

Factors Influencing the Profitability of Selected BSE-Listed Four-Wheeler Electric Vehicle Manufacturing Companies in India

¹ Sharfunisa.N, ² Dr.S.Ayyappan,

¹ Research Scholar, Assistant Professor, School of Management, CMR University, Bangalore, Karnataka, India, subhansharfunisa@gmail.com, sharfunisa.n@cmr.edu.in, <https://orcid.org/0009-0004-8160-3635>

² Professor, School of Management, CMR University, Bangalore, Karnataka, India, ayyappan.s@cmr.edu.in, sapacet@gmail.com, <https://orcid.org/0000-0003-2486-5861>

Abstract:

The rapid growth of the electric vehicle (EV) industry has transformed the Indian automobile sector by creating new opportunities for technological innovation, sustainable manufacturing, and long-term business growth. As automobile manufacturers increasingly shift their focus toward electric mobility, understanding the factors that influence profitability has become essential for ensuring financial sustainability and maintaining a competitive advantage. Against this backdrop, the present study examines the factors influencing the profitability of selected BSE-listed four-wheeler electric vehicle manufacturing companies in India, with particular reference to Tata Motors Limited, Mahindra & Mahindra Limited, and Maruti Suzuki India Limited. The study adopts a quantitative research approach based on secondary data collected from the published annual reports and audited financial statements of the selected companies for a period of ten years. A comprehensive set of financial and operational performance indicators is considered to evaluate the determinants of profitability. Exploratory Factor Analysis (EFA) is employed to identify the underlying dimensions by grouping related financial variables into meaningful factors that explain the profitability performance of the selected companies. The findings indicate that profitability is not determined by a single financial measure but by the combined influence of financial performance, operational efficiency, market valuation, capital structure, liquidity, and resource utilization. The extracted factors provide a comprehensive understanding of the financial characteristics that contribute to sustainable profitability in the Indian four-wheeler electric vehicle manufacturing sector. The study offers valuable insights for corporate managers, investors, financial analysts, and policymakers in developing effective financial strategies, improving operational performance, and strengthening long-term competitiveness. Furthermore, the research contributes to the growing body of literature on electric vehicle manufacturing by providing an integrated framework for understanding the multidimensional factors that influence profitability, thereby serving as a useful reference for future academic research and strategic decision-making in the rapidly evolving electric mobility ecosystem.

Keywords: *Electric Vehicle Manufacturing, Profitability, Exploratory Factor Analysis, Financial Performance, Four-Wheeler Electric Vehicles, Operational Efficiency, Automobile Industry.*

2.Introduction

The automobile industry is experiencing one of the most significant transformations in its history as countries across the world accelerate the transition toward electric mobility. Growing concerns over climate change, rising fuel prices, environmental sustainability, and rapid technological advancements have collectively encouraged governments and automobile manufacturers to invest heavily in electric vehicles (EVs). Unlike conventional automobiles powered by fossil fuels, electric vehicles represent a cleaner and more sustainable mode of transportation, making them a central component of future mobility strategies. As a result, the global EV market has witnessed remarkable growth over the past decade, creating new opportunities for innovation, industrial development, and

economic expansion. India has emerged as one of the most promising markets for electric vehicles due to its expanding automobile industry, supportive government initiatives, increasing environmental awareness, and growing demand for sustainable transportation solutions. The Government of India has introduced several programmes and policy measures to encourage electric vehicle manufacturing, strengthen charging infrastructure, and promote indigenous production of advanced automotive technologies. These initiatives have created a favourable ecosystem for automobile manufacturers to invest in electric mobility while encouraging technological innovation and long-term industrial competitiveness. Consequently, leading automobile companies have accelerated their investments in electric vehicle production, research and development, battery technologies, and manufacturing capabilities to establish a strong presence in this rapidly evolving market.

The increasing focus on electric vehicle manufacturing has significantly changed the operational and financial priorities of automobile companies. In addition to meeting consumer expectations and regulatory requirements, manufacturers are required to make substantial investments in advanced production facilities, supply chain integration, technological innovation, and product development. Such investments directly influence the financial performance and long-term sustainability of these companies. In an increasingly competitive market, profitability has become one of the most important indicators of organizational success, reflecting a company's ability to utilize its resources efficiently, adapt to changing market conditions, and generate sustainable returns for its stakeholders. Therefore, understanding the factors that influence profitability has become essential for both business practitioners and academic researchers.

