“A STUDY ON FINANCIAL SOLVENCY OF SELECTED AUTOMOBILE COMPANIES IN INDIA USING ALTMAN Z - SCORE MODEL”

A THESIS

SUBMITTED BY

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DECLARATION CERTIFICATE

I declare that the thesis entitled **"A STUDY ON FINANCIAL SOLVENCY OF SELECTED AUTOMOBILE COMPANIES IN INDIA USING ALTMAN Z - SCORE MODEL"** submitted by me for the degree of Masters of commerce is the record of research work carried out by me under the guidance of **MS. POOJA THAKRAR** and has not formed the basis for the award of any degree, diploma, associate ship, fellowship, titles in this or any other university or other institution of higher learning.

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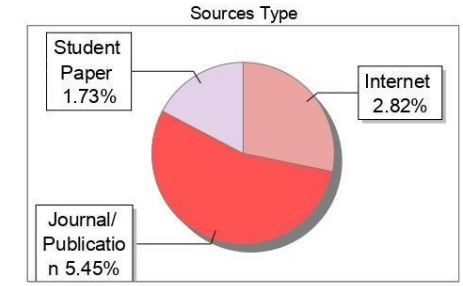

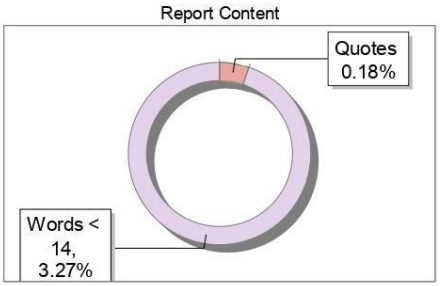

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This thesis is a culmination of collective efforts and shared wisdom. It would not have been possible without the support, encouragement, and guidance of all those mentioned above. To each one of you, I extend my deepest gratitude.

PREFACE

The Indian automobile industry plays a pivotal role in the country's economic development by contributing significantly to GDP, generating employment, and boosting exports. However, with increasing market competition, changing consumer preferences, and global economic uncertainties, it is essential to assess the financial stability of companies operating in this sector. This study, titled "A Study on Financial Solvency of Selected Automobile Companies in India Using Altman Z-Score Model," aims to evaluate the financial health of leading automobile firms over a period of seven years (2017-2024) and categorize them into safe using the Altman Z-Score model.

The Altman Z-Score model is a well-known prediction tool for estimating the probability of financial hardship or company insolvency. Tata Motors Ltd., Mahindra & Mahindra Ltd., Bajaj Auto Ltd., Hero MotoCorp Ltd., Maruti Suzuki India Ltd., Eicher Motors Ltd, and TVS Motor Company Ltd. are the seven well-known automakers in India whose financial soundness is being evaluated under this model.

The study includes an extensive literature analysis to highlight previous research on financial solvency and the use of Altman's Z-Score model across businesses. In addition, the study examines the past performance of these chosen businesses and examines important financial ratios. This study's approach entails quantitative analysis of secondary data taken from financial statements, yearly reports, and pertinent databases like Money control. To find differences in the chosen companies' financial soundness across the analyzed time, statistical methods like one-way ANOVA have been used. By comparing these automakers' solvency and long-term financial sustainability. The findings, which distinguish between financially solid and distressed organizations, provide insightful information for investors, legislators, and corporate management.

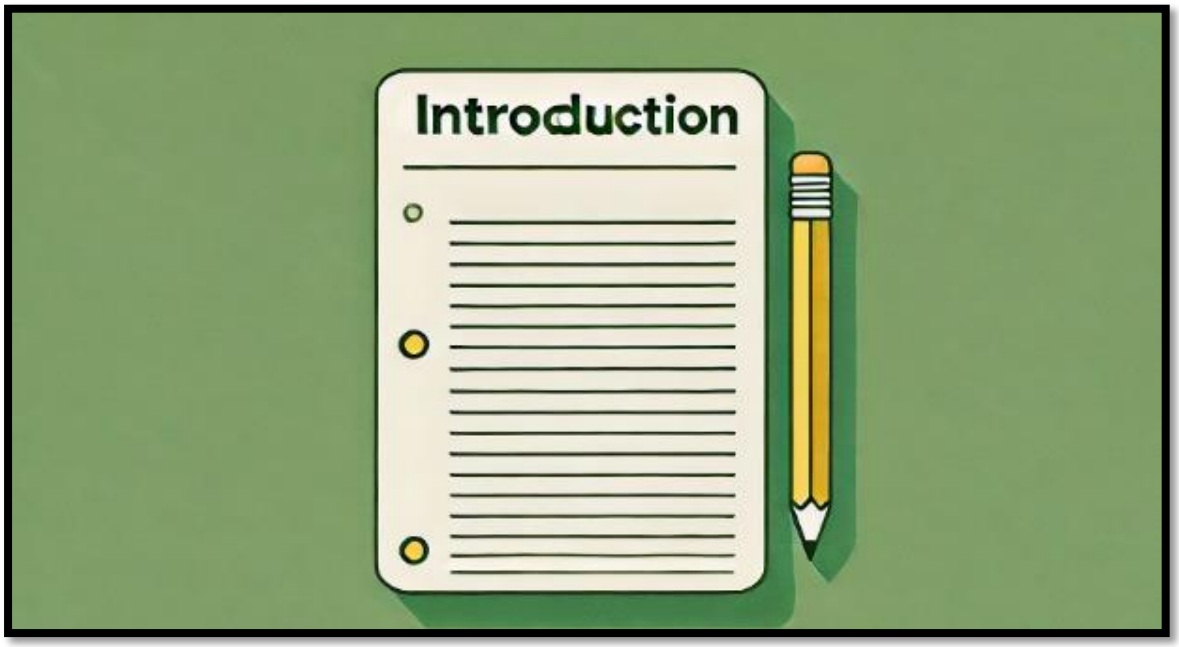
I am sincerely grateful to my faculty, mentors, and colleagues for their invaluable guidance and support throughout this research journey. I would also like to acknowledge the authors and researchers whose work has provided the foundation for this study. I hope that this research will serve as a useful contribution to the field of financial analysis and corporate solvency assessment.

INDEX

List of Tables

List of Charts

CHAPTER – 1 INTRODUCTION



INDEX

1.1 Introduction of Automobile Sector

The Indian automobile industry is one of the country's largest and most active industries, contributing considerably to economic growth, job creation, and industrial development. It contributes for roughly 7.1% of India's GDP and 49% of manufacturing GDP, making it an important engine of the country's economic success. Furthermore, the industry employs approximately 37 million people directly and indirectly, providing assistance to industries such as steel, rubber, electronics, and logistics.

India is the world's fourth-largest vehicle market, with strong local demand and an expanding export base. The industry is divided into numerous divisions, including passenger vehicles (PV), commercial vehicles (CV), two- and three-wheelers, and electric vehicles (EVs). The country is also the leading manufacturer of two-wheelers, serving a significant consumer base in both urban and rural areas.

The automobile industry has contributed significantly to industrial progress by promoting technological improvements, infrastructure development, and foreign direct investment (FDI). Since the economic liberalisation in 1991, global automobile heavyweights such as Hyundai, Honda, Toyota, and Ford have entered the Indian industry, increasing competition and innovation. The advent of Make in India and Atmanirbhar Bharat (Self-Reliant India) initiatives has cemented the industry's status as a worldwide manufacturing hub.

In terms of international trade, India has emerged as a key automobile exporter, particularly in the small car, two-wheeler, and commercial vehicle segments. African, Middle Eastern, Latin American, and Southeast Asian countries are major export destinations. With increased investments in electric mobility, autonomous vehicles, and sustainable transportation, India's automobile sector is destined to play a significant role in the future of global automotive manufacture.

Despite its rapid growth, the business faces a number of hurdles, including high taxation (GST), fluctuating fuel prices, semiconductor shortages, and infrastructure constraints. Government measures, such as the Faster Adoption and Manufacturing of Electric Vehicles (FAME) plan, Production-Linked Incentive (PLI) scheme, and Automotive Mission Plan (AMP) 2026, attempt to overcome these barriers and ensure long-term sustainability.

With expanding urbanisation, rising disposable incomes, and a growing emphasis on green and digital mobility, the Indian vehicle industry is entering a revolutionary period. The sector is likely to continue contributing considerably to India's economic and industrial growth, cementing the country's status as a worldwide automotive leader.

1.2 An overview of worldwide automobile sector:

The worldwide automobile industry is one of the world's largest and most prominent sectors, making substantial contributions to GDP, employment, and technical innovation. This industry includes the production, distribution, and repair of motor vehicles, such as passenger cars, commercial vehicles, and electric vehicles. With a market value surpassing $3.6 trillion, the sector has a significant impact on industrial growth and worldwide trade. China, the United States, Germany, Japan, and South Korea are among the major automobile-producing countries, each of which has made its own contribution to the industry's evolution.

China is the world's largest automobile manufacturer, producing approximately 26 million automobiles every year. Mass manufacturing, government backing for electric vehicle (EV) adoption, and the presence of significant corporations such as BYD, Geely, and SAIC all contribute to the country's automotive industry. The United States, which is home to top automakers such as General Motors, Ford, and Tesla, continues to be a hub for technical developments, particularly in electric and self-driving vehicles. Europe is well-known for its luxury and high-performance vehicles, with companies such as Volkswagen, Mercedes-Benz, BMW, and Ferrari establishing engineering and design standards. Toyota, Honda, Nissan, Hyundai, and Kia dominate the global market in Japan and South Korea, where efficiency and dependability are valued.

In recent years, the automotive sector has seen a considerable movement towards sustainability and digital transformation. The advent of electric vehicles, pioneered by businesses such as Tesla and Volkswagen, has changed the market, with many automakers pledging to phase out internal combustion engines in favour of greener options. Autonomous driving technology, artificial intelligence (AI), and the Internet of Things (IoT) are further transforming the industry, bringing linked and self-driving cars to fruition.

Waymo, BMW, and Volvo are making significant investments in these technologies to improve road safety and economy.

Despite its growth and innovation, the global car sector faces numerous obstacles. Supply chain disruptions, notably from semiconductor shortages and geopolitical conflicts, have had an impact on production and profitability. Manufacturers are under pressure to speed their transition to green technologies due to stringent environmental restrictions around the world. Furthermore, fierce market competition has created a persistent demand for distinction and innovation among automakers.

Electric mobility, smart transportation, and environmentally friendly practices are likely to affect the future of the automotive industry. The demand for electric and hybrid vehicles is expected to skyrocket, with governments throughout the world providing incentives to encourage adoption. Furthermore, emerging economies in Asia and Africa are becoming new regions of expansion for automakers seeking growth outside of saturated Western markets.

Overall, the global automobile business is a dynamic and expanding sector that must balance technical developments, regulatory constraints, and changing consumer preferences. Because financial stability is a critical aspect in determining the success of companies in this field, analysing their solvency using financial models such as the Altman Z-score can provide useful insights into their long-term viability and competitiveness.

1.3 An overview of Indian automobile sector:

The Indian automobile industry has a long history, dating back to the early twentieth century when foreign cars were introduced under British administration. The first automobile in India was seen in 1897, and by the 1940s, businesses such as Hindustan Motors and Premier were producing vehicles. However, the industry remained mostly undeveloped until after independence, when the Indian government encouraged indigenous manufacture. In the 1950s and 1960s, the industry was severely regulated, resulting in restricted competition and slow growth. Only a few manufacturers, including Hindustan Motors (Ambassador), Premier (Padmini), and Tata Motors, controlled the market.

The introduction of inexpensive and fuel-efficient cars such as the Maruti 800 by Maruti Udyog Limited (now Maruti Suzuki) in the 1980s marked a significant transformation. Economic liberalisation in 1991 represented a watershed moment for the industry, with international manufacturers such as Hyundai, Honda, and Toyota entering the Indian market. This resulted in more competition, technical breakthroughs, and higher quality requirements. The two-wheeler industry, dominated by companies such as Hero, Bajaj, and TVS, grew significantly as demand for low-cost personal transportation increased.

India is now the world's fourth-largest vehicle market and the leading producer of two-wheelers. The sector has expanded into electric vehicles (EVs), premium cars, and commercial vehicles. Government measures such as the Faster Adoption and Manufacturing of Electric Vehicles (FAME) initiative and the Production-Linked Incentive (PLI) scheme encourage investment in electric mobility. Supply chain problems, semiconductor shortages, and rising gasoline prices all have an influence on the sector.

Despite these problems, the Indian automotive sector is evolving, with an emphasis on sustainability, automation, and smart mobility solutions. Increasing demand for electric vehicles, improvements in AI-powered mobility, and supporting government legislation are changing the industry's future. With India promoting itself as a global manufacturing hub, the automobile industry is likely to expand significantly in the coming years.

1.4 The auto industry's contribution to the economy:

India's automotive sector is a significant contributor to the economy. It plays a crucial role due to its strong backward and forward links of expansion. Recent liberalisation and governmental interventions have resulted in a competitive market with new competitors, leading to increased capacity and job creation in the automobile industry. This sector presently accounts for around 7.1% of national GDP, up from 2.77% in 1992-93. It employs nearly 19 million individuals, both directly and indirectly.

During 2021-22, two-wheelers and passenger automobiles dominated the Indian automobile market, with 77% and 18% respectively. Small and medium automobiles account for the majority India plans to increase its auto industry size to Rs. 15 lakh crores by the end of 2024. Between of Passenger car sales. Total automobile exports grew from 4,134,047 in 2020-21 to 5,617,246 in 2021-22, with a positive rise of 35.9% April 2000

and September 2022, the industry received $33.77 billion in FDI, accounting for approximately 5.48% of overall FDI inflows in India.

The industry is one of India's greatest employers, directly and indirectly supporting about 37 million jobs in a variety of sectors such as manufacturing, sales, services, logistics, and car parts. The expanding electric vehicle (EV) market is also expected to generate new employment possibilities in battery manufacture, charging infrastructure, and software development. India is a major exporter of automobiles and auto components, with countries across Africa, Asia, and Europe being key markets. The industry has attracted over $35 billion in Foreign Direct Investment (FDI) in the past two decades, helping improve technology, innovation, and global competitiveness.

The expansion of the automotive industry leads to advances in road networks, highways, and city transit systems. Government projects such as the National Electric Mobility Mission Plan (NEMMP) and Smart cities initiatives are inextricably tied to the growth of the automotive industry. The sector is propelling India towards a technologically advanced and sustainable future through the use of electric vehicles (EVs), hybrid technology, and AI-driven automation. Companies are investing in R&D to make cars more fuel-efficient and ecologically friendly. The vehicle industry generates significant money for the government in the form of GST, road taxes, and excise levies. With rising car sales and increased acceptance of EVs, government revenues from the sector are increasing.

The automobile sector is a key driver of India's economic growth, contributing to GDP, employment, exports, and technological advancement. With government initiatives promoting sustainability and electric mobility, the sector is expected to expand further, transforming India into a global hub for vehicle manufacture and innovation.

1.5 Domestic market share for 2018-2024:

The Indian automobile sector is among the world’s largest, contributing significantly to the country's economic growth. The sector is organised into five major segments: passenger vehicles, commercial vehicles, three-wheelers, two-wheelers, and quadricycles. The industry's tendencies have fluctuated over the last six years (2018-2024) due to a variety of reasons such as economic conditions, policy changes, supply chain disruptions, and the impact of the COVID-19 pandemic.

Table 1.1 Domestic Market Share

Category	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24
Passenger Vehicles	33,77,389	27,73,519	27,11,457	30,69,523	38,90,114	42 18,746
Commercial Vehicles	10,07,311	7,17,593	5,68,559	7,16,566	9,62,468	9,67,878
Three Wheelers	7,01,005	6,37,065	2,19,446	2,61,385	4,88,768	6,91,749
Two Wheelers	2,11,79,7	1,74,16,2	1,51,20,3	1,35,70,8	1,58,62,07	1,79,74,365
Quadricycles	627	942	-12	124	725	725
Grand Total	**2,62,66,19**	**2,15,45,51**	**1,86,20,23**	**1,76,17,66**	**2,12,04,12**	**2,38,53,43**

(Source: Society of Indian Automobile Manufacturers SIAM)

This data follows broader market patterns, showing a strong recovery in the Indian automobile sector after the pandemic-driven decline.

1.6 Challenges Faced by the Indian Automobile sector:

The Indian automobile industry has encountered a number of issues in recent years, affecting its growth and stability. The COVID-19 pandemic (2020-21) was a significant setback, resulting in factory closures, supply chain disruptions, and a dramatic drop in car sales. Even after the industry recovered, it faced a global chip scarcity, resulting in

production delays and lengthy wait times for popular models. Rising raw material costs, notably for steel, aluminium, and plastics, have driven up vehicle prices, making them less affordable to customers.

The shift to BS-VI emission regulations (2020) and other strict regulatory changes increased financial pressure on firms, necessitating significant investments in technology upgrades. Furthermore, the rush for electric vehicle (EV) adoption introduced new problems, such as high battery costs, a lack of charging infrastructure, and restricted domestic supply of EV components. Meanwhile, fluctuating gasoline prices and high interest rates on vehicle loans impacted consumer purchasing power, resulting in reduced sales, particularly in the two-wheeler and entry-level car segments.

Another difficulty has been rising competition from global firms, which has prompted domestic automakers to invest more in research, innovation, and innovative mobility solutions. Infrastructure difficulties, increased urban congestion, and rising traffic density have all had an impact on purchasing patterns, with more people turning to shared and electric vehicles. Moreover, geopolitical tensions and global economic changes have hindered exports and supply chain activities.

Despite these challenges, the Indian automobile sector has demonstrated resiliency, with businesses working on digital transformation, alternative fuel technologies, and government-sponsored EV incentives to promote future growth. Addressing these problems through deliberate policy support, infrastructure development, and innovation will be critical to ensuring long-term prosperity in the sector.

1.7 Necessity of innovation:

Innovation is essential for overcoming obstacles in the Indian automobile sector, which is constantly expanding while facing numerous hurdles.

1.7.1 Promoting Electric Vehicles (EVs) and Reducing Pollution:

The government has implemented the FAME (Faster Adoption and Manufacturing of Electric Vehicles) program, which offers incentives to make electric vehicles more accessible to consumers. It is investing in charging infrastructure by installing additional public charging stations around cities and highways. The Production-Linked Incentive (PLI) initiative stimulates indigenous production of EV components such as batteries and

motors reducing reliance on imports. The government is also encouraging tax breaks and lower GST rates for EVs in order to increase accessibility.

1.7.2 Enhancing Road Safety and Traffic Management:

To prevent accident fatalities, the government mandated safety measures such as airbags in all new cars. It is putting in place smart traffic management technologies that use AI and IoT to control city congestion. The Bharatmala project is renovating highways and roads to make travel smoother and safer. Strict enforcement of the Motor Vehicles Amendment Act results in greater traffic discipline, heavier penalties for offences, and higher road safety standards. Through these measures, the Indian government is aggressively encouraging innovation to make transportation more sustainable safer, and more efficient.

