 10-year returns.

### *Risk/Standard Deviation of Scooters and Three Wheeler Equity Stocks*

In terms of risk, as can be seen from Table 9, SI recorded the highest risk, followed by ATU and BA during all tenures of the study.

### *Beta (Systematic Risk) of Scooters and Three Wheeler Equity Stocks*

Table 9 shows the beta values of scooters and three-wheelers equity stocks. It can be observed that all the stocks in this segment recorded positive beta values which are less than one. This means returns of this segment's stocks move in tandem with the stock market, but are less sensitive to market changes. BA recorded the highest beta during all the tenures, followed by SI and ATU.

### *Reward to Risk Ratio of Scooters and Three Wheeler Equity Stocks*

Reward to Risk ratio value for different periods is displayed in Table 9. Reward to risk ratio was found to be positive for BA and SI throughout the study whereas ATU recorded a negative ratio for the one-year, three-year, and five-year tenures. ATU recorded a positive reward to risk ratio during the 10-year period.

Table 10 shows the comparison of reward to risk ratio for scooters and three-wheelers segments across time and companies. The *p*-value for variation of reward to risk ratio among scooters and three-wheelers segment is

**Table 10.** ***Mean Comparison of Reward to Risk Ratio for Scooters and Three Wheeler Segment***

| Source of Variation | *SS* | *Df* | *MS* | *F* | *p*-value | *F*-crit |
|---|---|---|---|---|---|---|
| Companies | 0.0032 | 02 | 0.0016 | 4.039 | 0.077 | 5.14 |
| Time period | 0.0012 | 03 | 0.0003 | 0.986 | 0.4633 | 4.75 |
| Error | 0.0024 | 06 | 0.0004 | | | |

***Note.*** SS stands for sum of squares, *df* stands for degrees of freedom, and MS stands for mean square.

less than 0.05 level of significance. Therefore, $H_{07}$ is rejected. This indicates that the difference between reward to risk ratios *across companies* is statistically significant. Further, the *p*-value for variation in reward to risk ratio of scooters and three-wheelers segment across periods is less than 0.05 significance level. Thus, $H_{08}$ is rejected. This means that reward to risk ratio of scooters and three-wheelers segment varies significantly across time periods.

Table 11 shows average returns, standard deviation, beta, and reward to risk ratio of tractor segment's equity stocks.EL recorded negative returns during one-year tenure and positive returns during the remaining tenures. It recorded the highest return of 41% in five-year tenure, followed by 32% in three-year tenure and 25% in 10-year tenure. VST recorded negative returns during the tenures of one-year and three-year and the highest return of 15% in the 10-year tenure. In terms of risk, EL recorded higher risk as compared to VST. EL recorded a beta of more than 1, indicating higher sensitivity of returns to the market, as compared to VST. Moreover, EL also recorded a higher reward to risk ratio than VST during the tenures of three-year, five-year and 10-year.

**Table 11.** ***Risk and Return of Automobile – Equity Stocks of Tractor Companies***

| Indicators | Tenure/ Term | Escorts Ltd. (*ET*) | VST Tillers Tractors Ltd. (*VST*) |
|---|---|---|---|
| Average Returns (%) | 1Y | (3) | (32) |
| | 3Y | 32 | (10) |
| | 5Y | 41 | 1 |
| | 10Y | 25 | 15 |
| *S.D.* (%) of Returns | 1Y | 648 | 447 |
| | 3Y | 591 | 450 |
| | 5Y | 655 | 459 |
| | 10Y | 678 | 560 |
| Beta –Systematic Risk | 1Y | 1.11 | 0.28 |
| | 3Y | 1.14 | 0.38 |
| | 5Y | 1.07 | 0.37 |
| | 10Y | 1.04 | 0.42 |
| Reward to Risk Ratio | 1Y | 0.00 | (0.07) |
| | 3Y | 0.05 | (0.02) |
| | 5Y | 0.06 | 0.00 |
| | 10Y | 0.04 | 0.03 |

***Note.*** Figures in brackets indicate negative values.

**Table 12.** ***Mean Comparison of Reward to Risk Ratio of Tractor Segment Companies***

| Source of Variation | *SS* | *Df* | *MS* | *F* | *p*-value | *F*-crit |
|---|---|---|---|---|---|---|
| Automobile segment | 0.000148 | 04 | 3.69E-05 | 0.739467 | 0.582928 | 3.259167 |
| Time period | 0.000764 | 03 | 0.000255 | 5.096959 | 0.016716 | 3.490295 |
| Error | 0.000599 | 12 | 4.99E-05 | | | |

***Note.*** SS stands for sum of squares, *df* stands for degrees of freedom, and MS stands for mean square.

Table 12 shows the comparison of reward to risk ratio across time and across tractor companies. The *p*-values for both tenures and companies are less than 0.05 level of significance. Thus, $H_{09}$ and $H_{10}$ are rejected. This indicates that reward to risk ratio is statistically significant and varies across different companies in the tractor segment. Further, it means that reward to risk ratio of the tractor segment varies significantly across time periods as well.