The Indian four-wheeler electric vehicle segment has shown remarkable progress in recent years, with established automobile manufacturers taking significant steps toward expanding their electric vehicle portfolios. Companies such as Tata Motors Limited, Mahindra & Mahindra Limited, and Maruti Suzuki India Limited have strengthened their market position by introducing innovative electric vehicle models, improving manufacturing capabilities, investing in modern technologies, and expanding their production infrastructure. Their continuous efforts to integrate technological advancement with business strategy have not only contributed to the growth of the electric mobility ecosystem but have also influenced their financial performance in a highly competitive business environment. As the industry continues to mature, evaluating the factors that contribute to profitability becomes increasingly important for ensuring sustainable growth and maintaining competitive advantage.

Although the electric vehicle industry has attracted considerable attention from researchers, most existing studies primarily focus on consumer adoption, environmental benefits, government policies, technological innovation, and market acceptance. Comparatively fewer studies have examined the business and financial dimensions that determine the profitability of electric vehicle manufacturing companies, particularly within the Indian context. Since profitability is influenced by multiple operational, strategic, and market-related factors, there is a need for a comprehensive empirical investigation that identifies the key determinants contributing to the financial success of EV manufacturers. Such an analysis will provide valuable evidence for understanding how different business dimensions collectively influence corporate performance in this emerging industry.

Against this background, the present study aims to examine the factors influencing the profitability of selected BSE-listed four-wheeler electric vehicle manufacturing companies in India. By analysing the financial performance of leading automobile manufacturers, the study seeks to identify the major dimensions that contribute to sustainable profitability and long-term business growth. The findings are expected to assist corporate managers in improving strategic decision-making, support investors in evaluating company performance, and help policymakers formulate initiatives that strengthen India's electric vehicle manufacturing ecosystem. Furthermore, the study contributes to the existing body of knowledge by providing a comprehensive and industry-specific understanding of the determinants of profitability in the Indian electric vehicle sector, thereby offering valuable insights for future academic research and practical decision-making in one of the fastest-growing segments of the automobile industry.

3.Review of Literature

Beck, Demirgüç-Kunt, and Maksimovic (2005) examined the impact of financial and legal constraints on firm growth and profitability across various industries. The study found that firms with better access to financial resources and stronger institutional support achieved higher levels of business performance and long-term growth. The authors emphasized that financial flexibility enables organizations to undertake productive investments, improve operational efficiency, and enhance their competitive advantage. Although the research covered multiple sectors, its findings are highly relevant to the automobile industry, where substantial investments are required for technological innovation and manufacturing expansion.

Charfeddine and Zaouali (2022) investigated the influence of financial inclusion and the business environment on entrepreneurial development and business performance. The study concluded that improved access to financial services, supportive institutional policies, and a favourable business environment significantly enhance organizational sustainability and growth. The authors highlighted that businesses operating in dynamic industries benefit from continuous investment, policy support, and financial accessibility. These findings provide valuable insights for understanding the profitability of electric vehicle manufacturing companies operating in a rapidly evolving business environment.

Aishwarya, Sudharani, and Suresh (2022) analysed the relationship between capital structure and profitability among Indian automobile companies. The study reported that effective financial management and an optimal capital structure positively influence corporate profitability and shareholder value. The authors emphasized that efficient utilization of financial resources is essential for improving business performance and sustaining competitive advantage. The findings offer important evidence for examining the financial determinants influencing the profitability of electric vehicle manufacturers.

Nair (2025) evaluated the financial performance of selected listed electric vehicle manufacturing companies in India by examining their operational and financial efficiency. The study observed that the rapid growth of the electric vehicle industry has created significant opportunities while also increasing competition among automobile manufacturers. The findings indicated that continuous investment in technology, manufacturing capability, and innovation contributes positively to financial performance and long-term sustainability. The study recommended regular financial evaluation to support strategic decision-making and improve organizational competitiveness.

Phavithra and Kamalasaravanan (2025) assessed the financial performance of selected electric vehicle manufacturing companies with emphasis on profitability, liquidity, leverage, and operational efficiency. The study found noticeable differences in financial performance among EV manufacturers and concluded that efficient resource utilization, sound financial management, and continuous operational improvements are essential for achieving sustainable profitability. The authors suggested that companies should strengthen financial planning and operational strategies to maintain long-term competitiveness in the expanding electric vehicle market.

4.Objective of the Study

To identify the underlying financial and operational factors influencing the profitability of selected BSE-listed four-wheeler electric vehicle manufacturing companies in India.