1.8 Future Employment Opportunities in the Indian Automobile Industries:

The Indian automobile sector is expanding rapidly and is projected to generate more job opportunities in the future. The rise of electric vehicles (EVs), automation, and new technologies has increased the demand for talented individuals in manufacturing, design, software, and artificial intelligence (AI). Many businesses are investing in EV production, battery manufacturing, and smart mobility solutions, which will create additional opportunities in engineering, research, and maintenance.

Moreover, as the sector shifts towards automation and robotics, IT specialists and data analysts will be required to create and maintain smart vehicle systems. The rise of shared mobility services, such as ride-sharing and self-driving automobiles, will also provide job opportunities in fleet management, customer support, and software development. Government efforts such as Make in India and PLI (Production-Linked Incentive) policies encourage investment in the sector, resulting in increased job possibilities.

Overall, the future of employment in the Indian vehicle sector appears promising, with enormous possibilities in EV technology, automation, and smart mobility. Young individuals with expertise in engineering, artificial intelligence, and green energy solutions will have numerous job options in this rapidly evolving business.

1.9 Profile of the selected Automobile companies in India:

1.9.1 Tata Motors Ltd

Tata Motors Ltd, the Tata Group's flagship firm, is one of India's top vehicle manufacturers, with a strong global presence. It is a member of the Tata Group and has it's headquarter in Mumbai India. The company manufactures vehicles, trucks, vans, and buses. Tata Engineering and Locomotive Co. Ltd. (TELCO) was founded in 1945 and initially focused on the manufacture of locomotives and other engineering items. Tata Motors joined the commercial vehicle category in 1954 with a collaboration with Daimler-Benz, introducing India's first indigenous truck. By the early 1990s, the corporation had expanded into passenger vehicles, releasing the Tata Sierra (1991), Tata Indica (1998), and Tata Safari (1998), indicating its entry into the personal mobility market.

Tata Motors achieved a crucial milestone in 2008 when it purchased the renowned Jaguar Land Rover (JLR) from Ford, increasing its global presence in the premium vehicle industry. The business also made history that year by launching the Tata Nano, the world's cheapest automobile, with the goal of making car ownership affordable to millions of Indians. Tata Motors has auto production and vehicle plants in India (Jamshedpur, Pantnagar, Lucknow, Sanand, Dharwad, and Pune), as well as Argentina, South Africa, the United Kingdom, and Thailand. It has research and development facilities in Pune, Jamshedpur, Lucknow, Dharwad, South Korea, the United Kingdom, and Spain. Tata Motors is traded on the BSE and NSE and is a component of the BSE SENSEX and NIFTY 50 benchmark indices. In 2019, the company rated 265th on the Fortune Global 500 list of the world's largest corporations. On January 17, 2017, Natarajan Chandrasekaran was appointed chairman of Tata Group. Tata Motors grew their UV market share to more than 8% in FY2019.

Tata Motors currently operates in over 125 countries and produces a wide variety of vehicles, including passenger automobiles, commercial vehicles, electric vehicles, and defence vehicles. The corporation has prioritised sustainability, innovation, and advanced mobility solutions, investing in technologies such as connected vehicles, automated driving, and hydrogen-powered engines. Tata Motors continues to be at the forefront of India's automotive industry, driving growth and transformation via its dedication to innovation and eco-friendly transportation. Tata Motors has recently emerged as an electric

vehicle (EV) market leader in India, with models such as the Nexon EV, Tigor EV, and Tiago EV getting popularity.

Tata Motors has had a dynamic five-year journey that has included both obstacles and major accomplishments. The company suffered headwinds in fiscal year 2020-21 because to the global pandemic, which caused supply chain interruptions and a drop in sales. However, Tata Motors demonstrated tenacity and went on a vigorous recovery path in the years that followed. The fiscal year 2022-23 was particularly noteworthy, as emphasised in the 78th Integrated Annual Report, where the firm presented a varied array of vehicles, including advances in electric mobility solutions. During this time, Tata Motors also strengthened its commitment to sustainability, in line with the Tata Group's aim for a greener future. Financially, the corporation reported higher revenue and profitability, indicating a successful comeback. The momentum carried over into fiscal year 2023-24, with Tata Motors' 79th Integrated Annual Report emphasising the company's focus on innovation, customer-centric strategy, and electric vehicle expansion. This decade also saw the launch of new models and technology, strengthening the company's position in both domestic and foreign markets. Overall, Tata Motors' performance over the years reflects a journey of resilience, strategic reinvention, and unwavering commitment to long-term growth.

Tata Motors Ltd. has showed exceptional power and strategic growth over the years, overcoming industrial obstacles and market changes. The company has effectively increased its footprint in the passenger, commercial, and electric vehicle markets by working on innovation, sustainability, and customer-centric methods. Its emphasis on electric transportation, good financial performance, and commitment to sustainability are consistent with its long-term goals of growth and worldwide expansion. With a solid foundation, technological innovations, and a forward-thinking strategy, Tata Motors is well-positioned to shape mobility's future and continue its automotive industry leadership.

1.9.2 Mahindra &Mahindra ltd

Mahindra & Mahindra Ltd (M&M), the Mahindra Group's primary company, is a corporate group. The company operates in a variety of industries, including automotive, aerospace, agribusiness, aftermarket, information technology, consulting, components, clean energy, financial services, defence, real estate and infrastructure, industrial and construction

equipment, two-wheelers, retail, steel, hospitality, IT services, automotive parts, aero structures, boats, investments, and logistics. It has manufacturing sites in the United States, France, Finland, India, Japan, Africa, China, and Australia. The corporation also maintains research and development facilities. M&M also has operations in India, South Korea, Japan, and Italy, in addition to North America. M&M is based in Mumbai, Maharashtra, India.

Mahindra & Mahindra was started as a steel trade company in Ludhiana on October 2, 1945, by brothers Kailash Chandra Mahindra and Jagdish Chandra Mahindra, together with Malik Ghulam Muhammad. The current Chairman of the Mahindra Group, Anand Mahindra, is the grandson of Kailash Chandra Mahindra. Ghulam Mohammed decided to relocate to Pakistan after its inception in 1948.The Mahindras were given corporate stationery and an M&M stamp. They did not have the money to change the name. Because there were two Mahindra brothers in the business, they decided to alter the company name to Mahindra and Mahindra.

They subsequently identified a financial opportunity in expanding into the manufacturing and sale of larger multiutility vehicles (MUVs) and began assembling under the Willys Jeep licence in India. M&M soon established itself as India's Jeep maker, and it eventually expanded into the production of light commercial vehicles (LCVs) and agricultural tractors. Jeep was purchased by American Motors Corporation in 1970; Jeeps were continued to be made by Mahindra under license from AMC and, later, by Chrysler after Chrysler acquired AMC in 1987.

Mahindra & Mahindra Ltd. (M&M) has strategically expanded through important acquisitions in a variety of areas. It purchased Gujarat Tractors (1999) and Punjab Tractors (2007), solidifying its position as the world's leading tractor manufacturer. In the EV market, it acquired REVA Electric (2010) and later rebranded it as Mahindra Electric. The company also bought South Korea's SsangYong Motor in 2011, but funding ended in 2020. Other significant purchases include Peugeot Motorcycles (2015-2019), Mitsubishi Agricultural Machinery (2015), Sampo Rosenlew (2016-2019), Hisarlar and Erkunt Tractors (2017), and MITRA Agro (2018-2020). In 2023, M&M bought a 60.01% share in Emergent Solren, a solar power company.

Mahindra & Mahindra Ltd. (M&M) has shown significant growth and resilience in recent years. Despite a revenue drop to ₹74,278 crore in FY 2020-21 due to the pandemic, the company recovered strongly in succeeding years. Revenue increased to ₹90,171 crore in FY 2021-22 and ₹1,21,269 crore in FY 2022-23, a 34% increase. In FY 2022-23, profit after tax (PAT) increased by 56% from the previous year to ₹10,282 crore. M&M expects to exceed ₹1,45,000 crore in revenue for FY 2023-24. Rising demand for SUVs, tractors, and electric vehicles, as well as strategic acquisitions and global expansions, have pushed the company to fame in the Indian automotive and agriculture sectors.

Mahindra & Mahindra Ltd. has established itself as a major player in the automotive, agricultural, and technology industries, owing to solid financial performance and sustained development. The company's success has been fuelled by its strategic focus on innovation, sustainability, and worldwide expansion, which has pushed it to the top of the SUV, tractor, and electric vehicle markets. M&M remains committed to ESG initiatives, digital transformation, and customer-centric solutions in response to market trends and emerging possibilities. Its resiliency, strategic acquisitions, and diverse business model position it for long-term growth, assuring its presence in the changing mobility and agribusiness landscapes.

1.9.3 Bajaj Auto ltd

Bajaj Auto Limited is a multinational car manufacturing firm headquartered in Pune, India. It makes bikes, scooters, and auto rickshaws. Bajaj Auto is a member of the Bajaj Group. Jamnalal Bajaj (1889–1942) founded it in Rajasthan in the 1940s.Bajaj Auto is the world's third-largest motorbike manufacturer, ranking second in India. It is the world's biggest three-wheeler manufacturer. In December 2020, Bajaj Auto's market capitalisation exceeded ₹1 trillion (US$12 billion), making it the world's most valuable two-wheeler firm.

Jamnalal Bajaj launched Bajaj Auto Ltd. as M/s Bachraj Trading Corporation Pvt. Ltd. on November 29, 1945, with the intended goal of importing and marketing two- and three-wheeler vehicles in India. In 1959, the company got a domestic manufacturing licence for two- and three-wheelers. By 1960, Bajaj Auto had become a publicly traded firm. The business rose to popularity with the release of their legendary Chetak scooter in the 1970s and then moved into motorcycles, producing the Bajaj Pulsar in 2001, which revolutionised the Indian bike market. Over time, Bajaj Auto grew into a global brand, becoming the

world's third-largest motorcycle maker and three-wheeler producer. Today, it exports to over 75 countries and continues to pioneer electric mobility solutions such as the Bajaj Chetak EV.

Bajaj Auto Ltd. has grown steadily and demonstrated resilience in the automotive business over the last few years. Despite a decrease in revenue to ₹27,741 crore in FY 2020-21 due to the pandemic, the company rebounded strongly and recorded ₹33,145 crore in FY 2021-22 and ₹36,428 crore in FY 2022-23. Net profit increased by 17% to ₹5,628 crore in FY 2022-23 compared to the previous year. Revenue for FY 2023-24 is predicted to reach ₹38,000 crore, with a net profit of around ₹5,900 crore. Strong domestic and foreign sales, strategic innovations, and development into electric mobility have all contributed to the company's growth, confirming its position as a global leader in two- and three-wheelers.

Bajaj Auto Ltd has established itself as a major participant in the worldwide two and three-wheeler markets, with good financial performance and sustained development. With an emphasis on innovation, cost savings, and worldwide expansion, the company has effectively navigated industry headwinds while remaining profitable. Its dedication to electric transportation, global expansion, and strong brand portfolio position it well for future growth. As market conditions and technical breakthroughs change, Bajaj Auto continues to be a significant force in determining the automobile industry's future.

1.9.4 Hero motocorp ltd

Hero Moto Corp Limited is an Indian multinational motorcycle and scooter manufacturer with its headquarters in Delhi. It accounts for over 30% of the Indian two-wheeler market. As of 2024, the Munjal family is the company's largest stakeholder, accounting for 34.75%.

Hero Honda was established in 1984 as a joint venture between Hero Cycles of India and Honda of Japan. The Munjal brothers used the brand name "Hero" for their main company, Hero Cycles Ltd. In 1984, the Hero Group and Honda Motor Company formed a joint venture known as Hero Honda Motors Limited in Dharuhera, India. The Munjal family and the Honda group each owned a 26% share in the company.

During the 1980s, the business introduced low-cost motorbikes to India. It was known for its advertising campaign based on the tagline 'Fill it, Shut it, Forget it,' which emphasised fuel efficiency. In 2001, the company established itself as India's largest two-wheeler manufacturer.

In 2011, Hero MotoCorp officially concluded its 26-year joint venture with Honda, which had previously been known as Hero Honda Motors Ltd. Following the split, Hero renamed as Hero MotoCorp Ltd. to develop a distinct global identity. The separation enabled Hero to develop its own technologies and expand into international markets without interference from Honda. Despite the termination, Hero continued to use Honda's technology under a license deal until it gradually built its own R&D capabilities, solidifying its position as the world's leading two-wheeler manufacturer.

Hero MotoCorp Ltd. has strategically extended its global reach and technological capabilities through important investments and the formation of subsidiaries:

- Erik Buell Racing (EBR): In July 2013, Hero MotoCorp paid $25 million for a 49.2% share in the American motorcycle manufacturer Erik Buell Racing. However, EBR filed for bankruptcy in 2015, prompting Hero to acquire certain assets from the company.
- Ather Energy: In 2016, Hero MotoCorp invested ₹205 crore (roughly $30.5 million) in Ather Energy, an Indian electric scooter start up, for a 32.31% ownership. In 2018, the corporation invested an additional ₹130 crore (about $19 million), raising its ownership to 34.58%.
- Hero Tech Center Germany GmbH (HTCG): Hero MotoCorp founded HTCG as a wholly-owned company in Germany, with the goal of focussing on two-wheeler research and development. HTCG's fiscal year 2020-21 revenue was ₹79.90 crore, with a net profit of ₹4.24 crore.

These significant expenditures, together with the formation of HTCG, have improved Hero MotoCorp's technological capabilities and permitted its development into international markets.

Hero MotoCorp Ltd. has shown consistent development and durability in the highly competitive two-wheeler business in recent years. Despite problems such as shifting demand and growing input costs, the company has maintained its top position. In FY 2022-23, revenue increased by 18.8% to ₹34,727 crore from ₹29,245 crore in FY 2021-22. However, profit after tax (PAT) fluctuated, falling to ₹2,329 crore in FY 2021-22 before rebounding to ₹2,936 crore in FY 2022-23. Strong local demand, product innovation, and the company's entry into electric mobility with the Vida EV series have all contributed to its rise. Hero MotoCorp has also increased its global presence through strategic

collaborations and foreign market expansion. With ongoing investments in R&D and environmental initiatives, the company is well-positioned to capitalise on emerging opportunities in the changing two-wheeler market.

Hero MotoCorp Ltd. is a major two-wheeler manufacturer that has evolved over the years with a focus on innovation, quality, and client needs. It has retained its top spot by diversifying into electric vehicles, increasing technology, and entering new worldwide markets. Despite problems such as changing demand and rising expenses, the company has maintained its strong performance. Hero MotoCorp is poised to grow further and maintain its position as a top player in the two-wheeler sector by continued investments in new products, sustainability, and improved technology.

1.9.5 Maruti Suzuki India ltd

Maruti Suzuki India Limited is a publicly traded Indian affiliate of Japan's Suzuki Motor Corporation. It is India's largest automotive manufacturer, focusing in compact automobiles. The CEO & Managing Director of maruti Suzuki India ltd is Hisashi Takeuchi and the Company's headquarters is located in New Delhi, India

The firm was created by the Government of India as Maruti Udyog Limited in February 1981 as a joint venture with Suzuki, the latter becoming the first Japanese manufacturer, as well as the first major foreign automaker to invest in India.

Maruti launched its first manufacturing unit in Gurugram, Haryana, in 1982. Maruti was initially majority-owned by the Indian government, with Suzuki only holding a 26% interest when company was founded in 1982. The Indian government steadily reduced its shareholding, partially exiting the firm in 2003 by making it a public corporation In 1983, the business launched its first car, the Maruti 800, which was an instant hit and transformed the Indian automobile market. Maruti grew its product selection throughout time, adding models such as the Zen, Swift, Alto, Wagoner, and Baleno, eventually becoming India's largest vehicle maker.

In 2003, the Government of India privatised Maruti, selling its interest to Suzuki, which became the main owner. In 2007, the company changed its name to Maruti Suzuki India Ltd. Today, it dominates the Indian automotive industry with a diverse variety of vehicles, a robust dealership network, and a future focus on hybrid and electric vehicle technologies.

Maruti Suzuki has become the largest Suzuki subsidiary in terms of production volume and sales. In September 2022, the business had a leading market share of 42% in the Indian passenger automobile market.

The company has various manufacturing facilities around India, including one in Gurgaon and Manesar, Haryana, as well as one in Gujarat. These mills have a total capacity of more than 2 million units per year, allowing Maruti Suzuki to meet domestic and worldwide demand.

Despite industry challenges, Maruti Suzuki India Ltd. has grown significantly in recent years. The company's sales decreased to ₹70,333 crore in FY 2020-21 due to the COVID-19 pandemic. However, it increased dramatically to ₹88,330 crore in FY 2021-22. Revenue increased to ₹1,12,500 crore in FY 2022-23 and is projected to reach ₹1,24,000 crore in FY 2023-24. Net profit decreased to ₹3,879 crore in FY 2021-22, but recovered to ₹8,049 crore in FY 2022-23 and a projected ₹9,200 crore in FY 2023-24.

Maruti Suzuki's commitment to innovation, diverse product offering, and strong production skills have cemented its position as a market leader in India. By focussing on client demands and market developments, the company continues to drive growth and set standards in the auto industry.

1.9.6 Eicher Motors Limited

Eicher Motors Limited is a global automotive firm located in New Delhi that makes motorbikes and commercial vehicles. Eicher is the parent firm of Royal Enfield, which produces middleweight bikes. It also manufactures Eicher-branded vehicles and buses in a joint venture with Volvo Group.

Eicher Motors Limited, an Indian company, manufactures commercial vehicles in India. It owes its beginnings to the Goodearth Company, which was founded in 1948 to sell and service foreign tractors in India. Goodearth Company, in partnership with Eicher Tractors of Germany, created Eicher Tractor Corporation of India in 1958 to produce tractors in India. The company produced its first indigenous tractor in 1959, and a year later changed its name to Eicher Tractors India Ltd. Eicher India has been fully owned by Indian shareholders since 1965. Massey Ferguson acquired a 30% stake in the German Eicher tractor in 1970. Massey Ferguson acquired the German company in 1973. In 2005, Eicher

Motors Ltd sold their tractor and engine business to TAFE Tractors (Tractors and Farm Equipment Ltd) of Chennai, the Indian licensee of Massey Ferguson tractors.

In July 2008, Eicher Motors Limited (EML) and the Volvo Group launched VE Commercial Vehicles (VECV), a 50:50 joint venture that designs, manufactures, and markets commercial vehicles, engineering components, and engineering design.

The company's concentration on launching new models, such as the 'Meteor 350' motorcycle and 'Flying Flea' e-bike, resulted in increased spending and reduced profit margins, raising investor concerns about its growth-over-profit strategy. Despite record vehicle sales, gross profit per vehicle fell to a six-quarter low, causing a nearly 7% plunge in share prices, the largest one-day decline since July 2023.