## Key Findings

**(1) Passenger Car Segment :** Maruti Suzuki India Ltd. has recorded the highest five-year return (20%) with the least risk (388%) compared to its 10-year returns. Moreover, it has also recorded the highest market risk compared to the other securities in this segment.

**(2) LCVs/HCVs Segment :**

- Ashok Leyland Ltd. recorded the highest five-year returns (18%) with the least total risk (574%). It recorded a positive beta value (1.11).
- Force Motors Ltd. recorded a 10-year return (23%) with a total risk of 714% and the market risk is 0.77.
- Tata Motors recorded the second-highest one-year return of 22 % with a total risk of 875% and the highest market risk of 1.56.

**(3) Motor Cycles/ Mopeds :** In the case of the motorcycle segment, company return depended largely on the investment horizon, i.e., investing for a longer period can generate a high rate of return. Eicher Motors Ltd. recorded the highest 10-year rate of return (41%) with a total risk of 521% and market risk of 0.77.

**(4) Scooters and Three Wheelers Segment :**

- Bajaj Auto Ltd.'s one-year return is better than the return in the other tenures. Also, it recorded a 20% rate of return with the least total risk of 342% compared to three-year, five-year, and 10-year returns. One-year market risk is also less compared to three-year, five-year, and 10-year market risk values.
- Atul Auto Ltd. recorded the highest 10-year returns (30%) with a total risk of 714% and a market risk of 0.54.
- Scooter India Ltd. company recorded a 10-year return of 15% with the least total risk (833%) compared to one-year total risk (880%) and return (12%). 10-year market risk is less (0.34) as compared to the other securities.

**(5) Tractors Segment :** Escorts Ltd. recorded a five-year return of 41% with the least total risk of 655% as compared to 10-year return and five-year market risk is 1.07. VST Tillers recorded a 10-year return of 15% with a total risk of 560% and a higher market risk when compared to one-year, three-year, and five-year investments.

## Conclusion

This study is an attempt to study the risk and returns of different segments of the automobile sector. Theoretically, higher the risk of investment, higher is the return generated from the investment. The findings of this research study indicate that higher returns are possible with minimum risk as observed in the case of some of the companies selected for the study. Similarly, some companies recorded minimum returns with high risk. On the other hand, a few companies have recorded high returns with high risk. Thus, investors should consider unsystematic risk apart from systematic risk while making an investment decision. This, in turn, would give better clarity to the investors while selecting stocks for investment. Information on industry prospects and sustainability of growth conditions in the firm should be collected and analyzed and meaningful insights can be drawn to streamline the investments to optimize the risk and return. The study would be really helpful to stock market investors while investing in automobile companies catering to different segments.

## Implications

Maruti Suzuki can be considered for long-term investment in the passenger car segment. Force Motor Ltd. can be considered for investment in LCVs/HCVs segment. Stocks like Eicher Motors Ltd. can be considered for investment in the motorcycle segment. Stocks such as Atul Auto Ltd. can be considered for investment in the auto scooters segment. Eicher Motors Ltd. and Escorts Ltd. can be considered for investment in the tractors segment as they recorded the maximum return with the minimum risk compared to the other automobile securities. Investors should also be aware of the current changes that take place in the economy and automobile sector while investing in it.

## Limitations of the Study and Scope for Future Research

The study is conducted purely based on secondary data, which throws very few insights into measuring the risk and returns of stocks. Moreover, the study is based on the historical stock returns which may not necessarily repeat in the future. Additional insights can be gained by interacting with the stock market experts about the performance of these sector stocks. Further, the general behavior of automobile company stocks can be studied with the help of advanced econometric tools and techniques.

## Authors' Contribution

Dr. Narayanaswamy T. conceived the idea of the topic and collected secondary data for the study. The literature review was collected and summarized by the professors Dr. Thamotharan A. and Dr. Venu Gopal Rao Chowdary. These authors also reviewed the data analysis and interpretation. Numerical calculation of risk and returns, hypotheses testing, data analysis, interpretation, conclusions, implications, and editing of the paper was done by Urvi Jitendra Sheth and Dr. Narayanaswamy T. Dr. Narayanaswamy T. wrote the final manuscript in consultation with all the other authors. SPSS 21.0 software was used to conduct data analysis and hypothesis testing.

## Conflict of Interest

The authors certify that they have no affiliation 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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