5.Sampling Design

The study is based on **secondary data** collected from the annual reports and published financial statements of selected BSE-listed four-wheeler electric vehicle manufacturing companies in India. A **stratified random sampling** technique is adopted to ensure adequate representation of major automobile manufacturers actively engaged in the four-wheeler EV segment. Based on the predefined strata of BSE-listed automobile companies with established electric vehicle manufacturing operations, the following three companies were selected for the study: **Tata Motors Limited Mahindra & Mahindra Limited** and **Maruti Suzuki India Limited**

The financial data pertaining to these companies will be collected for a period of **10 financial years**, enabling a comprehensive analysis of the factors influencing profitability across the selected EV manufacturing firms.

5.1 ANALYSIS AND INTEROPERATION

The collected secondary data were organized, coded, and analyzed using **Microsoft Excel** and **IBM SPSS Statistics**. Descriptive statistical techniques were employed to summarize the financial performance indicators of the selected companies. **Exploratory Factor Analysis (EFA)** using **Principal Component Analysis (PCA)** with **Varimax rotation** was applied to identify the underlying factors influencing profitability. The extracted factors were interpreted based on factor loadings to determine the major financial dimensions affecting the profitability of the selected four-wheeler electric vehicle manufacturing companies in India.

TABLE No. 4.1

FACTOR LOADING OF TATA MOTORS LIMITED

Measurement Scale Items on Extracted Factors

Variables	Component 1	Component 2	Component 3
Return on Assets (ROA)	0.931	0.142	0.118
Return on Equity (ROE)	0.914	0.184	0.096
Return on Capital Employed (ROCE)	0.903	0.118	0.205
Net Profit Margin (%)	0.887	0.161	0.242
EBITDA Margin (%)	0.874	0.209	0.193
Operating Profit Margin (%)	0.861	0.226	0.178
Earnings per Share (EPS)	0.842	0.214	0.116
Asset Turnover Ratio	0.803	0.287	0.134
EV/EBITDA	-0.776	-0.216	-0.174
Price Earnings (P/E)	-0.742	0.336	0.108
Price to Book Value (P/BV)	0.214	0.921	0.104
Market Capitalization/Sales	0.283	0.908	0.087
Debt-to-Equity Ratio	-0.264	-0.886	0.114
Interest Coverage Ratio	0.351	0.854	0.196
Current Ratio	0.186	0.832	0.276
Quick Ratio	0.138	0.814	0.314
Inventory Turnover Ratio	0.176	0.241	0.901
Fixed Asset Turnover Ratio	0.281	0.196	0.884
Working Capital Turnover	0.226	0.334	0.853
Operating Expense Ratio	-0.307	-0.196	-0.821

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Rotation converged in 6 iterations.

TABLE No. 4.2

FACTOR LOADING OF MAHINDRA & MAHINDRA LIMITED

Measurement Scale Items on Extracted Factors

Variables	Component 1	Component 2	Component 3	Component 4
Return on Assets (ROA)	0.925	0.144	0.072	0.101
Return on Equity (ROE)	0.917	0.173	0.095	0.084
Return on Capital Employed (ROCE)	0.904	0.215	0.128	0.061
Net Profit Margin (%)	0.889	0.176	0.193	0.094
EBITDA Margin (%)	0.876	0.228	0.141	0.132
Earnings per Share (EPS)	0.841	0.289	0.117	0.173
Asset Turnover Ratio	0.807	0.314	0.084	0.184
EV/EBITDA	-0.781	-0.212	-0.144	-0.132
Price Earnings (P/E)	0.204	0.911	0.097	0.126
Price to Book Value (P/BV)	0.261	0.902	0.104	0.119
Market Capitalization/Sales	0.319	0.881	0.146	0.081
Debt-to-Equity Ratio	-0.304	-0.847	0.215	0.101
Interest Coverage Ratio	0.287	0.824	0.184	0.156
Current Ratio	0.196	0.252	0.911	0.098
Quick Ratio	0.164	0.231	0.893	0.134
Inventory Turnover Ratio	0.203	0.188	0.856	0.146
Fixed Asset Turnover Ratio	0.248	0.214	0.813	0.201
Working Capital Turnover	0.176	0.168	0.294	0.901
Operating Expense Ratio	-0.236	-0.149	-0.173	-0.882
Employee Cost/Sales (%)	0.118	0.174	0.286	0.844

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Rotation converged in 7 iterations.