Eicher Motors remains a major presence in the automotive industry, exploiting its legacy brands and strategic partnerships. While the company has grown through new product introductions and global expansion, profit margins and investor expectations remain a struggle. Balancing growth objectives with profitability will be critical for Eicher Motors to maintain its place in the competitive automotive market.

1.9.7 TVS Motors ltd

TVS Motor Company is an Indian multinational motorcycle manufacturer with its headquarters in Chennai. It is India's third-largest motorbike company in terms of revenues. The company's yearly sales are three million units, and its annual production capacity exceeds four million automobiles. TVS Motor Company is also India's second largest two-wheeler exporter, shipping to more than 60 countries. TVS Motor Company is the flagship company of the TVS Group, with the greatest valuation and turnover.

Sundaram Clayton was created in 1962 in conjunction with Clayton Dewandre Holdings in the United Kingdom. It produced brakes, exhaust systems, compressors, and a variety of other vehicle components. In 1976, the business established a plant in Hosur to produce mopeds for their new division. The TVS 50, India's first two-seater moped, was produced in Hosur, Tamil Nadu, India, in 1980. In 1987, Sundaram Clayton Ltd and Suzuki Motor Corporation formed a joint venture as a consequence of a technical collaboration with Japanese automaker Suzuki Ltd. The commercial production of motorcycles began in 1989.

TVS and Suzuki had a one-year cooperation intended at technology transfer for the design and manufacture of two-wheelers exclusively for the Indian market. The business, renamed TVS-Suzuki, released various vehicles, including the Suzuki Supra, Suzuki Samurai, Suzuki Shogun, and Suzuki Shaolin. After splitting from Suzuki in 2001, the company was renamed TVS Motor and lost the ability to use the Suzuki name. Suzuki also agreed to a 30-month ban on competing two-wheelers in the Indian market.

The flagship model TVS Apache RR 310, the TVS Apache RTR 200, the TVS Victor, and the TVS XL 100 are among the most recent debuts. TVS recently received four top prizes from J.D. Power Asia Pacific prizes 2016, three top awards from J.D. Power Asia Pacific Awards 2015, and Two-Wheeler Manufacturer of the Year from NDTV Car & Bike Awards (2014-15).

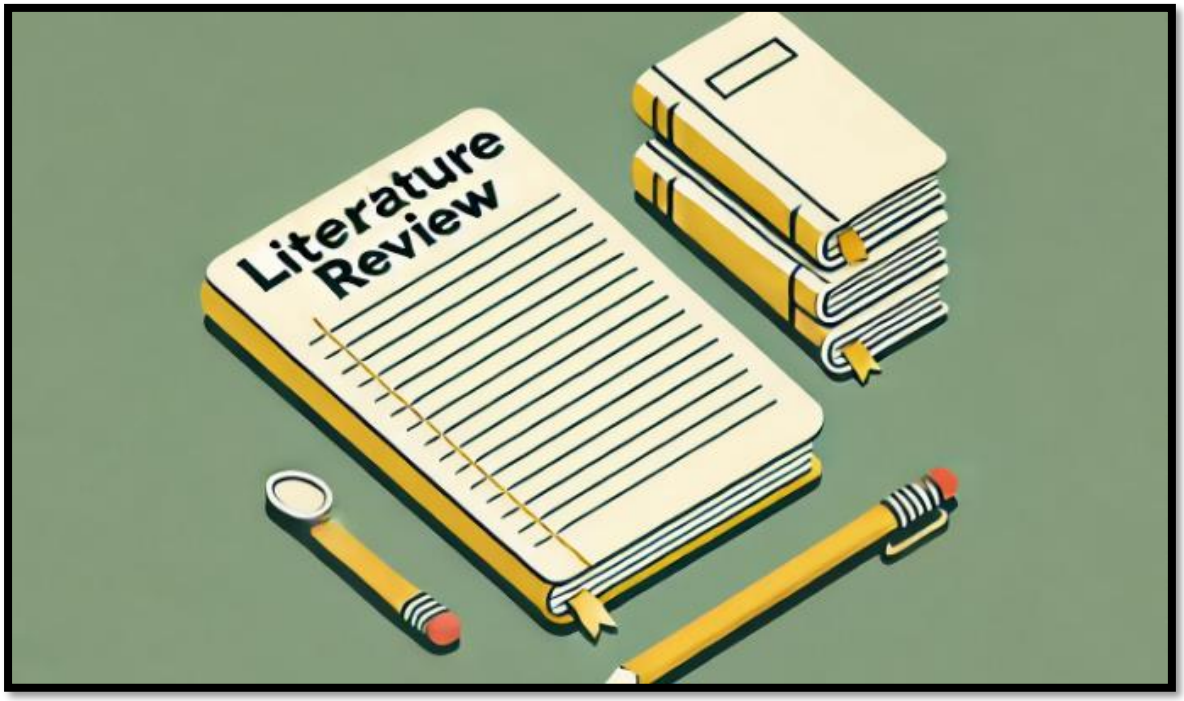
The company operates four cutting-edge two-wheeler manufacturing facilities in Hosur (Tamil Nadu), Mysore (Karnataka), Nalagarh (Himachal Pradesh), and Karawang (Indonesia). In addition, Hosur has a dedicated three-wheeler plant. These factories collectively have an annual production capacity of almost four million automobiles, demonstrating TVS Motor's strong manufacturing capabilities.

In fiscal year 2023-2024, TVS Motor Company recorded consolidated net sales of ₹11,301.68 crore for the quarter ended September 2024, representing a 13.78% year-on-year increase. The company encountered difficulty due to higher costs, resulting in a net profit of ₹6.63 billion for the same quarter, which fell short of analysts' estimates. Despite these challenges, TVS Motor continues to display resilience and adaptability in a competitive marketplace.

TVS Motor has a substantial global presence, exporting to more than 60 nations. Norton Motorcycle Company, a subsidiary of TVS, demonstrates the company's dedication to increasing its global reach and broadening its product offerings.

TVS Motor Company Limited has grown from its early collaborations to become a major player in the global automobile sector. With a diverse product portfolio, substantial production infrastructure, and a focus on innovation and sustainability, TVS Motor is well-positioned to continue its growth trajectory, meeting the changing demands of global consumers.

CHAPTER – 2 LITERATURE REVIEW



Index

2.1 Introduction of Literature review:

This chapter of the research report has been presenting review of literature of 50 important research that examined corporate bankruptcy prediction, financial solvency, and the use of the Altman Z-Score in the worldwide automotive industry and other business sectors. These studies offer a thorough grasp of sector-specific financial issues, model performance, and financial distress forecasting.

2.2 Review of Literature:

(Kamble, 2024) Examine how the Indian auto industry has changed significantly, especially after economic liberalisation in 1991. The report emphasises how technical developments and foreign direct investment (FDI) were able to transform the industry after liberalisation opened the Indian economy to international markets. The study looks at how government regulations helped make domestic businesses more competitive and made it easier for foreign businesses to enter the market. The Indian automobile industry had significant development and resilience through the adoption of new consumer-oriented techniques, supply chain efficiencies, and production standards. Changes in consumer preferences are also examined in the study, as these have further impacted the development of the industry.

(**Bhargav & Prakash, 2024**)Examine Abhinandan Motors Pvt. Ltd.'s profitability, asset management, and liquidity performance in this thorough financial study for the 2019–2023 timeframe. The study looks at past performance and present financial circumstances to determine the company's financial health. The study examines profitability margins, asset utilisation efficiency, and liquidity trends using ratio and common size analysis. Even if current assets and liabilities have changed over time, the results show a consistent rise in share capital and a notable expansion in fixed assets. The cash, quick, and current liquidity ratios all exhibit fluctuations, but the current asset turnover ratio points to increased asset management efficiency. All things considered, the study offers valuable information about the company's financial strengths and weaknesses, pinpointing important areas.

(Kumar & Holeyachi, 2024)undertook a study that examined the stock movements of TVS Motor, MRF, Ashok Leyland, Maruti Suzuki, and Tata Motors—five significant automakers that are listed in the NIFTY50 index. By examining quarterly and annual stock

price movements between January 2021 and December 2021, the study aims to pinpoint the major variables affecting stock volatility in the automotive industry. The study emphasises how quarterly performance of businesses affects changes in stock prices. Market demand and industry trends Government policy, fuel prices, and inflation are examples of macroeconomic influences. According to research, the vehicle industry's stock price fluctuations are quite erratic, therefore before making an investment, investors should thoroughly examine market patterns. Before trading stocks in this industry, investors should follow market circumstances and financial performance using a data-driven strategy, according to the report.

(Jadhav & Prakash, 2024) Economic policies, technological developments, and shifting customer demand have all had a substantial financial impact on the Indian auto sector. Examine the financial results and business plans of major companies like Maruti Suzuki, Mahindra & Mahindra, and Tata Motors, emphasising the potential and problems facing the industry. Major manufacturers confront a number of challenges, including $6 billion in tax-related financial troubles. As a result of increased export volumes, Ashok Leyland, on the other hand, reported a 31.3% increase in quarterly profits, demonstrating its financial stability (Reuters, 2025).

(Muhammad Ilyas, 2024)A corporation that undergoes a downturn in its financial situation prior to bankruptcy is said to be in financial difficulty. Utilising financial statement analysis methods like the Altman model, the business must monitor its financial status in terms of both its income statement and balance sheet in order to prevent this situation. With three classification categories—safe, grey, and distress—this study aims to use the Modified Altman technique to predict firm bankruptcy by analysing the occurrence of financial hardship. Utilising a quantitative method, this study selected a sample of 13 companies by utilising a purposive sampling technique on the entire population of all companies registered on the JII. Eight businesses with a cut-off value > 2.9 have continuously been in the Safe category for five years, according to the Altman Z-score research. Upon doing a comprehensive analysis, the average value derived from every company is 5.7688> 2.9. According to this figure, all companies listed on the Jakarta Islamic Index between 2018 and 2022 are, on average, in the safe category.

(Apriliana Putri, 2024) It is essential to comprehend the factors influencing profit growth in the automobile industry in order to preserve competitiveness and guarantee long-term

sustainability. Ten automobile businesses listed on the Indonesia Stock Exchange are the subject of this empirical investigation into the effects of the Current Ratio (CR) and Net Profit Margin (NPM) on profit growth between 2018 and 2022. Significant insights were found using a quantitative approach that made use of panel data regression analysis and more especially the Fixed Effects Model (FEM). Profit growth was found to be positively impacted by the CR while negatively by the NPM. The automotive industry's financial management processes can be better understood thanks to these empirical data. Investors, managers, and legislators can maximise financial methods for profit growth by making well-informed judgements based on their knowledge of how important financial variables affect profitability. This study adds to the body of literature by examining the relationship between the CR and NPM in the context of the automotive industry, which has not received enough thorough examination. These insights are essential for sustaining the industry's long-term viability in a highly competitive global market and guiding strategic financial decisions.

(Monika Dasharath Gorkhe, 2023) Analysis of financial statements is essential for determining the soundness of a company's finances and its capacity to pay debts. Financial statement analysis was first used by credit providers to assess the creditworthiness of borrowers, but it is now crucial for banks, investors, and credit rating agencies, among other stakeholders. When a business finds it difficult to meet its financial obligations, it is said to be in financial distress. Researchers frequently associate this with the possibility of bankruptcy. This study uses the updated Altman Z-score model to analyse the financial health and bankruptcy chances of 20 chosen FMCG companies in India that are listed on the Bombay Stock Exchange (BSE). Based on the Z-score classification, the majority of FMCG companies in India are found to have high financial stability, with many of them falling into the Safe Zone. Furthermore, businesses that started out in the Grey Zone have gradually improved their financial situation. Altman Z-scores and financial ratios have a strong positive link, as confirmed by Pearson correlation analysis, which supports the model's accuracy in forecasting financial trouble. By highlighting the usefulness of financial measures in evaluating business performance, the study assists investors in making well-informed choices by highlighting financially sound businesses.

(Krishnamurthy & Vijayapriya, 2023) Use the Altman Z-Score model to examine the automotive auxiliary sector's financial stability and insolvency risks in India. In order to assess the economic resilience and bankruptcy risk of ten auto accessory companies listed

on the NSE, the study uses the Z-Score formula to analyse their financial data. The results of the study show that not all businesses in the sector are financially sound, with some showing indications of possible financial hardship. Nonetheless, it is determined that a number of businesses in the industry are financially stable and dependable. The study demonstrates how well the Altman Z-Score model predicts the likelihood of corporate insolvency, assisting investors and decision-makers in making wise financial choices. Development and making tactical suggestions for future financial planning.

(V.B, 2023) Two important measures of a company's financial performance are cost-effectiveness and profitability. Using secondary data from the annual financial statements of five S&P BSE auto-listed companies from 2014 to 2023, the study A Study on Cost Effectiveness and Profitability of Indian Automobile Industries investigates the cost effectiveness and profitability of a subset of Indian automakers. The study uses multiple regression analysis with E Views software and Data Envelopment Analysis (DEA) to assess how cost inputs and outputs affect profitability. The findings show that total cost and profit models have a positive relationship, indicating that cost effectiveness has a direct impact on profitability. Businesses that successfully control expenses can attain greater levels of profitability, highlighting the significance of cost-management measures in the automotive industry.

(Rameshbhai & Ajmer, 2023) looks at how two elements are related, examining how profitability continues to be the primary driver of business sustainability while liquidity promotes operational efficiency. TVS Motors, Hero MotoCorp, and Bajaj Auto are the three main corporations that are the subject of this study, which uses financial data from 2011–12 to 2018–19. Key financial ratios are evaluated by a comparative financial analysis, and significant variations are evaluated using ANOVA statistical tests. Except for the Debtors Turnover Ratio, which exhibited a significant change over the research period, the results demonstrate that the majority of financial ratios stayed constant. This study emphasises that accomplishing financial objectives and guaranteeing long-term company success for two- and three-wheeler enterprises requires striking a balance between liquidity and profitability.

(karlina, 2023) Investigates how profitability (Return on Assets, or ROA) and liquidity (Current Ratio, or CR) affect the degree of financial hardship in Indonesia's automotive and component subsectors. Using data from 13 manufacturing companies listed on the

Indonesia Stock Exchange between 2015 and 2020, the study uses purposive sampling to choose 10 businesses that fit certain requirements. While multiple linear regression analysis establishes the connection between liquidity, profitability, and solvency risk, the Altman Z-Score model is utilised to evaluate financial distress. According to the results, financial stability is enhanced by higher ROA, but the dangers of financial distress are increased by lower liquidity levels. In order to avoid insolvency in the capital-intensive automotive sector, the study emphasises the significance of striking a balance between liquidity and profitability.

(Ramanuj, 2023) Over a ten-year period (2013–14 to 2022–23), examine the liquidity and profitability performance of three significant Indian automakers: Mahindra & Mahindra Ltd., Tata Motors Ltd., and Maruti Suzuki India Ltd. Regression analysis, arithmetic mean, and annual report data are used in the study to evaluate these companies' financial health. The strongest liquidity situation was exhibited by Mahindra & Mahindra Ltd., indicating effective short-term financial management, according to key findings. On the other hand, Maruti Suzuki India Ltd. scored better in terms of profitability, demonstrating greater revenue generation efficiency. A company's liquidity situation does not always translate into profitability, according to the study's conclusion that there is no statistically significant correlation between the two. According to this study, Indian automakers must optimise their financial strategies to guarantee both operational effectiveness and long-term sustainability by striking a balance between liquidity and profitability on their own.

(Srinivas, 2023)A company's financial stability has a big influence on a nation's development and the welfare of its citizens. Stakeholder funds are protected by financially sound businesses, who use them for the good of the country and society. Assessing the financial distress situation of a subset of the Indian Stock Market's NIFTY 50 companies is the goal of this study. Analysis was limited to companies that were not in the finance sector out of the 50 NIFTY 50 companies. These companies' financial statements were used by the researcher as secondary data for the 2022–2023 timeframe. The nature of this research article is both analytical and descriptive. Using the Altman Z-Score methodology, the researcher assessed the companies' financial difficulties and found that, of the 39 chosen enterprises, 9 are in a state of bankruptcy.

(M.Dhanabhakyam, 2023) One of the industries in India that is experiencing rapid growth is the fast-moving consumer goods (FMCG) sector. The last ten years have seen an

exceptional expansion in this industry. More than three million people are employed in downstream activities, which are typically conducted in smaller towns and rural areas of India, and the FMCG sector is the fourth largest sector in the country's economy and a significant contributor to its GDP. An assessment of the company's financial status and the management's strengths and weaknesses can be made using financial performance analysis. These analyses are helpful in boosting the company's credibility. Using Altman's z score model, which is based on discriminant analysis, the study aims to assess the performance of FMCG companies in India and forecast the solvency of a subset of these companies. Additionally, the report claims to have identified important factors influencing the company's solvency. Financial metrics such as total assets, EBIT, retained earnings, and working capital would be employed. New insights into firm analysis should be gained from the identification of the companies' performance and distress indicators. The use of financial ratios as variables is suggested.

(Maheshwari et al,2023) Examines the financial results of Tata Motors and Mahindra & Mahindra (M&M) Ltd., two significant automakers in India. The study compares their performance from 2018 to 2022 and uses a variety of financial ratios to evaluate their financial situation. The study assesses important financial measures based on secondary data to identify the organisation with the better financial standing. According to the results, Mahindra & Mahindra Ltd. beat Tata Motors in a number of financial areas over the course of the study. The findings imply that in order to strengthen its position as a competitor in the Indian auto sector, Tata Motors should concentrate on cutting costs and increasing profitability. The study's overall findings underscore M&M Ltd's exceptional financial performance and the necessity for Tata Motors to make significant financial improvements.

(Kotak, 2022) The study finds trends in India's top five cement industries based on financial health and validates Altman's Z score model. Ratio analysis has been used to calculate the five-year timeframe from 2008 to 2012 that we are employing for this. It has been determined that Altman's Z score model is a suitable predictor for the top five cement industry positions as of right now. The Altman Z-score is a crucial metric in this regard for assessing the company's financial stability. Studying, evaluating, and contrasting the sample companies' financial situations was the goal of the current investigation. According to the study's overall findings, ACC Cement, Ambuja Cement, India Cement, Birla Cement, and UltraTech Cement were all financially stable over the study period Z score model.

(Reddy,2022) Investigates, using ratio analysis and Economic Value Added (EVA) analysis, the financial performance of the top 10 automakers listed on the BSE Ltd. as of December 31, 2021. The study sheds light on the financial efficiency, liquidity, and profitability of a few chosen companies using secondary data from annual reports from 2016–17 to 2020–21. According to the findings, the industry's overall financial performance was slow, with growth and profitability varying. Hyundai Motors and Maruti Suzuki, on the other hand, consistently showed excellent performance and financial stability, demonstrating their significant market presence and sound financial management. The study emphasises that although the Indian automobile industry makes a substantial contribution to the country's GDP, financial efficiency differs among businesses, necessitating deliberate actions to improve performance.