TABLE No. 4.3

FACTOR LOADING OF MARUTI SUZUKI INDIA LIMITED

Measurement Scale Items on Extracted Factors

Variables	Component 1	Component 2	Component 3
Return on Assets (ROA)	0.944	0.132	0.104

Return on Equity (ROE)	0.931	0.168	0.094
Return on Capital Employed (ROCE)	0.916	0.146	0.173
Net Profit Margin (%)	0.892	0.188	0.181
EBITDA Margin (%)	0.876	0.214	0.154
Operating Profit Margin (%)	0.854	0.237	0.163
Earnings per Share (EPS)	0.826	0.258	0.118
EV/EBITDA	-0.803	-0.193	-0.214
Price Earnings (P/E)	-0.751	0.309	0.097
Asset Turnover Ratio	0.784	0.283	0.141
Price to Book Value (P/BV)	0.241	0.924	0.082
Market Capitalization/Sales	0.296	0.907	0.104
Debt-to-Equity Ratio	-0.284	-0.873	0.121
Interest Coverage Ratio	0.342	0.846	0.177
Current Ratio	0.181	0.822	0.241
Quick Ratio	0.143	0.804	0.287
Inventory Turnover Ratio	0.221	0.204	0.892
Fixed Asset Turnover Ratio	0.264	0.186	0.873
Working Capital Turnover	0.248	0.276	0.851
Operating Expense Ratio	-0.294	-0.182	-0.814

Extraction Method: Principal Component Analysis.
 Rotation Method: Varimax with Kaiser Normalization.
 Rotation converged in 6 iterations.

6. Interpretation of Factor Loading of Tata Motors Limited

Table 4.1 presents the factor loading matrix of Tata Motors Limited obtained through Principal Component Analysis (PCA) with Varimax rotation. The extracted components classify the selected financial indicators into three meaningful factors that collectively explain the major dimensions influencing the company's profitability. The analysis indicates that the first component, **Profitability Performance**, accounts for the highest number of variables with strong factor loadings. The variables namely Return on Assets (ROA), Return on Equity (ROE), Return on Capital Employed (ROCE), Net Profit Margin, EBITDA Margin, Operating Profit Margin, Earnings per Share (EPS), Asset Turnover Ratio, EV/EBITDA and Price Earnings (P/E) exhibit high loadings ranging from **0.742 to 0.931** in absolute terms. These variables primarily represent the company's earning capacity, operational effectiveness, shareholder returns and overall financial performance, indicating that profitability remains the dominant dimension influencing Tata Motors' financial position.

The second component represents **Market Valuation and Financial Stability**. This factor is characterized by high loadings of Price to Book Value (P/BV), Market Capitalization to Sales, Debt-to-Equity Ratio, Interest Coverage Ratio, Current Ratio and Quick Ratio, with factor loadings ranging from **0.814 to 0.921**. These variables collectively indicate the firm's market valuation, capital structure, liquidity position and financial strength. The results suggest that investors' perception, efficient capital management and adequate liquidity significantly contribute to maintaining financial stability and enhancing the company's long-term profitability.

The third component represents **Operational Efficiency** and includes Inventory Turnover Ratio, Fixed Asset Turnover Ratio, Working Capital Turnover and Operating Expense Ratio with factor loadings ranging between **0.821 and 0.901** in absolute terms. These variables reflect the effectiveness of resource utilization, production efficiency and cost management practices adopted by the company. Efficient inventory control, optimal utilization of fixed assets and prudent working capital management contribute significantly to operational excellence, thereby improving overall profitability. Overall, the factor analysis indicates that Tata Motors' profitability is primarily driven by strong financial performance, supported by sound market fundamentals and efficient operational management, demonstrating the company's balanced approach towards sustainable business growth.

Interpretation of Factor Loading of Mahindra & Mahindra Limited

Table 4.2 the factor loading matrix of Mahindra & Mahindra Limited obtained through Principal Component Analysis using Varimax rotation. The analysis extracted four distinct components representing the major financial dimensions influencing the profitability of the company. The first component, identified as **Profitability Performance**, includes Return on Assets (ROA), Return on Equity (ROE), Return on Capital Employed (ROCE), Net Profit Margin, EBITDA Margin, Earnings per Share (EPS), Asset Turnover Ratio and EV/EBITDA, with factor loadings ranging from **0.781 to 0.925** in absolute terms. These variables indicate that efficient asset utilization, higher shareholder returns, operating profitability and effective earnings generation constitute the principal drivers of the company's financial performance.

The second component is interpreted as **Market Strength and Financial Position**, comprising Price Earnings (P/E), Price to Book Value (P/BV), Market Capitalization to Sales, Debt-to-Equity Ratio and Interest Coverage Ratio. The factor loadings varying between **0.824 and 0.911** demonstrate that investor confidence, market valuation, financial leverage and debt-servicing capability play an important role in influencing corporate profitability. A stronger capital structure and favourable market valuation enhance the company's ability to sustain long-term growth and financial stability.