(Divya, 2022)A company's finances are its foundation. Planning and managing finances are crucial at every stage of the company's development. A company's cash flow serves to guarantee that money and available resources are used effectively in accordance with the concepts of profitability, liquidity, and solvency. An accounting summary that shows a company's sales, costs, and net profits is called a statement of financial performance. In general, a financial performance statement is necessary to determine whether the company is profitable. It is a proclamation to make further decisions to grow and advance the company. This crucial element inspires all researchers to examine the financial results of each given sector. Maruti Suzuki India Limited, one of the leading players in the automotive business sector, was selected as the study's sample in this modest attempt to evaluate the performance of the vehicle industry. The study has been conducted for ten years, from 2013 to 2022. The database on moneycontrol.com provided the secondary data used in the analyses. The financial bankruptcy model of Altman's Z-score model has been used to forecast the financial performance and distress.

(Shah, 2022) The application of the Altman Z score to five specific industries is discussed in the research report. The Altman Z score can be used to forecast insolvency. It assists in determining if the business is in a safe, grey, or distressed zone. This tool's research focused on five industries: cement, airlines, two- and three-wheeler automobiles, and fast-moving consumer goods (FMCG) personal care. The Altman score is applied to a subset of the five chosen companies. The personal care industry is safe for all businesses. In the airline sector, Spice Jet and Global Vectra are experiencing difficulties. With the exception of scooters in

India, all other companies operating two- and three-wheelers are safe. Tata Motors' historical statistics has put the automobile four-wheeler industry in a precarious position. Additionally, the cement sector is safe, with the exception of India Cement and Birla Corp. Although further research is needed in the cement sector, the Altman Z score can be used to gain a clearer understanding of the industry in a wider range of industries with both listed and unregistered businesses.

(Kishankumar M. Rathod, 2022) The main goal of this study is to evaluate the asset management and liquidity positions of a few chosen automakers and offer suggestions for strengthening these areas. Five years are covered by the current study, from 2015–2016 to 2019–2020. Five ratios were computed for the three organisations selected for this study: the working capital turnover ratio, the total asset turnover ratio, the current ratio, the liquidity ratio, and the fixed asset turnover ratio. ANOVA was used in order to test the theory. This research is based on the secondary data. Different ratios were used to analyse the financial position of TATA motors and M & M Ltd. Findings: By analysing the financial position of the two companies it is clear that the net sales of the M & M Ltd is higher than the Tata Motors. It shows that even though the Tata Motors is performing well in its sales it has to concentrate to reduce its expenses to increase the profit. Likewise in the aspects of earnings per share, return on capital employed ratio, return on net worth ratio, gross profit ratio and net profit ratio the Tata Motors is lesser than the M & M Ltd. After analysing the aspects in this research, it says that M&M Ltd is better than Tata Motors from the year 2018 to 2022.

(Arora, 2022) The COVID-19 pandemic has caused the world economy to stall. This slowdown has the potential to become a recession, with businesses facing financial challenges that ultimately result in bankruptcy. Predicting such defaults is essential to safeguarding the interests of stakeholders and the financial market. By evaluating the models' effectiveness, this study compares the top bankruptcy prediction models from the Spring ate and Grover models. DHFL (Dewan Housing Finance Corporation Limited), ILFS Infrastructure Leasing & Financial Services Limited, and Srei Infrastructure Finance Ltd are the three insolvent NBFCs chosen for this study for the five-year period from 2014–15 to 2018–19. Microsoft Excel was used to analyse the data that was gathered. Financial institutions, investors, and providers of raw resources, loans, and investments can all benefit from the current research. The study's findings demonstrate that the spring ate

model outperforms the Grover model in forecasting the financial health of certain enterprises.

(Sisodiya, 2022) Finding out the long-term viability of particular automakers was the main goal of this investigation. In order to achieve this goal and determine the long-term solvency situation of a chosen group of automobile firms, information was gathered from the companies' financial statements and annual reports for the five accounting periods from 2016 to 2020. The components that were gathered were examined in an Excel spreadsheet, and proprietary ratios, debt to equity ratios, interest coverage ratios, and total assets to debt ratios were computed using IBM SPSS. The mean, standard deviation, coefficient of variance, maximum and minimum, column chart, and one-way ANOVA were utilised as descriptive statistics to make the data more meaningful and comprehensible. Bajaj Auto Ltd. has maintained its long-term solvency performance, according to the research study's findings.

(N Konanki, 2022) Internet marketing's increasing importance in India, with a focus on how businesses use social media and search tactics to accomplish their marketing objectives. To draw in and keep consumers, it emphasises a number of digital marketing strategies, such as growth, content, and influencer marketing. By emphasising education over direct sales, the study highlights the function of content marketing in interacting with consumers through a variety of media formats, such as blogs, info graphics, and videos. Due to the quick growth of digital marketing in India, a lot of companies are using online advertising to obtain a competitive advantage. Additionally, the evaluation looks at how important the internet is to digital marketing and how it opens up new advertising channels. The study is to examine the preferences of digital marketing by taking into account three important parties: customers, businesses, and outside agencies. In the end, it will assess the tactics used by different Indian organisations.

(Bhan, 2021) Compared the financial standing of Mahindra & Mahindra and Tata Motors, two of the biggest companies in the Indian auto sector. Key financial metrics such revenue growth, profitability, liquidity, debt structure, and asset utilisation will be the focus of the study's evaluation of their financial performance and stability. In addition to highlighting each company's advantages and disadvantages, the study identifies the variables that affect its operational effectiveness and financial stability. The study also looks at industry fundamentals, market trends, and competition positioning, all of which have a big impact

on how both businesses do financially. Managing debt presents difficulties for both businesses, necessitating careful financial planning. In the fiercely competitive automobile sector, the study offers stakeholders, investors, and industry professionals insightful information that aids in their strategic and financial decision-making.

(Kannamudaiyar, 2021) Two years before the incident occurs, companies' discomfort is predicted using the Altman Z score. This paper's primary goal is to evaluate how well the model predicts financial trouble among Indian footwear companies five years before the event occurs. To evaluate the effectiveness and precision of this methodology, five businesses have been chosen. According to the report, the footwear industry's overall financial health is in a good place. Due to the fact that four of the five chosen businesses—Bata India, Relaxo, Mirza International, and Khadim's are in a strong position. Only Liberty Footwear's Z score value, which indicates the distress zone, is below 1.80.

(M. M. Swalih, 2021) The Altman Z score is a useful metric for assessing a company's health and likelihood of going bankrupt. In this study, the financial soundness of the Indian auto sector was assessed using the Z score methodology. Both the original and emerging market formulations of the Altman Z score were analysed using the financial data of ten automakers who are listed on the National Stoke Exchange (NSE). The findings imply that the industry's listed companies on the NSE are financially stable. As to the study's findings, the Indian automobile industry is stable and strong, and there is little chance of financial crisis or bankruptcy for the companies involved anytime soon.

(Vivek Divekar, 2021) The COVID-19 pandemic has severely damaged the aviation sector. Prior to this pandemic being a diversion, the Indian economy was ready to take off and grow, especially in the aviation sector, until March 2020. The aviation sector's success was primarily due to the expanding middle class, but the pandemic has caused a temporary shift in the situation for the upcoming years. That being said, history indicates that practically all Indian airlines were losing money even prior to the outbreak. While Kingfisher Airlines is already a thing of the past, Jet Airways is virtually permanently grounded. Given that the aviation industry is one of the most significant for the economy and even for investors, an effort is made to determine the causes of the financial collapse of a few chosen Indian aviation companies using Altman’s Z Score Model, Pilarski's P-Score Model, and other issues they have encountered. The primary source of secondary data is the annual reports of India's top four airline companies. Analysis reveals that a number of internal and external

causes contribute to these enterprises' appalling financial situation, and both the companies and the government must seriously alter their operations.

(Kamran, 2020) Not only is the automobile industry the largest player in India, but it also makes a significant contribution to the global economy. The company's forward and backward links to numerous important economic sectors give it a strong multiplier effect on industrial progress. In order to adjust to the current market environment, the automotive industry has been changing and overcoming a variety of obstacles over the years, including restructuring, consolidations, and transitions. India now has the fourth-largest vehicle industry in the world, with revenue rising 9.5% annually to 4.02 million devices in 2017. India's total automobile exports increased at a CAGR of 6.86 percent from FY13 to FY18. The study uses ratio analysis to evaluate. Not only does the automobile industry dominate the Indian economy, but it also plays a significant role in the global economy. Ratio analysis is used in the study to measure.

(Rahman, 2020) This article aims to investigate the financial well-being of Indian automakers. The financial health has been evaluated for a long time. The five years covered by the study are 2015–16 through 2019–20. A financial performance analysis of the chosen automakers is conducted using Altman's Z score. A credit-strength test that uses five financial ratios that may be computed from information in an organization's annual report yields the Altman Z-score. India's automotive sector is currently the fourth largest in the world and the seventh largest producer of commercial cars. The automobile industry is the largest sector, accounting for 7.1% of the country's GDP and 45% of its manufacturing GDP. Today, the car industry is not limited to India. However, the world is dealing with issues to reduce liquidity risk and increase profitability. By 2021, it is anticipated that the main Indian automakers will have elevated India to the top of the global two-wheeler and four-wheeler markets. To meet the challenges and overcome the difficulties, the automobile industry is urged to draw in greater investments to reduce liquidity risk and increase profitability. Improving and implementing efficient monetary techniques in the industrial sector can effectively address the trade-off between liquidity and profitability. The study assists in giving businesses recommendations on how to stay out of financial trouble by using an approach frequently used to predict bankruptcy is Altman's Z-Score model.

(Manjit Kour, 2020) Green practices have a lot of ramifications for contemporary company. Green defines purity as being equitable in terms of cost, value, and quality in transactions. Green practices concentrate on creating and marketing goods that meet customer demands and desires. In order to reap the greatest benefits from greater brand development, long-term cost savings, enhanced regulatory compliance, and increased investor interest and talent, the automotive sector is starting to implement green practices. However, there's still room for improvement and more involvement in green technologies. The automotive sector is under pressure to preserve the company's long-term financial performance while also protecting the environment. Analysing the effect of green practices on the financial performance of Indian automakers is the aim of this article. A structured questionnaire is given to a sample of 285 supply managers in the Indian automotive industry for this study. To analyse the data, the structural equation modelling method is employed. The findings showed that four elements—integrated environmental management, eco-design, technology integration, and green marketing—had a favourable and noteworthy impact on the automakers' financial performance. Pollution prevention and customer orientation, however, were shown to have no discernible impact on the financial success of automakers.

(Shashikanta Baisag, 2020) The literature on predicting corporate financial difficulty and preventing financial distress is reviewed in this study. The literature is divided into two main categories: Financial Distress Prediction and Principles of Financial Management to Avoid Financial Distress. The analysis emphasises how popular the Altman Z-score model is for forecasting business financial problems. Adopting good management practices, preventing bank asset quality deterioration, monitoring non-performing assets (NPAs), keeping an optimal debt level, and routinely monitoring important financial ratios (such as cash flow to total debt, net income to total assets, and total debt to total assets) are also important strategies to avoid financial distress. These observations offer useful advice for businesses looking to improve their financial stability and avert future financial disasters.

(Prameela S. Shetty, 2020) The Z score method has been used consistently for bankruptcy prediction for the past fifty years or so. Predictions are mostly made to assess loan terms and provide lenders and investors with a safe environment. Altman's Z score has been employed as a means of assessing the firms' believe ability. This study attempts to determine whether bankruptcy might be forecast by analysing Yes Bank's performance

from 2014 to 2019 using the Z-score. The analysis concludes that the Z-score algorithm by itself is unable to forecast bankruptcy in this particular instance. The Yes Bank was one of the top private sector banks when it was founded in 2003. Unscientific lending procedures and a number of internal issues caused the bank to experience a serious crisis.

(Sanjeev Bansal, 2020) Models that anticipate bankruptcy have become more prevalent since the 2008 financial crisis. The purpose of this study is to evaluate the financial stability of the pharmaceutical companies that are listed on the Bombay Stock Exchange. The Altman Z score model is the most admired of the worrying models that companies have developed to predict bankruptcy situations. With an eye on financial difficulty, this model looks at a company's financial stability. The financial distress risk for pharmaceutical businesses listed on the Bombay stock exchange is explored in this study, and the model can be used to analyse the threat of bankruptcy.

(Ouw Desiyanti, 2019) This paper's goal is to use the Z-Score Altman technique to determine how financial ratios affect financial distress. This study includes 105 data observations from 21 real estate and property companies listed in the BEI between 2014 and 2018. Return on equity (ROE), debt to equity ratio (DER), current ratio (CR), working capital ratio (WCR), and Z-score are the factors that are used. The findings indicate that while DER and CR have a significant negative impact on Z-Score Altman's financial hardship, ROE and WCR have a positive significant impact. t the same time, it demonstrates that at least one factor significantly influences Z-Score Altman financial hardship. The number of businesses in financial hardship increased from five in 2014 to nine in 2018, indicating a worsening of the financial situation of businesses in the real estate sector over time. Similarly, the number of businesses in the grey zones' financial status increased from eight in 2014 to nine in 2018. In contrast, the number of businesses in sound financial standing fell from eight in 2014 to just three in 2018. Implications of research limitations. Because of the small sample size, results might not be applicable to the entire population. Originality value. The purpose of this article is to gather empirical data regarding the relationship between financial ratios and financial distress probabilities to real estate firms that serve as study subjects.

(Pathak, 2019) India's economy is one of the most important in the Asia-Pacific area. This study investigates the connection between the listed manufacturing businesses' corporate success, as determined by the Return on Equity (ROE), and their financial health, as

determined by the Altman Z-Score. To ascertain the strength and direction of the correlations between these variables, a linear regression has been performed. Additionally, Z-Score patterns over a five-year span have been examined. ROE and the market's Z-Score have a statistically significant positive link, according to the data, which spans the years 2013 through 2017 (inclusive). India's mean and median Z-Scores were moderate to strong. These results add to the market's solid economic standing as a major Asian market.

(Panigrahi, 2019) Predicting financial difficulty has been a significant worry for all businesses since the 2008 financial crisis. Financial difficulties are harmful to both large and small businesses. Because it encourages businesses to adopt actions that hurt debt holders and non-financial stakeholders, it is expensive and damages stakeholder relationships and credit availability. Again, if competitors react aggressively to a company's weakening state in an attempt to increase their market share, financial turmoil can be expensive. There is a clear reason for conducting empirical research on corporate bankruptcy prediction: early financial distress diagnosis and the implementation of corrective measures (such corporate governance) are better than bankruptcy law protection. Appropriate steps can be done to reverse the process before it's too late if failing companies can be identified beforehand. The financial distress of a few chosen pharmaceutical companies is tested in this study using Altman's 'Z' Score Model. With positive outcomes, this model has been used in a number of research on bankruptcy and financial difficulties. The study's five-year timeframe is from 2012–2013 to 2016–2017. Investigations are conducted using just secondary data. The Altman's "Z" score test approach has been used to examine the data. According to the findings, the pharmaceutical industry's average Z-Score for the study period was 5.90.

(Arpita Agarwal, 2019) One of the most important tasks is predicting bankruptcy. Recognising a company's solvency early on helps protect it from bankruptcy, perhaps preventing major problems down the road. There are numerous methods for assessing a company's financial health, and Altman's Z-score is a well-known indicator for forecasting insolvency. The study uses financial statistics to analyse the foundations of the companies by selecting PSU index companies from various industries listed on the Bombay Stock Exchange over a six-year period from 2013 to 2018. Altman's Z-score model is remarkably accurate at predicting distress based on financial ratios, according to the findings. The findings could help management make financial decisions, stakeholders select investment

opportunities, and others manage their interest in the manufacturing and non-manufacturing businesses in question.

(Joji Abey, 2018) An important part of India's economic development is the country's automobile sector. A company's ability to pay its debts on time is a key component of any industry's reputation. The ability of the company to settle its debts is indicated by its liquidity. The correlation and regression tests are used in the paper to examine the liquidity position of the automotive industry. The information needed for the research is secondary. The capitalise database provides the necessary information for the years 2008–2017. Both regression and correlation are used to analyse the gathered data. The outcome shows that age, inventory turnover ratio, dividend payout ratio, and leverage all affect a company's liquidity status.

(Choudhary, 2018) The relationship between financial performance and capital structure factors is up for discussion. Understanding how shareholder return changes in relation to capital structure composition is the goal of this study. The best-fitting model was chosen using the Hausman and Wald tests, using data from 15 years and 16 automakers. Both panel regression and pooled regression (Fixed effects and Random effects models) were employed. The Fixed Effects model was determined to be the most effective model. It found that short-term debt and equity have highly statistically significant negative and positive effects on return on equity (ROE), respectively. Nearly 57% of the variation in ROE was explained by the model, and the error component had no autocorrelation issues. This research is really important. Nearly 57% of the variation in ROE was explained by the model, and there was no autocorrelation issue in the error term. Because it shows that ROE is adequately predicted by the mix of capital structures, the study is highly significant for both investors and businesses in terms of decision-making.

(Suhesti Ningsih, 2018) This study intends to examine the factors from Altman Z Score Modification techniques in forecasting financial difficulty in the automotive subsector and component of go public companies from 2012 to 2016. The analysis's findings, which were derived from the Altman Z Score Modifications method, indicate that businesses in the automotive industry and its subsectors are expected to have encountered financial difficulties virtually annually. In 2012, GDYR was the predicated company to encounter financial difficulties; in 2013, BOLT and GDYR were the two companies and in 2014, IMAS GDYR was the predictable company. In 2015, there were two companies: IMAS

and GDYR; in 2016, there were three companies: GDYR, IMAS, and PRAS. The average Z "Score of years 2012-2016 under 1.1 on go public company automotive sub sector and components according to the analysis of Z" Score of the enterprises in financial distress situation consists of the GDYR and the IMAS. Based on the analysis's findings per year and on average from 2012 to 2016.

(Sadayat, 2018) Risk is an inherent aspect of the bank's operations. Effective risk management is essential to a bank's ability to build its finances. From this angle, adapting risk management to the hierarchical structure and business processes of banks has proven crucial for the banking industry. The bank's risk of bad luck arising from a borrower who fails to make promised instalments is known as credit risk. This state is known as default. Risk is the primary factor influencing financial behaviour. Financial institutions must be able to handle risk effectively in order to respond to those who are willing to take risks. Undoubtedly, the dynamics of risk management will determine the banking industry's destiny. Banks with an efficient risk management system will be able to survive in the market for a long time. Due to the unusual nature of its operation, a bank's most significant and well-established risk is credit risk. For a variety of reasons, it has therefore become more significant in the recent past. Globally, the banking industry's primary trend is monetary advancement. India is a unique example of this shift to a market-driven economy. Using a variety of risk indicators to highlight the risk profile of Indian banking organisations, this research assesses changes in banks' capital structures and solvency positions. The risk profiles of the top five public and private sector banks are thoroughly assessed in this paper.

(S.Poominathan, 2017) The purpose of the current study is to examine how capital structure affects the Indian capital goods industry's Altman's Z score. Applied content analysis and secondary data gathered from the annual reports of the BSE 200 listed businesses served as the foundation for this investigation. The following have been used: mean, standard deviation, correlation coefficients, and linear regression analysis. Edward Altman's Z score was computed and used in conjunction with debt equity, earnings per share, and book value per share as a contemporary solvency variable. The capital structure has no effect on Altman Z score, according to this study, however Z score is 63.7% based on debt equity at 1% and earnings per share at 10% of a chosen capital goods industry in India.

(Ravi Singla, 2017) Corporate failure occurs when a company's market value of assets falls below its entire liabilities and it is unable to pay debts when they become due. The paper's objective is to use a regression model to investigate the association between business size and failure probability for Indian steel sector enterprises. While total assets and total sales are used as indications for business size, Altman's Z-score model has been employed to determine the firm's probability of failure. The findings show an inverse relationship between size and failure likelihood. The likelihood that a business would fail drops as its size increases, and vice versa.

(N. C. Shilpa, 2017) Financial difficulty causes a company to go bankrupt, which has a systemic effect on the nation's macro and local economies. The industry's traits also have a significant impact on a company's longevity and subsequent financial plans. Both internal and external stakeholders, particularly creditors, are compelled to assess the firm's financial health. Management can take steps to prevent issues before they arise if they are aware that the company is on the verge of going into crisis. Significant modifications to India's vehicle laws have a range of implications on the auto sector. This essay is an attempt to assess the Indian auto industry's financial standing. Manufacturers of passenger cars, commercial vehicles, motorcycles, mopeds, scooters, and three-wheelers are the four product-based groups into which the automobile industry has been divided. During the ten years (2007–2016) while the Altman Z score model, which was created for manufacturing companies, was in use, the Indian government's Automotive Mission Plan was implemented. Commercial vehicle manufacturers are in an intermediate state of financial hardship, according to the study, which urges quick action.

(MacCarthy, 2017) Finding out if the Beneish M-model and Altman Z-score can identify Enron Corporation's corporate failure and financial fraud is the aim of this study. Five years of financial data from 1996 to 2000 were gathered from the US SEC Edgar database. According to the Beneish model, management had falsified the financial accounts for the five years under study. The researcher contended, based on the analysis, that using both models at the same time would safeguard stakeholders more than using the Altman Z-score alone. The study suggested using the Beneish M-Model in conjunction with the Altman Z-score as a crucial component of each audit.

(Chadha, 2016) To investigate the financial performance of the companies listed on the Kuwait Stock Exchange, a quantitative approach was adopted. Out of the 206 firms that

could have been investigated, 196 were (two are subsidiaries of one of the firms, and the others are insurance firms excluded). In order to determine the listed companies' position in the market and its future course, they were observed between 2009 and 2014. The financial information was obtained from the websites of the Kuwait Stock Exchange and the published annual reports of the corresponding companies. Using the Altman Z-score model for the years 2009–2014, the results indicate that, on average, 39.46% of the firms were safe, 25.94% of the firms were distressed, 15.90% of the firms were in a grey area, and 18.71% of the firms had no available data. Due to the lack of bankruptcy rules in the State of Kuwait and the inconclusive results, the bankruptcy rate could not be justified using the Zmijewski scoring model. The degree of financial difficulty in Kuwait is discussed in this study. The degree of distress indicates that significant adjustments are required within businesses and that things are not going smoothly. Companies that are in financial difficulties must abide by bankruptcy laws. In addition to providing future academics with realistic bankruptcy rate predictions for the State of Kuwait, this investigation serves as a springboard for prospective investors by highlighting the most lucrative industries for investment.

(M, 2015) The reality sectors of the world's economies were held accountable for causing the bubbles that resulted in the 2008 recession. India suffers from the effects of the global economic slowdown as well. Analysing the reality industry's financial success in India during a recession makes sense. The study period was divided into pre-recession, recession, and post-recession stages in order to obtain more precise results. The study covered the last ten years. Only the organised reality sector's performance was examined, and only businesses with a market valuation of at least Rs. 10 billion were taken into account. To assess the financial soundness, Altman's Z score was primarily used to evaluate the gathered data. The outcome demonstrates that the global recession has little effect on the Indian reality sector, which has demonstrated consistent success over the course of the study.

(B. Senthil Arasu, 2014) The commercial firms' financial strength is a significant concern. A business firm's financial strength can be measured using a variety of techniques. Altman's Z-score model, however, is a good and dependable approach. This model forecasts a commercial organization's likelihood of going bankrupt. Analysing the financial health of auto ancillary and real estate enterprises is the goal of this study. The necessary data was

gathered for this investigation between April 2014 and March 2018. The analysis made it abundantly evident that the majority of the sample companies are experiencing financial difficulties. They would be better off shutting down. Exide Industries and Amtek Auto are ancillary firms, whereas Brigade Enterprises, Unitech, Prestige Estate, and Sunteck are in the reality sector. Additionally, it concludes that Amara Raja Batteries, Omax Auto, and PRICOL in the Auto Ancillary divisions are currently financially sound; but, the failure to enhance their liquidity, asset productivity, and solvency within two years could result in bankruptcy. The performance of Phoenix Township was strong in prior years, but it declined in the next two years. The management is therefore advised to take the required actions to increase their productivity. Additionally, in order to retain adequate revenues for prospective future investments, it advises policymakers to create an ideal capital structure, including a mix of debt and equity and a suitable dividend policy.

(Vineet Chouhan, 2014) The ability to foresee financial difficulty is of relevance to external stakeholders as well as management in the age of globalisation. To make the decision-making process more logical, the stakeholders are always looking for the best performance forecasting solution. The recent past indicates that businesses' financial stability is at risk. The financial soundness of businesses is a constant issue for stockholders, managers, creditors, and employees. Financial ratios are the instrument used most often in financial analysis. The equity position of "stockholders" and the claims of creditors, however, no longer support the use of financial ratios. Concerns among stakeholders include the effects of financial hardship on businesses and the regulatory capital requirements controls over capital sufficiency (Mingo, 2000). The subject of how financial difficulty can be foreseen or what factors disclose a firm's credit risk is one that is constantly being investigated and attempted to be answered because of this shared interest. Although the Altman Z score is the most often used measure for this purpose, research on financial distress prediction has not come to a definitive result because of the nature of the explanatory variables. The Altman Z score analysis and re-examination is the main objective of this paper. Several ratios from Altman's Z score were extracted to aid in the current study. In order to achieve our goal, Z score ratios were utilised to separate the sample firms into BSE-30 companies that were stable and those that were not. For ten businesses chosen for this purpose, the Z score is first determined over a five-year period. Next, it is split according to z scores. Then, using the One Sample Komogrov-Smirnow

test, the significant changes in the ratio are determined. The outcome showed that the change in the z scores is not significant for all organisations.

(Bhavna Ranjan Ahuja, 2014)A helpful technique for predicting financial difficulty in business organisations working in a wide range of industries is the Altman Z Score model. Edward I. Altman created the Altman's Z score, a multiple discriminant analytical model that uses well recognised cut off criteria to assess a company's bankruptcy. In this research study, we offer a framework for interpreting the Z-Score model and apply it to a subset of Indian textile sector enterprises between 2006 and 2011. When it comes to employment and output, the Indian textile industry is among the biggest in the nation. An evaluation of the Indian textile industry's financial situation is essential given the companies' significant susceptibility to the presently unpredictable western economy as well as their erratic sales and profits.

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CHAPTER – 3 RESEARCH METODOLOGY

Index

3.1 Introduction:

Research methodology is the methodical process of conducting a study that provides accuracy, validity, and dependability of the results. The research strategy, data collection techniques, sample criteria, and analytical framework utilized to assess the financial stability of a subset of Indian automakers between 2017 and 2024 using the Altman Z-Score Model are described in this chapter. The study uses a quantitative research methodology, calculating Z-Scores and evaluating the financial health of businesses using secondary data from financial statements. The study uses statistical methods, trend analysis, and comparative evaluation to assess the degree of financial difficulty and insolvency threats that Indian automakers face. To ensure a thorough representation of the industry, the companies are chosen based on a number of factors, including market capitalization and the accessibility of financial data. The study also takes into account outside variables that have an impact on the industry, like changes in regulations, recessions, and the effects of new technologies like electric vehicles (EVs). Through a methodical examination of these businesses' financial results, this study seeks to shed light on how well the Altman Z-Score Model predicts financial difficulty in the Indian auto sector. The results will help investors, legislators, and business executives make wise financial choices.

3.2 Research Design:

The research design is the plan for performing a study, outlining the methodology, data collection, and analytical procedures utilised to fulfil the research objectives. It ensures a methodical, disciplined, and objective approach to the subject at hand. In this study, the Altman Z-Score Model is used to examine the financial solvency of selected Indian automobile businesses from 2017 to 2024. Given the nature of the study, a descriptive and analytical research design is used to investigate financial trends, solvency status, and distress forecast among the companies chosen.

The study is quantitative, relying on secondary financial data from yearly reports, stock market reports, and financial databases. The Altman Z-Score Model enables the evaluation and comparison of financial health across firms. Furthermore, statistical tools such as trend analysis and financial ratio analysis are used to detect

patterns in financial stability. Purposive sampling is used in the study, with seven significant automobile companies Tata Motors Ltd., Mahindra & Mahindra Ltd., Bajaj Auto Ltd., Hero MotoCorp Ltd., Maruti Suzuki India Ltd., Eicher Motors Ltd., and TVS Motor Company Ltd. chosen based on their market relevance and data availability. The objective of this research is to provide useful insights into the financial health of the Indian automobile business and determine whether the Altman Z-Score Model remains a credible tool for anticipating financial hardship in this industry.

3.3 Title of the study:

"A study on financial solvency of selected Automobile companies in India using Altman Z score model"

3.4 Problem Statement:

Evaluating financial solvency is essential to comprehending a company's long-term viability, especially in sectors where the economy is unstable. Regulatory changes, technical upheavals, global supply chain problems, and economic slowdowns have all contributed to the recent financial difficulties facing the Indian auto industry. The COVID-19 pandemic, the switch to BS-VI emission standards, the increase in fuel prices, and the growing popularity of electric cars (EVs) have all put additional strain on the financial soundness of businesses in this industry. Examining the financial standing of automakers has therefore become crucial in order to spot any insolvency risks and ascertain their capacity to weather financial hardship. The Altman Z-Score Model offers a quantitative method of assessing solvency and is a well-known instrument for forecasting company financial problems. However, not much study has used this model to analyse the Indian auto industry, especially when it comes to the years 2017–2024, which involve significant regulatory changes and disruptions. By analysing the financial soundness of a few Indian automakers using the Altman Z-Score Model, this study seeks to close this gap. Through the use of a methodical research approach, this study will compare financial performance across industrial categories, analyse solvency trends, and determine how well the Z-Score Model predicts distress. In order to make wise financial decisions, investors, financial analysts, legislators, and business management will find the findings to be a useful resource.

3.5 Objectives of the study:

1. To assess the financial solvency of automobile companies using the Altman Z-Score Model over a 7-year period.
2. To analyze the financial components of selected Automobile companies.
3. To categorize the selected companies into different financial zones (Safe Zone, Grey Zone, and Distress Zone) based on their financial health.

3.6 Hypothesis of the study:

In research, hypotheses are crucial because they offer a methodical framework for evaluating assumption and deriving conclusions from actual data. In order to evaluate the financial solvency of a subset of Indian automakers from 2017 to 2024, this study develops hypotheses using the Altman Z-Score Model. In the Indian automobile industry, the hypotheses seek to investigate variations in Z-Score trends, disparities in financial solvency, and the predictive power of the Altman Z-Score Model.

The following alternative (H_1) and null (H_0) hypotheses are developed in accordance with the research objective in order to evaluate the financial solvency of a subset of Indian automakers from 2017 to 2024 using the Altman Z-Score Model.

1. **Null Hypothesis (H_0)**: There is no significant difference in the financial solvency (Z-Score) of the selected automobile companies over the 7-year period.
2. **Alternative Hypothesis (H_1):** There is a significant difference in the financial solvency (Z-Score) of the selected automobile companies over the 7-year period.

3.7 Data Collection:

The study uses secondary data from reliable financial sources to analyse the financial solvency of selected Indian vehicle manufacturers. Financial databases such as Money control and Bloomberg are important sources, as they include historical financial statements, stock performance data, and industry insights.

Money control is a popular tool that gives business financials, balance sheets, profit and loss statements, and market trends, whereas Bloomberg provides detailed financial analysis, stock market data, and macroeconomic indicators relevant to the automotive industry.

3.8 Study period:

The study examines the financial performance of selected Indian automobile companies over a seven-year period from 2017 to 2024.

3.9 Sample Selection:

The study focusses on a carefully chosen sample of seven prominent Indian automakers that include two-wheelers, commercial vehicles, and passenger cars, representing various market segments. The selection process takes into account variables such as market capitalisation, financial performance, industry impact, and the availability of data for the 2017–2024 study period. The following businesses are part of this study TVS Motor Company Ltd., Hero MotoCorp Ltd., Eicher Motors Ltd., Bajaj Auto Ltd., Mahindra & Mahindra Ltd., and Tata Motors Ltd. These businesses were selected to ensure a thorough and representative examination of financial solvency in the Indian auto industry.

All of these companies are listed on the National Stock Exchange (NSE) and Bombay Stock Exchange (BSE), guaranteeing the availability of the financial statements and stock market data required for the research. By including companies from diverse business sectors, financial solvency trends may be compared, offering valuable information about the stability, financial health, and distress risks of India's automakers. The objective of this study is to assess and compare these companies' solvency during the specified period using the Altman Z-Score Model, providing useful information to investors, decision-makers, and industry stakeholders.

3.10 Methodology:

This study employs financial component analysis**,** Z-Score analysis**,** and solvency tests to evaluate the financial health of selected companies over a seven-year period. Additionally, a yearly comparison is conducted using a one

Way ANOVA test to determine whether there is a statistically significant variation in the company's financial performance over time.

3.10.1 Altman Z score model

A popular financial instrument for estimating financial distress and forecasting company insolvency is the Altman Z-Score Model. The Altman Z-Score Model is used in this study to assess the financial stability of a subset of Indian automakers from 2017 to 2024. Data gathering, Z-Score calculation, and result interpretation are all part of the process used to assess bankruptcy risk and financial stability. So there are five essential ratios make up the model, which is used to evaluate the financial health of businesses. These proportions are as follow:

1. X1 = Working Capital / Total Assets(for liquidity measure)
2. X2 = Retained Earnings / Total Assets(for measure of reinvested earning)
3. X3 = EBIT / Total Assets(for profitability measure)
4. X4 = Market Value of Equity / Total Liabilities(for leverage measure)
5. X5 = Net Sales / Total Assets(for sales generating ability)

The original Z-score formula was as follows:

Z = 1.2X1 + 1.4X2 + 3.3X3 + 0.6X4 + 0.99X5

The Z-score may be interpreted as follows.

- Z > 2.99 -“Safe” Zones
- 1.81 < Z < 2.99 -“Grey” Zones
- Z < 1.81 -“Distress” Zones

3.11 Limitation of Study

The purpose of the study Financial Solvency of Selected Automobile Companies in India is to assess the financial stability of seven significant automakers: TVS Motor Company Ltd., Mahindra & Mahindra Ltd., Bajaj Auto Ltd., Hero MotoCorp Ltd., Eicher Motors Ltd., Maruti Suzuki India Ltd., and Tata Motors Ltd. The study contains significant limitations in spite of the thorough examination. One major drawback is the use of secondary data that has been taken from financial statements, annual reports, and other publicly accessible sources; this data may contain inconsistencies or reporting errors.

Furthermore, the Altman Z-Score model may not adequately represent the distinctive features of the Indian auto industry, where variables like governmental regulations, technological developments, and market volatility are important. This is because the model was initially created for manufacturing companies in the United States. Another drawback is the study's time length, which normally concentrates on data from 2017 to 2024, thereby ignoring long-term financial trends or sector cycles. A company's financial stability can be significantly impacted by qualitative aspects like customer happiness, brand perception, and managerial effectiveness, but these are not taken into account by the model, which mainly looks at quantitative financial statistics. Furthermore, the study only includes seven prominent businesses, leaving out smaller or up-and-coming firms whose financial stability may provide more information on the dynamics of the industry as a whole. Additionally, the absence of macroeconomic variables like inflation, interest rates, and worldwide market patterns restricts the model's capacity to completely evaluate outside influences on these businesses' financial health. For a more comprehensive knowledge of the financial solvency of the Indian automobile sector, these constraints imply that future study could improve the technique by taking into account a wider range of factors and expanding the scope of analysis.

3.12 Scope of the Study

By analyzing the financial stability of seven prominent automakers Tata Motors Ltd., Mahindra & Mahindra Ltd., Bajaj Auto Ltd., Hero MotoCorp Ltd., Maruti Suzuki India Ltd., Eicher Motors Ltd., and TVS Motor Company Ltd.The study Financial Solvency of Selected Automobile Companies in India offers a solid basis for further research. There are a number of encouraging avenues for furthering this study, though. Future research can increase the sample size by incorporating newer and smaller automakers to obtain a more thorough picture of the financial health of the sector.

To evaluate the effect of worldwide disruptions on these enterprises' solvency, researchers can also compare the financial performance of these companies

before and after the epidemic. Using the Altman Z-Score model to evaluate the financial stability of other auto industry segments, such as EV manufacturers and related industries, with that of conventional automakers, is another possible research direction.

In order to improve the forecasting accuracy of financial difficulty and bankruptcy beyond the reach of conventional statistical models, future research can potentially include dynamic models and machine learning approaches. For a more comprehensive knowledge of the external factors affecting financial solvency, macroeconomic variables like inflation, interest rates, and currency rates might be included. Furthermore, long-term research projects that go beyond 2024 may be able to reveal changing patterns and trends in financial well-being.

A multifaceted view of the elements influencing solvency can be obtained by researchers by investigating the effect of corporate governance policies on financial stability. Finally, the Altman Z-Score model may offer important insights into the worldwide financial success and sustainability of Indian automakers' foreign operations in various regions.

3.13 Research Gap

Few studies have explicitly examined the Indian vehicle industry over a seven-year period (2017–2018 to 2023–2024), despite the fact that numerous studies have used the Altman Z-Score Model to evaluate financial solvency in a variety of businesses.

There is a knowledge gap regarding the financial health of major Indian automakers like Tata Motors, Mahindra & Mahindra, Bajaj Auto, Hero MotoCorp, Maruti Suzuki, Eicher Motors, and TVS Motor Company because the majority of current research either examines financial solvency in larger manufacturing sectors or concentrates on international automakers.

Furthermore, fewer studies take into consideration how these businesses are affected by industry-specific difficulties, changes in technology such as electric vehicles (EVs), and shifting market conditions. This highlights the need for a more targeted and current research.

CHAPTER 4- DATA ANALYSIS & INTERPRETATION

Index

4.1 Introduction:

The Altman Z-Score Model is a popular financial instrument for evaluating a company's creditworthiness and stability. Edward Altman created the model in 1968, and it predicts the probability of company bankruptcy by combining a number of financial ratios. Investors, financial analysts, and risk managers find it especially helpful when assessing a company's financial standing using publicly accessible financial documents.