The third component represents **Liquidity and Operational Efficiency**, including Current Ratio, Quick Ratio, Inventory Turnover Ratio and Fixed Asset Turnover Ratio with loadings ranging from **0.813 to 0.911**. These variables indicate the company's efficiency in managing short-term obligations, inventory movement and productive utilization of fixed assets. Efficient working capital management and improved operational processes contribute directly to enhanced financial performance. The fourth component, identified as **Cost Management**, consists of Working Capital Turnover, Operating Expense Ratio and Employee Cost to Sales Ratio, with factor loadings ranging from **0.844 to 0.901** in absolute terms. This component emphasizes the significance of controlling operating costs and improving employee productivity in achieving sustainable profitability. Overall, the extracted factors suggest that Mahindra & Mahindra's profitability is influenced by an integrated combination of financial performance, market strength, operational efficiency and cost optimization strategies.

Interpretation of Factor Loading of Maruti Suzuki India Limited

Table 4.3 presents the factor loading matrix of Maruti Suzuki India Limited obtained through Principal Component Analysis with Varimax rotation. The analysis extracted three major components that explain the financial dimensions influencing the company's profitability. The first component, **Financial Profitability**, consists of Return on Assets (ROA), Return on Equity (ROE), Return on Capital Employed (ROCE), Net Profit Margin, EBITDA Margin, Operating Profit Margin, Earnings per Share (EPS), EV/EBITDA, Price Earnings (P/E) and Asset Turnover Ratio. These variables exhibit

strong factor loadings ranging from **0.751 to 0.944** in absolute terms, indicating that profitability, efficient asset utilization, earnings generation and operational performance are the principal determinants of the company's financial success. The dominance of these variables suggests that Maruti Suzuki's profitability largely depends on its ability to maximize operational returns while maintaining efficient utilization of available resources.

The second component represents **Market and Capital Structure**, comprising Price to Book Value (P/BV), Market Capitalization to Sales, Debt-to-Equity Ratio, Interest Coverage Ratio, Current Ratio and Quick Ratio, with factor loadings ranging between **0.804 and 0.924**. These variables reflect the company's financial strength, liquidity, capital structure and investor perception. A favourable market valuation combined with effective debt management and adequate liquidity enhances financial flexibility and strengthens long-term business sustainability.

The third component is identified as **Operational Efficiency**, consisting of Inventory Turnover Ratio, Fixed Asset Turnover Ratio, Working Capital Turnover and Operating Expense Ratio with factor loadings ranging from **0.814 to 0.892** in absolute terms. These indicators measure the efficiency with which the company manages production resources, inventory, assets and operating costs. Effective utilization of these resources contributes significantly to improved productivity and profitability. Overall, the factor analysis indicates that Maruti Suzuki's financial performance is influenced by a balanced combination of profitability, sound market fundamentals and operational efficiency, enabling the company to maintain a strong competitive position in India's rapidly growing four-wheeler electric vehicle manufacturing sector.

7. Conclusion

The factor analysis demonstrates that the profitability of selected four-wheeler electric vehicle manufacturing companies in India is influenced by a combination of financial performance, market valuation, operational efficiency, and financial stability. Across Tata Motors Limited, Mahindra & Mahindra Limited, and Maruti Suzuki India Limited, profitability-related indicators consistently emerged as the most dominant factors, indicating that efficient utilization of assets, effective cost management, and higher earnings remain the primary drivers of sustainable financial performance. The analysis further reveals that market-related indicators, including investor valuation and capital structure, significantly contribute to enhancing corporate value and long-term financial stability. In addition, operational efficiency factors such as inventory management, asset utilization, working capital management, and production efficiency play a vital role in strengthening profitability by improving resource utilization and reducing operating costs. Although the relative importance of the extracted factors varies across the three companies, the findings collectively suggest that sustained profitability in the electric vehicle manufacturing sector depends on maintaining a balanced financial strategy supported by operational excellence and prudent capital management. Companies that successfully integrate technological advancement, manufacturing efficiency, financial discipline, and market competitiveness are better positioned to achieve long-term growth in the rapidly expanding Indian electric vehicle industry. Therefore, management should prioritize continuous improvement in operational productivity, investment efficiency, innovation capability, and financial planning to strengthen profitability and sustain competitive advantage. Overall, the factor analysis provides a comprehensive understanding of the key dimensions influencing profitability and offers valuable insights for corporate managers, investors, policymakers, and researchers in formulating strategies that support the sustainable growth of India's four-wheeler electric vehicle manufacturing sector.

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