By using statistical methods, the Z-Score model divides businesses into three groups: those that are at risk, financially stable, or likely to go bankrupt. Originally created for publicly traded manufacturing companies, the model has now been modified for use by private companies and non-manufacturing organisations.

The Altman Z-Score's development, components, and use in data analysis are examined in this chapter. Analysts can evaluate financial risk and enhance investment strategies by using this model to inform data-driven decision-making.

4.2 Analysis of the Altman Z-Score Model's Financial Components:

A firm's financial health is represented by each of the five major financial ratios that form the basis of the Altman Z-Score Model. These elements reveal information about a company's efficiency, leverage, profitability, liquidity, and solvency. The financial statement of sampled units, the name of the components are given below:

- **Current Assets**
- **Total Assets**
- **Net Sales**
- **Interest**
- **Total Liability**
- **Current Liability**
- **Market value of equity**
- **Earnings before interest and tax**
- **Retained Earning**

4.2.1 Analysis of financial components of Tata motors Ltd:

Table 4.1 Financial Components of Tata motors Ltd

Component\Years	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	Average
Current Assets	14971.66	13229.3	13568.76	15854.59	15619.61	11499.95	15207.67	28810.8
Total Assets	59212.3	60909.63	62589.87	65059.66	63899.87	61770.77	66083.74	30660.3
Net sales	8913.43	9715.16	9008.69	8571.64	9983.1	13874.98	15827.33	19033
Interest	1744.43	1793.57	1973	2110.83	2121.73	2047.51	1705.74	16945
Total Liability	59212.3	60909.63	62589.87	65059.66	63899.87	61770.77	66083.74	16794.9
Current Liability	24218.95	22940.81	25810.82	26251.55	26992.81	25803.53	27326.16	6190.8
Value of equity	1075.9	624.5	235.2	1067.4	1544.5	1503.1	3635.1	180.10
EBIT	-1524.55	2058.02	-6608.66	-3277.89	-2824.12	591.7	4175.45	-266.46
Retained Earning	991.63	-1991.54	4682.49	-1489.55	-881.69	-2529.49	-7673.46	991.63

(Source: Computed from the Balance Sheet and Profit &loss A/c)

Table 4.1 identifies the Altman model's components during the study period of Tata motors Ltd. From 2018 to 2024, Tata Motors Ltd.'s financial performance shows notable variations in a number of financial metrics. The company's current assets fluctuated in terms of liquidity, reaching a peak of ₹15,854.59 Cr in 2020–21, then falling to ₹11,499.95 Cr in 2022–23, and then somewhat rebounding to ₹15,207.67 Cr in 2023–24. Higher short-term financial demands are shown by current liabilities, which climbed significantly from ₹24,218.95 Cr in 2017–18 to ₹27,326.16 Cr in 2023–24. Even while the business has been able to keep a healthy balance of liquid assets, this raises the possibility of liquidity issues.

As measured by asset utilisation and efficiency, total assets increased steadily from ₹59,212.3 Cr in 2017–18 to ₹66,083.74 Cr in 2023–24, indicating ongoing expenditures in corporate expansion and infrastructure. Net sales also grew significantly, rising from ₹8,913.43 Cr in 2017–18 to ₹15,827.33 Cr in 2023–24. The post-pandemic rebound and

rising demand for Tata automobiles are probably to blame for the considerable spike in2022–2023 sales. Tata Motors has been growing its business and enhancing its market position throughout the years, based on the increase in sales and assets. Financial risk and solvency, however, continue to be major concerns. As assets increased, total liabilities also increased, indicating a high level of debt dependency. The value of equity fluctuated, falling sharply to ₹235.2 Cr in 2019–20 and then rising to ₹3,635.1 Cr in 2023–24, indicating shifting investor confidence.

The average annual interest expense of ₹1,944.64 Cr also stayed comparatively constant, suggesting a persistent financial strain brought on by debt finance. In terms of profitability, the business had difficulties, especially with EBIT (Earnings before Interest and Tax), which had severe losses for several years and had dropped to ₹-6,608.66 Cr in 2019–20. EBIT increased to ₹4,175.45 Cr in 2023–24, demonstrating higher operational efficiency and a subsequent improvement in profitability.

However, retained earnings were negative for the most of the years, and in 2023–2024 they dropped sharply to ₹-7,673.46 Cr, indicating that the corporation has had trouble holding onto profits, either as a result of reinvestments, excessive costs, or cumulative losses.

In summary, Tata Motors Ltd. has demonstrated tenacity and asset and sales development, but it still has issues with profitability, debt management, and retained earnings. Even if the 2023–24 recovery in EBIT and equity value is encouraging, the company needs to concentrate on strengthening its financial stability by cutting liabilities, cutting interest costs, and raising retained earnings in order to guarantee long-term viability.

4.2.2 Analysis of financial components of Mahindra & Mahindra Ltd:

Table 4.2 financial Components of Mahindra & Mahindra Ltd

Component\Years	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	Average
Current Assets	16474.47	18071.06	15141.49	20312.3	25917.7	34643.63	35105.8	19523.25
Total Assets	47416.75	52697.06	50502.06	59588.8	67130.26	75779.81	83811.38	19904.35
Net sales	48112.32	52960.8	44897.93	44296.95	56336.39	83251.31	96895.57	15974.01
Interest	112.2	113.39	113.39	370.88	223	272.78	138.77	10617.63
Total Liability	47416.75	52697.06	50502.06	59588.8	67130.26	75779.81	83811.38	127118.7
Current Liability	13323.21	14334.07	10972.82	15133.17	18820.29	26039.99	25978.75	4044.2
Value of equity	838.4	562	764.8	898.5	1354.8	1915.2	3355.5	951.20
EBIT	5225.7	6183.31	4575.19	4111.87	6068.97	8951.03	14185.28	1007.60
Retained Earning	-3210.51	-3914.36	7.07	-43.29	-4489.54	-4358.16	-8880.83	-3210.51

(Source: Computed from the Balance Sheet and Profit & loss A/c)

Table 4.2.2 identifies the Altman model's components during the study period of Mahindra & Mahindra Ltd. From 2018 to 2024,The Altman Z-score model's financial analysis of Mahindra & Mahindra Ltd. offers insightful information on the company's financial health, encompassing factors like liquidity, profitability, leverage, and overall stability over the previous seven years. Between 2017–18 and 2023–24, the current assets grew steadily, rising from ₹16,474.47 million to ₹35,105.8 million. This suggests that Mahindra & Mahindra has improved its short-term cash situation and is now better able to satisfy its short-term obligations. As a result of the company's growth and investments in long-term assets, total assets have also expanded steadily, rising from ₹47,416.75 million in 2017–18 to ₹83,811.38 million in 2023–24. Financial stability and a solid basis for future business operations are shown by this increase in total assets. The majority of the years have seen retained earnings stay negative despite this asset expansion, with 2023–2024 seeing the lowest at ₹-8,880.83 million. Retained earnings that are negative suggest that the

business has either accrued losses over time or paid out more dividends than it has made, which may raise questions about its long-term viability. Though it increased from ₹5,225.7 million in 2017–18 to ₹14,185.28 million in 2023–24, EBIT (Earnings before Interest and Taxes) has shown an increasing tendency, indicating that the business has increased its operational efficiency and profitability. An encouraging sign for stakeholders and investors, the increase in EBIT suggests that Mahindra & Mahindra has been successful in increasing profits from its core business operations.

In terms of financial leverage, overall liabilities have grown from ₹47,416.75 million in 2017–18 to ₹83,811.38 million in 2023–24. Higher liabilities are often required for expansion and investment in new business operations, even though they also signify higher financial risk. From ₹838.4 million in 2017–18 to ₹3,355.5 million in 2023–24, the market value of equity has increased significantly throughout this time. This large rise indicates that investors are becoming more confident in Mahindra & Mahindra's financial standing and prospects. A rising market value of equity indicates that investors see the company's stock favourably, which improves its financial position even more.

In addition, net sales rose from ₹48,112.32 million in 2017–18 to ₹96,895.57 million in 2023–24, showing steady development. The company's capacity to increase revenue and broaden its market position is demonstrated by the notable rise in net sales. This further suggests that Mahindra & Mahindra has been making good use of its resources to improve sales results. This is supported by the steady asset turnover ratio, which attests to the company's effective resource management in fostering corporate expansion.

Overall, the research shows that Mahindra & Mahindra has shown robust revenue growth, higher profitability, and improved liquidity over the years, even though negative retained earnings are still a problem. The company appears to be in sound financial standing based on the increase in EBIT, the rising market value of equity, and the steady asset utilisation efficiency. To guarantee long-term financial sustainability and resilience, Mahindra & Mahindra must strengthen its retained earnings position. The company will further establish its position as a financially stable and expanding business in the automotive industry if it keeps increasing its profitability and efficiently manages its financial leverage.

4.2.3 Analysis of financial components of Bajaj Auto Ltd:

Table 4.3 Financial components of Bajaj Auto Ltd

Component\Years	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	Average
Current Assets	9235.63	7062.66	6596.96	14175.13	9994.47	8870.41	10357.18	10141.19
Total Assets	23819.49	27380.39	24773.3	31530.2	31921.94	31127.69	34250.65	10254.38
Net sales	24700.3	29567.25	29111.54	27132.9	32135.98	35359.15	43578.87	8316.51
Interest	1.31	4.48	3.16	6.66	8.66	39.48	53.5	5585.88
Total Liability	23819.49	27380.39	24773.3	31530.2	31921.94	31127.69	43578.87	6702.794
Current Liability	4111.29	4873.68	4253.21	5643.21	4689.44	5198.04	8725.7	2423.62
Value of equity	805.9	843.8	694.5	1056.2	1042.7	1099.6	2037.6	1861.06
EBIT	6847.02	7744.78	8067.33	6956.18	7130.12	8307.62	10874.62	2388.645
Retained Earning	-2069.63	-2676.04	1854.41	-5276.77	-1466.54	1236.53	561.58	-2069.73

(Source: Computed from the Balance Sheet and Profit & loss A/c)

Table 4.2.3 identifies the Altman model's components during the study period of Bajaj auto Ltd. from 2018 to 2024, gives important information on the company's liquidity, solvency, profitability, and financial stability. The Altman Z-Score Model, which uses important elements including working capital, retained profits, EBIT, market value of equity, total assets, and liabilities to determine financial distress, can be used to evaluate Bajaj Auto's financial health over time. A company's ability to meet short-term obligations is determined by its liquidity. Current assets have varied over the years, averaging ₹10,141.19 million over the seven-year period, with a low of ₹6,596.96 million in 2019–2020 and a high of ₹14,175.13 million in 2020–2021. This volatility points to changes in the company's short-term asset base, which could be caused by short-term investments, cash holdings, or inventory management. However, Current Liabilities have been on the rise, going from ₹4,111.29 million in 2017–2018 to ₹8,725.7 million in 2023–2024 and beyond. An increase in trade payables or short-term borrowings may be the cause of the steady rise in current

liabilities, which suggests a larger level of short-term obligations. The business seems to retain a healthy cash situation, nevertheless, as current assets have also grown.

By increasing from ₹23,819.49 million in 2017–2018 to ₹34,250.65 million in 2023–2024, total assets have demonstrated a robust growth pattern, demonstrating Bajaj Auto's continuous expansion of its asset base. This growth is a result of the company's ongoing investments in new markets, infrastructure, and technology. From ₹23,819.49 million in 2017–2018 to ₹43,578.87 million in 2023–2024, Total Liabilities have also climbed dramatically, indicating either higher financial obligations or more borrowing. While an increase in liabilities isn't always a bad thing, it should be considered in conjunction with revenue growth and profitability to make sure the business can continue to meet its financial commitments. From ₹24,700.3 million in 2017–2018 to ₹43,578.87 million in 2023–2024, Bajaj Auto Ltd. has displayed steady revenue development. The corporation may have effectively introduced new items, increased market reach, or enhanced sales tactics, based on this rising tendency. Earnings before Interest and Taxes, or EBIT, is a crucial measure of profitability that has steadily increased from ₹6,847.02 million in 2017–2018 to ₹10,874.62 million in 2023–2024. The company's capacity to turn a profit is aided by this increase in EBIT, which shows efficient cost control and operations. The surge in interest expenses, which have increased dramatically over the past two years and reached ₹53.5 million in 2023–2024, is one worrying aspect, though. Even while interest rates are still low when compared to EBIT, net profitability may be impacted by any additional increases in borrowing expenses.

Over time, Bajaj Auto's market capitalisation, or worth of equity, has grown significantly, rising from ₹805.9 million in 2017–2018 to ₹2,037.6 million in 2023–2024. An increase in investor confidence and a more optimistic assessment of the company's performance are indicated by this rise in equity value. Nonetheless, the rise in total obligations, growing interest expenses, and declining retained earnings over a number of years point to possible financial dangers. Maintaining long-term financial stability requires the organisation to concentrate on increasing retained earnings, cutting liabilities, and controlling interest costs.

4.2.4 Analysis of financial components of Hero Motocorp Ltd:

Table 4.4 financial components of Hero Motocorp ltd

Component\Years	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	Average
Current Assets	8848.18	8115.64	8288.56	10952.79	10114.96	9036.79	9796.02	9189.15
Total Assets	16738.8	17641.19	18749.33	22161.05	21714.02	23263.14	25571.55	9231.77
Net sales	24700.3	29567.25	29111.54	27132.9	32135.98	35359.15	43578.87	8159.36
Interest	6.25	8.6	22.02	21.84	25.8	19.87	18.5	5402.50
Total Liability	23819.49	27380.39	24773.3	31530.2	31921.94	31127.69	34250.65	6481.76
Current Liability	4343.32	4130.36	3976.06	6110.22	5072.38	5623.98	6544.26	2147.32
Value of equity	689.2	560.1	380.2	590.2	460.2	480.2	720.4	1415.33
EBIT	5214.38	5099.97	3856.7	3803.36	3157.29	3782.76	5599.49	1778.39
Retained Earning	-1657.59	-1078.64	-1273.43	-1058.42	-579.08	-910.98	-1271.08	-1657.59

(Source: Computed from the Balance Sheet and Profit & loss A/c)

Table 4.4 identifies the Altman model's components during the study period of Hero Motocorp Ltd. from 2018 to 2024, Hero MotoCorp Ltd.'s financial health during the last seven years may be inferred from the Altman Z-Score model's study of the company's financial components. Working capital, total assets, EBIT, market value of equity, total liabilities, and retained earnings are some of the variables that are included in the Altman model, which forecasts financial distress based on important financial parameters.

Hero MotoCorp's present assets have stayed very steady, averaging ₹9,189.15 crore and ranging from ₹8,115.64 crore to ₹10,952.79 crore. This shows a modest liquidity situation, meaning the business has enough short-term assets to cover its creditors. As a result of asset growth and business operations expansion, the total assets have steadily increased from ₹16,738.8 crore in 2017–18 to ₹25,571.55 crore in 2023–24. From ₹24,700.3 crore in

2017–18 to ₹43,578.87 crore in 2023–24, the net sales have likewise increased steadily, indicating excellent revenue generation and market presence.

Hero MotoCorp hasn't relied too much on debt funding, as evidenced by the interest expense staying low. The average recorded interest was ₹5,402.50 crore, with the highest being ₹25.8 crore in 2021–2022 and the lowest being ₹6.25 crore in 2017–18. The whole liabilities increased from ₹23,819.49 crore in 2017–18 to ₹34,250.65 crore in 2023–24, indicating a rise in monetary commitments. The short-term debts, or current liabilities, have been mild, rising from ₹4,343.32 crore in 2017–18 to ₹6,544.26 crore in 2023–24.

Market capitalisation, the measure of equity value, has varied greatly throughout time, reflecting changes in the stock market and investor mood. It dropped to ₹380.2 billion in 2019–20 from ₹689.2 billion in 2017–18, but it recovered in the following years, reaching ₹720.4 billion in 2023–2024. Due to industry difficulties and economic downturns, EBIT (Earnings before Interest and Taxes) also fluctuated, declining in 2019–20 and 2020–21. Nonetheless, EBIT improved in 2023–24, reaching ₹5,599.49 crore, indicating increased operational effectiveness and profitability. Retained earnings are a key metric in the Altman model since they show cumulative gains or losses over time. Hero MotoCorp has reported negative retained earnings for the entire time, ranging from -₹579.08 crore to -₹1,657.59 crore. This indicates that the firm has either lost money or dispersed more income as dividends. The corporation may need to concentrate on increasing retained earnings in order to maintain long-term financial stability, as this could suggest a worse internal financing position.

Hero MotoCorp's consistent revenue growth, asset expansion, and controllable liabilities demonstrate its overall financial robustness. On the other hand, fluctuating equity values and negative retained earnings suggest that strategic financial management is required. Even if the business is not currently experiencing financial difficulties, using the Altman Z-Score model to track working capital efficiency, profitability, and retained earnings will be essential to maintaining long-term financial health.

4.2.5 Analysis of financial components of Maruti Suzuki India Ltd:

Table 4.5 financial components of Maruti Suzuki India ltd

Component\Years	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	Average
Current Assets	7921.4	12361.6	8427.4	18526.7	16781.2	11599.9	17762.4	25357.73
Total Assets	59370.1	62931.8	62552.1	70067.4	73394.3	83178.7	110284.8	27537.27
Net sales	78104.8	83026.5	71690.4	66562.1	83798.1	112500.8	134937.8	22989.72
Interest	345.7	75.8	132.9	100.8	125.9	186.6	193.2	13803.88
Total Liability	59370.1	62931.8	62552.1	70067.4	73394.3	83178.7	110284.8	16495.52
Current Liability	15442.1	14150.3	11294.8	16106.7	17013.7	20099.3	22928.7	5776.875
Value of equity	2700.6	2066.6	1457.8	2084.4	2291.8	2567.7	-23,593.8	2555.13
EBIT	10291	100077	6959.9	5074.3	3589.3	9497.1	17872.9	2482.4
Retained Earning	-5326.2	-4384.2	-2295.5	-2929.8	-2719.2	-6296	-23593.8	-5326.2

(Source: Computed from the Balance Sheet and Profit & loss A/c)

Table 4.5 identifies the Altman model's components during the study period of Maruti Suzuki India Ltd. from 2018 to 2024, Information about Maruti Suzuki India Ltd.'s liquidity, profitability, leverage, and general financial health may be found in its financial data from 2017–18 to 2023–24. The company's current assets have fluctuated, reaching at ₹18,526.7 crore in 2020–21 and falling to ₹7,921.4 crore in 2017–18 before rising to ₹17,762.4 crore in 2023–24. With growing asset reserves over time, this shows Maruti Suzuki's ability to satisfy short-term obligations is still solid. But current liabilities have also gone up, rising from ₹15,442.1 crore in 2017–18 to ₹22,928.7 crore in 2023–24. The expanding short-term debts indicate greater financial commitments, maybe as a result of supplier payments and operational expansions, even though the company's cash has improved. A steady difference between current assets and liabilities shows that liquidity is under control. Between 2017 and 2018, Maruti Suzuki's total assets increased steadily from ₹59,370.1 crore to ₹1, 10,284.8 crore in 2023–2024. This notable expansion suggests

ongoing investments in R&D, manufacturing facilities, and market expansion. As evidence of the company's capacity to produce rising income, net sales have also increased, rising from ₹78,104.8 crore in 2017–18 to ₹1,34,937.8 crore in 2023–24. Sales have increased significantly over the past two years, particularly in 2022–2023 and 2023–2024, indicating a robust comeback from the effects of COVID-19 and semiconductor shortages that originally impacted output. The earnings before interest and taxes (EBIT) of the corporation have fluctuated a lot. EBIT reached its highest point in 2018–19 at ₹1,00,077 crore. However, it declined sharply to ₹3,589.3 crore in 2021–22 before rising to ₹17,872.9 crore in 2023–24. This variation reflects shifts in supply chain interruptions, production costs, market demand, and economic factors that impact profit margins. With interest costs ranging from ₹75.8 crore to ₹345.7 crore, they have been comparatively modest, suggesting less reliance on borrowed finance. Reduced interest payments indicate that the business is more likely to rely on internal cash reserves or equity financing than on large borrowings, which is good for its financial stability.

In 2017–18, Maruti Suzuki's total liabilities were ₹59,370.1 crore; in 2023–24, they were ₹1,10,284.8 crore. This shows that the corporation has been taking on more debt, perhaps to pay for operational expenses and expansion plans. Conversely, the value of equity has varied, slowly increasing to ₹2,780.7 crore in 2023–2024 from a low of ₹1,457.8 crore in 2019–20. Investor confidence is reflected in rising share values, but rising liabilities point to a greater financial load that needs to be effectively managed to preserve long-term stability. Maruti Suzuki's financials are problematic because of the negative retained earnings over the timeframe. After a minor improvement in 2019–20 (-₹2,295.5 crore), the retained earnings fell sharply to ₹-23,593.8 crore in 2023–24 from ₹-5,326.2 crore in 2017–18.If retained earnings are negative, the corporation has either been paying out larger dividends, making significant asset reinvestments, or is having trouble staying profitable. In the absence of a substantial increase in profitability and increased earnings retention, this tendency may have an effect on the company's long-term financial viability.

For the business to maintain long-term growth, it must concentrate on increasing profit margins and lowering debt. Effective cost control and striking a balance between growth and financial restraint will be essential to Maruti Suzuki's success in the future.

4.2.6 Analysis of financial components of Eicher Motors Ltd

Table 4.6 financial components of Eicher Motors ltd

Component\Years	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	Average
Current Assets	2524.42	4384.43	6336.6	8747.69	5497.8	3499.91	3874.61	2077.03
Total Assets	7794.67	9477.41	10579.01	12624.91	14284.55	16875.5	20472.81	2021.11
Net sales	8913.43	9715.16	9008.69	8571.64	9983.1	13874.98	15827.33	1196.32
Interest	3.04	2.99	10.86	9.2	10.25	12.97	19.2	-89.87
Total Liability	7794.67	9477.41	10579.01	12624.91	14284.55	16875.5	20472.81	-108.452
Current Liability	2194.63	1978.24	1861.12	2428.71	2878.87	3045.07	3359.9	-2084.23
Value of equity	847.69	699.65	357.3	711.7	672.7	806.8	1100.5	-3510.52
EBIT	3070.34	3359.61	2667.76	1789.31	2120.83	3636.11	5579.06	-5689.625
Retained Earning	-14449.59	-1754.2	-114.87	-1429.63	-1089.56	-209.32	-2806.68	-1444.59

(Source: Computed from the Balance Sheet and Profit & loss A/c)

Table 4.6 identifies the Altman model's components during the study period of Eicher motors Ltd. from 2018 to 2024, Significant trends in asset management, liabilities, sales, and profitability may be seen in Eicher Motors Ltd.'s financial performance over the last seven years, from 2017–18 to 2023–24. A thorough examination of several elements based on the provided data is provided below:

From ₹2,524.42 crores in 2017–18 to ₹3,874.61 crores in 2023–24, Eicher Motors' current assets have demonstrated an overall upward trend, peaking at ₹8,747.69 crores in 2020–21. There has been variation, nevertheless, perhaps as a result of adjustments to working capital, investments, or inventory levels. The company's asset expansion strategy is demonstrated by the substantial increase in total assets from ₹7,794.67 crores in 2017–18 to ₹20,472.81 crores in 2023–24. Capital expenditures and an increase in long-term assets to support corporate expansion are reflected in this growth. From ₹8,913.43 crores in 2017–

18 to ₹15,827.33 crores in 2023–24, Eicher Motors' net sales have varied over time. Even though sales fell in 2019–20 (₹9,008.69 crores) and 2020–21 (₹8,571.64 crores), the business recovered well after the epidemic, as seen by a strong increase in revenue. Strong demand for Royal Enfield motorcycles, a major brand owned by Eicher Motors, is indicated by this rebound. From ₹3.04 crores in 2017–18 to ₹19.2 crores in 2023–24, the interest expense has gone up over time, suggesting a rise in debt financing.

The interest cost is still manageable, though, when measured against overall revenue, indicating good debt management. Total liabilities increased as a result of expansion activities, rising from ₹7,794.67 crores in 2017–18 to ₹20,472.81 crores in 2023–24. Additionally, current liabilities rose from ₹2,194.63 crores to ₹3,359.9 crores, albeit at a slower rate, indicating that the business has been successfully handling its short-term financial obligations.

With a low of ₹357.3 crores in 2019–20 and a high of ₹1,100.5 crores in 2023–24, the value of equity has seen substantial volatility. Improved market mood and investor confidence in the business are shown by this rebound. Earnings before Interest and Tax (EBIT) fluctuated, falling to ₹2,667.76 crores in 2019–20 and ₹1,789.31 crores in 2020–21 before rising substantially to ₹5,579.06 crores in 2023–24. The strong rebound points to increased sales volumes, better operating efficiencies, and better cost control.

Although it improved over time, the retained earnings showed a downward trend, with notable losses of -₹14,449.59 crores in 2017–18 and -₹2,806.68 crores in 2023–24. This implies that the business may have been affecting retained earnings by distributing profits, either through dividends or investing in expansion plans.

Following 2020, Eicher Motors Ltd. demonstrated robust asset growth and revenue recovery, as seen by recent increases in sales and profitability. On the other hand, declining retained earnings, increasing liabilities, and fluctuating EBIT all point to financial dangers. For long-term success, the company's capacity to control debt, maintain sales growth, and preserve profitability will be crucial. In the upcoming years, Eicher Motors may improve its financial standing if it keeps up its global expansion, product innovation, and operational efficiency.

4.2.7 Analysis of financial components of TVS Motor Company Ltd

Table 4.7 financial components of TVS Motor Company ltd

Component\Years	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	Average
Current Assets	2578.11	3154.9	3221.59	3446.79	3362.28	3667.5	4217.82	9828.08
Total Assets	7179.47	8369.36	9353.32	10197.45	11847.73	13992.39	16062.24	10734.24
Net sales	14966.78	17912.51	16073.63	16603.45	20436.84	26008.06	31502.49	11242.071
Interest	56.62	80.56	102.19	141.6	125.92	140.66	181.63	10621.286
Total Liability	59370.1	62931.8	62552.1	70067.4	73394.3	83178.7	110284.8	12734.22
Current Liability	3779.5	4041.68	4494.16	4585.41	5186.5	6008.54	6606.8	1075.25
Value of equity	308.9	237.6	166.3	285.2	332.7	427.7	570.3	173.333
EBIT	684.69	569.23	329.81	365.53	650.92	1472.71	2228.84	106.30
Retained Earning	-472.09	-466.9	-270.77	-552.86	-603.58	-122.81	1683.19	-472.09

(Source: Computed from the Balance Sheet and Profit & loss A/c)

Table 4.2.7 identifies the Altman model's components during the study period of TVS Motors Company Ltd. from 2018 to 2024, the success of TVS Motor Company Ltd. over the previous seven years may be inferred from its financial data in important categories like revenue, earnings, equity, liabilities, and assets. The following is a thorough examination of each element:

TVS Motor has demonstrated enhanced liquidity and asset efficiency by expanding its current assets from ₹2,578.11 crore in 2017–18 to ₹4,217.82 crore in 2023–24. From ₹7,179.47 crore in 2017–18 to ₹16,062.24 crore in 2023–24, the total assets were likewise a significant increase. This implies that the company has increased the size of its asset base, either organically or through acquisitions, capital investments, or both. Over the years, the company's net sales have steadily increased, rising from ₹14,966.78 crore in 2017–18 to

₹31,502.49 crore in 2023–24. Strong revenue growth, fuelled by improved product mix, increased sales volumes, and market expansion, is evident in this. Sales increased most during the latter two years, especially in 2022–2023 and 2023–2024, indicating a post-pandemic rebound and increased demand for TVS Motor's goods. Additionally, interest costs have gone up over time, rising from ₹56.62 crore in 2017–18 to ₹181.63 crore in 2023–24. This suggests the business has been increasing its debt, perhaps to finance operations or expansion. Ineffective management of the growing interest burden may eventually affect profitability. The company's increasing financial commitments are reflected in TVS Motor's significantly higher total liabilities. Short-term obligations are included in the current liabilities, which have also grown from ₹3,779.5 crore in 2017–18 to ₹6,606.8 crore in 2023–24. The increase in liabilities points to an increasing reliance on outside funding, which could have been utilized for expansion, acquisitions, or working capital needs. Although the equity value fluctuated, it rose sharply from ₹308.9 crore in 2017–18 to ₹570.3 crore in 2023–24. This indicates a possible rise in shareholder value over time as well as an improvement in investor confidence.

Throughout 2022–2023 and 2023–2024, the company's EBIT increased significantly, reaching ₹1,472.71 crore and ₹2,228.84 crore, respectively. This indicates increased operational profitability and efficiency. Due to either weaker margins or higher expenses, EBIT was lower in the prior years. The notable increase in recent years points to a robust recovery and improved operational efficiency.

TVS Motor has typically displayed negative retained earnings, which means that after deducting expenses, the corporation has either been making dividend payments or has been losing money. Nonetheless, a notable improvement is recorded in 2023–24 with a sharply positive retained earnings of ₹1,683.19 crore. This implies that the business has improved its financial standing, generated a profit, and kept revenue.

Over the years, TVS Motor Company Ltd. has demonstrated robust growth in net sales, total assets, and EBIT, pointing to a promising financial future. On the other hand, the growing liabilities and interest costs indicate that the business has been depending on outside funding to grow. Better profitability and financial stability are reflected in the recent rise in retained earnings and equity value. With increased revenue, improved EBIT, and a notable rise in retained earnings, the company looks to be in a stronger financial position in 2023–2024. In the future, maintaining sales growth, maximizing interest rates, and

effectively managing debt will be essential for long-term financial stability and increasing shareholder value.

4.3 Analysis of financial ratios of Altman Z Score Model:

By analyzing important financial ratios, the Altman Z-Score Model is a financial instrument that forecasts a company's probability of going bankrupt. Five essential ratios make up the model, which is used to evaluate the financial health of businesses. These proportions are:

6. X1 = Working Capital / Total Assets(for liquidity measure)
7. X2 = Retained Earnings / Total Assets(for measure of reinvested earning)
8. X3 = EBIT / Total Assets(for profitability measure)
9. X4 = Market Value of Equity / Total Liabilities(for leverage measure)
10. X5 = Net Sales / Total Assets(for sales generating ability)

- **X1 = Working Capital / Total Assets(for liquidity measure)**
  The ratio of working capital to total assets is commonly used in research on business issues. This ratio evaluates the company's net liquid assets in relation to its overall assets or capitalization. The difference between current assets and current liabilities is known as working capital. A company that consistently experiences operational losses will typically have current assets relative to total assets. The quick ratio and current ratio were two additional liquidity ratios that were examined. For some failing firms, they were found to be less beneficial and susceptible to perverse patterns.

- **X2 = Retained Earnings / Total Assets(for measure of reinvested earning)**
  The accounts that show a company's total amount of reinvested earnings over a specific time period are called retained earnings. Another name for the accounts is earned surplus. Over a specific time period, this ratio calculates the cumulative profitability. This ratio subtly takes into account a firm's age. A relatively young company, for instance, is likely to have a low RE/TA ratio since it hasn't had time to accumulate cumulative earnings. The youthful firm's likelihood of going bankrupt is therefore comparatively higher than that of other older firms, according to this analysis.

Thus, this is a significant model limitation. Furthermore, the RE/TA ratio calculates the firm's leverage. Companies that have a high retained earnings to total assets ratio have financed their assets by keeping their profits and have used less debt.

- **X3 = EBIT / Total Assets(for profitability measure)**

  This ratio, which is unaffected by tax or leverage, represents the actual productivity of the company's assets. The earning potential of the company's assets (asset utilization) determines its long-term survival. Additionally, insolvency in the sense of bankruptcy happens when a company's total liabilities exceed its total assets. The earning capability of the assets determines the firm's reasonable worth. Therefore, we shall demonstrate that this ratio consistently outperforms cash flow and other profitability metrics.

- **X4 = Market Value of Equity / Total Liabilities(for leverage measure)**

  The market value of all preferred and common stock shares, as well as current and long-term liabilities, come together to form the capital fund. The metrics indicate the maximum amount of asset depreciation before the firm becomes insolvent due to the excess of liabilities over assets

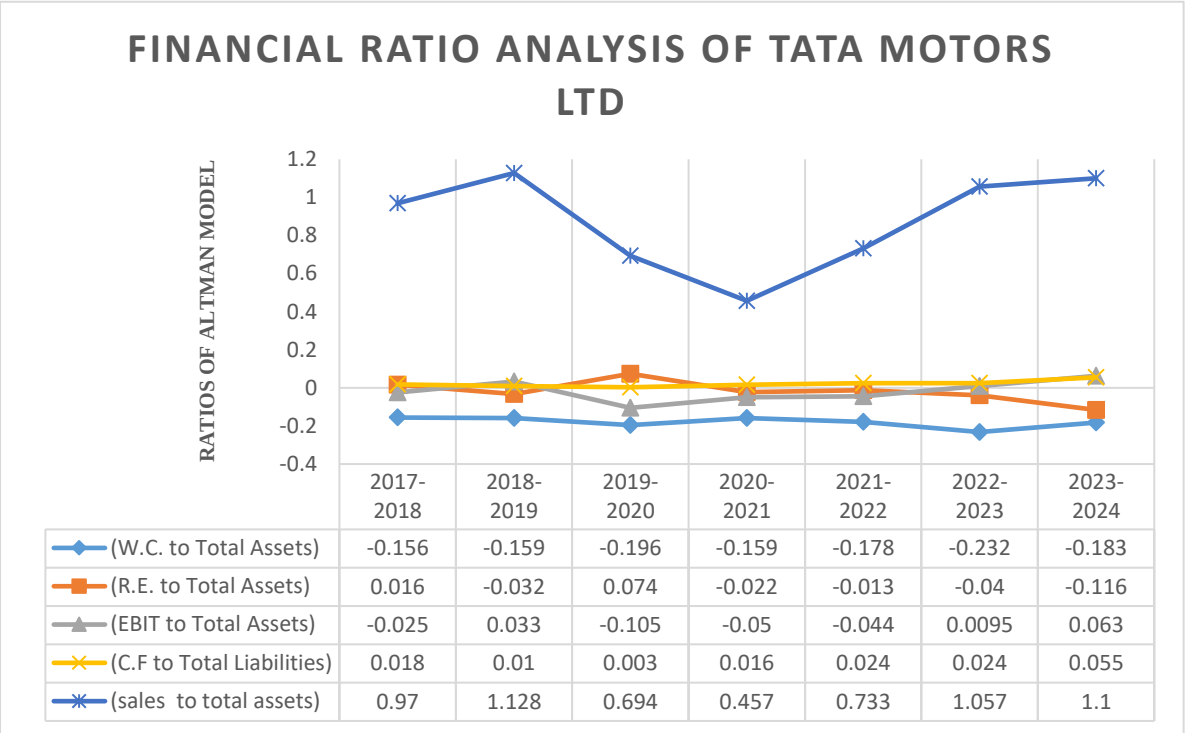
  As an illustration, consider a company whose debt is Rs. 500 crores and whose equity is at Rs. 100 crores. May see a two-thirds decrease in the value of assets prior to bankruptcy. But if the value of the stocks drops by just one-third, the same company with 250 crores of equity will become bankrupt. The firm's asset value is represented by the equity market value.

- **X5 = Net Sales / Total Assets(for sales generating ability)**

The capital turnover ratio is a common financial number that shows how well a company's assets can generate sales. The management capacity and competitive conditions are the subjects of this ratio. This ratio has special connections to the other variables in the model. When it comes to the model's overall performance, the sales to total assets ratio comes in second.

4.3.1 Altman Model Ratio Analysis of Tata Motors Ltd:

Chart 4.1 Ratio Analysis of Tata Motors Ltd



	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024
(W.C. to Total Assets)	-0.156	-0.159	-0.196	-0.159	-0.178	-0.232	-0.183
(R.E. to Total Assets)	0.016	-0.032	0.074	-0.022	-0.013	-0.04	-0.116
(EBIT to Total Assets)	-0.025	0.033	-0.105	-0.05	-0.044	0.0095	0.063
(C.F to Total Liabilities)	0.018	0.01	0.003	0.016	0.024	0.024	0.055
(sales to total assets)	0.97	1.128	0.694	0.457	0.733	1.057	1.1

Chart 4.1 shows analysis of ratio which is used to Altman Model of Tata Motors Ltd, From 2017–2018 to 2023–2024, Tata Motors Ltd.'s financial ratio study reveals significant trends in profitability, liquidity, and operational efficiency. Liquidity issues are shown by the working capital to total assets ratio, which has been negative throughout. It peaked in 2022–2023 at -0.232 and then marginally improved in 2023–2024 at -0.183. The ratio of retained earnings to total assets varies, indicating uneven profitability. It peaked in 2019–2020 (0.074) and then sharply declined in 2023–2024 (-0.116), indicating lower earnings. The EBIT to Total Assets ratio likewise exhibits volatility, falling to a low of -0.105 in 2019–2020 before rising to 0.063 in 2023–2024, a sign of improved operational success.

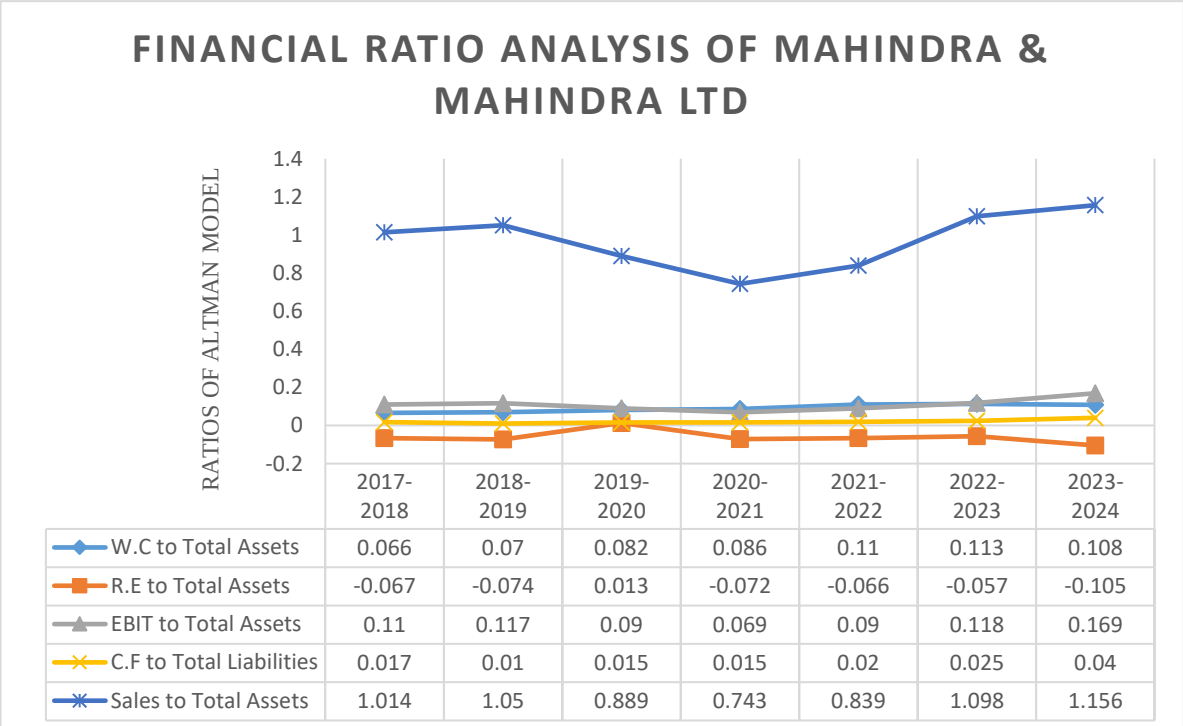
The Cash Flow to Total Liabilities ratio, which shows better liquidity management, remained positive but low, falling to 0.003 in 2019–2020 before steadily rising to 0.055 in 2023–2024. After 2018–2019, the Sales to Total Assets ratio (1.128), which gauges asset

efficiency, fell to its lowest point in 2020–2021 (0.457) before sharply rising to 1.1 in 2023–2024, indicating increased revenue generation.

In general, Tata Motors Ltd. has encountered financial difficulties, especially with regard to profitability and liquidity. Recent increases in cash flow, asset turnover, and EBIT, however, point to a possible comeback. Maintaining operational efficiency while enhancing profitability and liquidity management is essential for long-term financial stability.

4.3.2 Altman Model Ratio Analysis of Mahindra & Mahindra Ltd

Chart 4.2 Ratio Analysis of Mahindra & Mahindra Ltd



	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024
W.C to Total Assets	0.066	0.07	0.082	0.086	0.11	0.113	0.108
R.E to Total Assets	-0.067	-0.074	0.013	-0.072	-0.066	-0.057	-0.105
EBIT to Total Assets	0.11	0.117	0.09	0.069	0.09	0.118	0.169
C.F to Total Liabilities	0.017	0.01	0.015	0.015	0.02	0.025	0.04
Sales to Total Assets	1.014	1.05	0.889	0.743	0.839	1.098	1.156

Chart 4.2 shows analysis of ratio which is used to Altman Model of Mahindra & Mahindra Ltd, The Companies' financial ratio study shows that the company's financial situation has been steady and getting better over time. With a peak of 0.113 in 2022–2023 and a modest decline to 0.108 in 2023–2024, the Working Capital to Total Assets ratio stayed positive throughout, demonstrating good liquidity management. Nevertheless, the ratio of retained earnings to total assets has continuously been negative, falling from -0.067 in 2017–2018 to -0.105 in 2023–2024, indicating

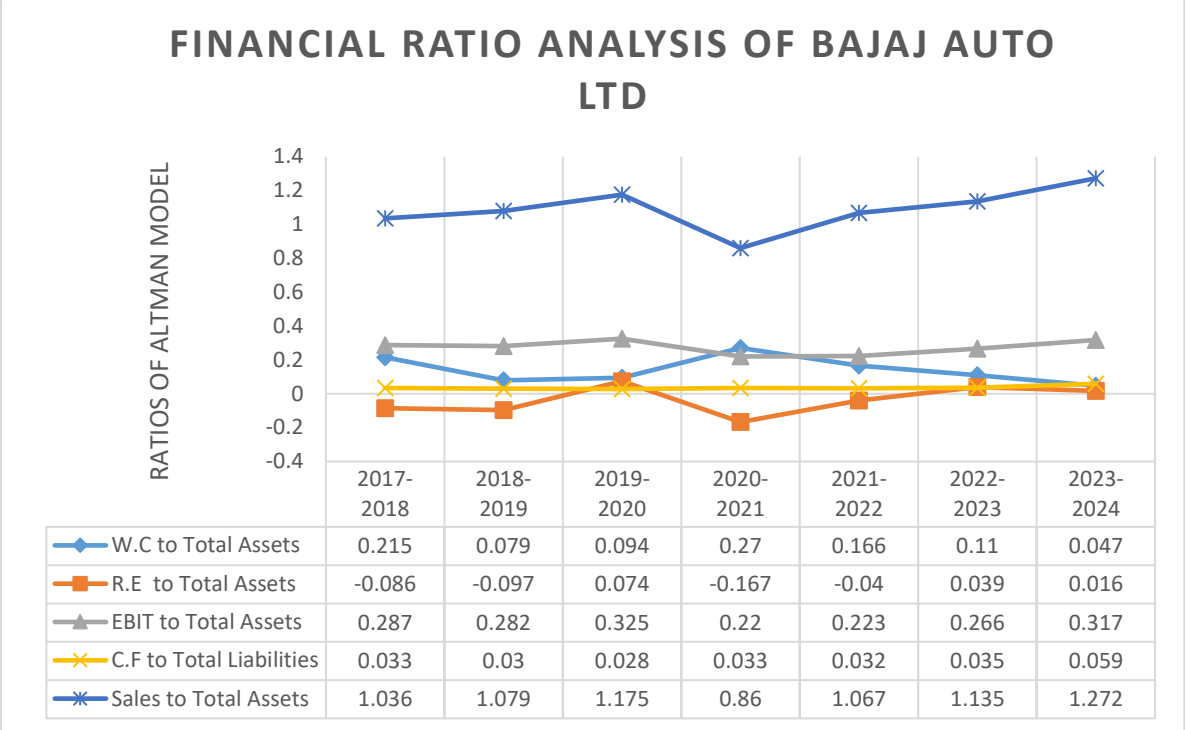
difficulties in holding onto profits in spite of operational expansion. Better operational efficiency and earnings creation are shown in the EBIT to Total Assets ratio, a crucial profitability measure, which increased from 0.11 in 2017–2018 to 0.169 in 2023–2024.

The Cash Flow to Total Liabilities ratio, which indicates better debt management and financial flexibility, has grown gradually from 0.017 in 2017–2018 to 0.04 in 2023–2024. In contrast, the Sales to Total Assets ratio, which measures asset efficiency, fell from 1.014 in 2017–2018 to 0.743 in 2020–2021, most likely as a result of outside market forces. However, it recovered sharply to 1.156 in 2023–2024, suggesting stronger asset utilization and revenue generation.

Mahindra & Mahindra Ltd. has shown strong liquidity and operational efficiency overall, and its rising cash flow and EBIT ratios support its sound financial standing. The persistently low retained profits ratio, however, indicates that improved profit retention tactics are required. The company is in a strong position for long-term growth thanks to the rebound in asset turnover and consistent financial improvements.

4.3.3 Altman Model Ratio Analysis of Bajaj Auto Ltd

Chart 4.3 Ratio Analysis of Bajaj Auto Ltd



	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024
W.C to Total Assets	0.215	0.079	0.094	0.27	0.166	0.11	0.047
R.E to Total Assets	-0.086	-0.097	0.074	-0.167	-0.04	0.039	0.016
EBIT to Total Assets	0.287	0.282	0.325	0.22	0.223	0.266	0.317
C.F to Total Liabilities	0.033	0.03	0.028	0.033	0.032	0.035	0.059
Sales to Total Assets	1.036	1.079	1.175	0.86	1.067	1.135	1.272

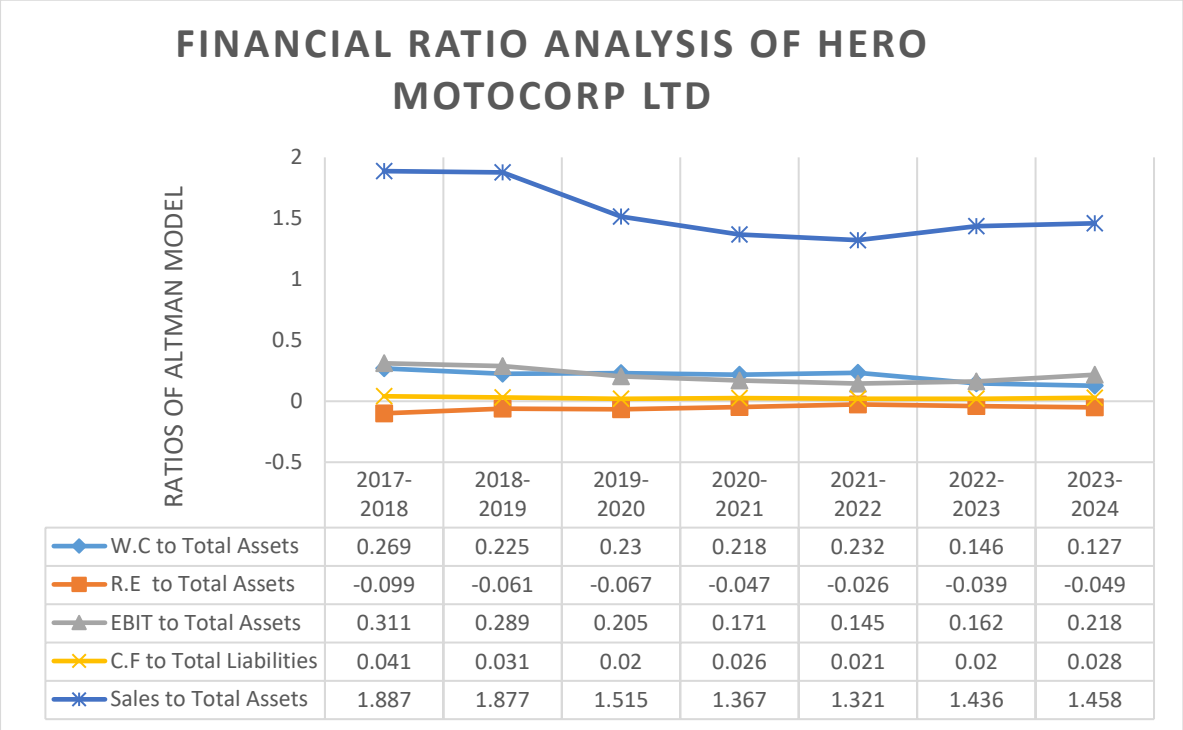
Chart 4.3 shows analysis of ratio which is used to Altman Model of Bajaj Auto Ltd uses the Altman Z-Score model to show important trends in liquidity, profitability, and operational efficiency. Short-term liquidity was measured by the Working Capital to Total Assets (W.C. to Total Assets) ratio, which decreased from 0.215 in 2017–2018 to 0.047 in 2023–2024. The steep decline following 2020–2021 suggests that short-term liabilities may have increased or current assets may have decreased, which would have weakened liquidity. Low retained profits or accumulated losses were indicated by the Retained profits to Total Assets (R.E. to TA) ratio's first negative values (-0.086 in 2017–2018 and -0.097 in 2018–2019). Despite turning positive by 2019–2020 (0.074), there was a brief decline to -0.167 in 2020–2021, which was indicative of financial distress. With a steady improvement, the ratio reached 0.016 in 2023–2024, a sign of increasing earnings retention.

Values ranged from 0.287 in 2017–2018 to 0.317 in 2023–2024, indicating steady operational efficiency and stability in the EBIT to Total Assets ratio. This suggests that Bajaj Auto was able to efficiently produce operational income from its assets. The ratio of cash flow to total liabilities, or C.F. to total liabilities, stayed low, indicating that cash flow was constrained in comparison to liabilities. Even if it improved slightly from 0.033 in 2017–2018 to 0.059 in 2023–2024, the ratio still shows how limited the company's cash flow is in covering its liabilities.

Increased asset usage and revenue production were shown by the Sales to Total Assets ratio, which increased from 1.036 in 2017–2018 to 1.272 in 2023–2024. Concerns about Bajaj Auto's diminishing liquidity position and constrained cash flow coverage, which demand concentrated attention for long-term financial stability, persist despite the company's overall high operating efficiency and increased profitability.

4.3.4 Altman Model Ratio Analysis of Hero MotoCorp Ltd

Chart 4.4 Ratio Analysis of Hero Moto Corp Ltd



	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024
W.C to Total Assets	0.269	0.225	0.23	0.218	0.232	0.146	0.127
R.E to Total Assets	-0.099	-0.061	-0.067	-0.047	-0.026	-0.039	-0.049
EBIT to Total Assets	0.311	0.289	0.205	0.171	0.145	0.162	0.218
C.F to Total Liabilities	0.041	0.031	0.02	0.026	0.021	0.02	0.028
Sales to Total Assets	1.887	1.877	1.515	1.367	1.321	1.436	1.458

Chart 4.4 shows analysis of ratio which is used to Altman Model of Hero MotoCorp Ltd. from 2017–2018 to 2023–2024 provides important information about the company's operational effectiveness, profitability, and liquidity using the Altman Z-Score methodology. The ratio of working capital to total assets, or W.C. to total assets, is trending downward, beginning at 0.269 in 2017–2018 and progressively dropping to 0.127 in 2023–2024. This shows a declining liquidity situation over time, implying that the short-term assets of the business are losing their ability to cover its total assets. The period-long

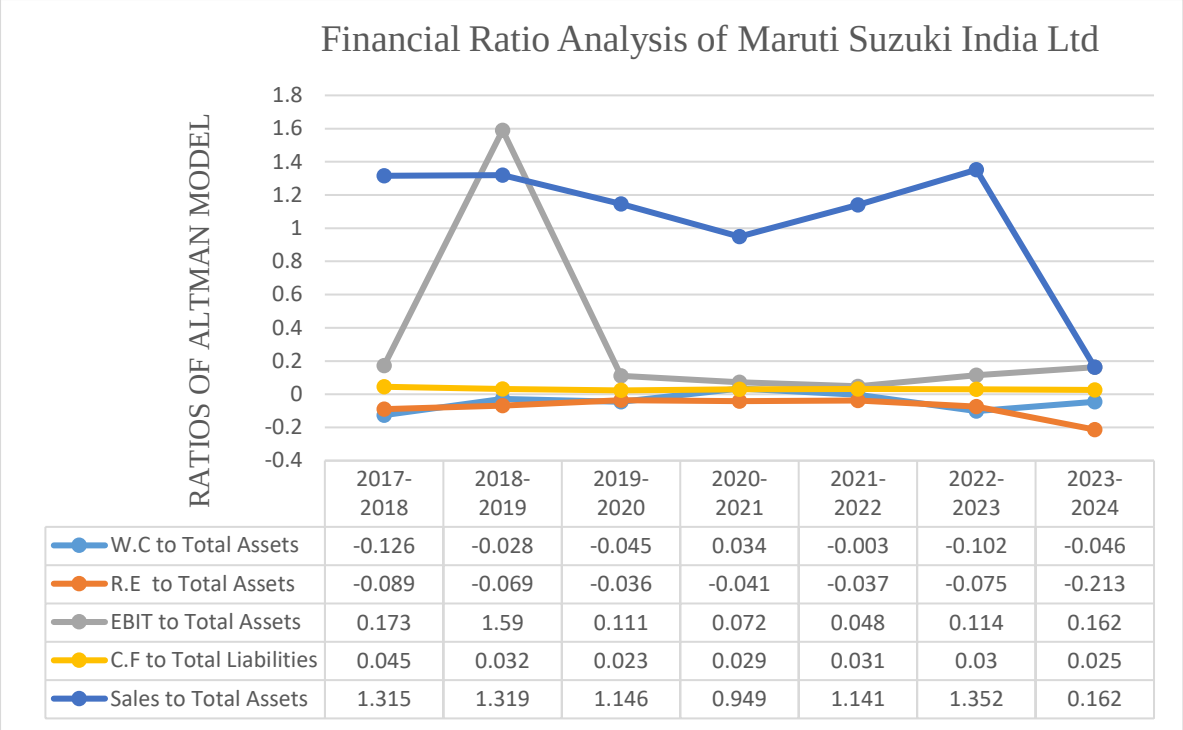
negative Retained Earnings to Total Assets (R.E. to Total Assets) ratio suggests minimal retained earnings and potential accumulating losses. After a minor improvement from -0.099 in 2017–2018 to -0.026 in 2020–2021, it fell once more to -0.049 in 2023–2024, indicating that the company did not have enough retained earnings to finance its assets.

From 0.311 in 2017–2018 to 0.145 in 2021–2022, the EBIT to Total Assets ratio—which measures operational efficiency—first showed a negative trend before somewhat improving to 0.218 in 2023–2024. This implies a marginal improvement after a period of decreased operational efficiency, either brought on by increased operating expenses or decreased profitability. The company's ability to pay its debts with available cash flow is shown by the Cash Flow to Total Liabilities (C.F. to Total Liabilities) ratio, which has been continuously low. It ranged from 0.041 in 2017–2018 to 0.028 in 2023–2024, indicating insufficient cash flow in relation to liabilities.

Prior to rising to 1.458 in 2023–2024, the Sales to Total Assets ratio—which gauges asset utilization and income generation—exhibited a declining trend, going from 1.887 in 2017–2018 to 1.321 in 2021–2022. This implies better asset usage in the last many years. Hero MotoCorp has made significant progress in improving its operational efficiency and asset utilization, but there are still issues with liquidity and retained earnings that need to be addressed if the company is to have long-term financial success.

4.3.5 Altman Model Ratio Analysis of Maruti Suzuki India Ltd

Chart 4.5 Ratio Analysis of Maruti Suzuki India Ltd



	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024
W.C to Total Assets	-0.126	-0.028	-0.045	0.034	-0.003	-0.102	-0.046
R.E to Total Assets	-0.089	-0.069	-0.036	-0.041	-0.037	-0.075	-0.213
EBIT to Total Assets	0.173	1.59	0.111	0.072	0.048	0.114	0.162
C.F to Total Liabilities	0.045	0.032	0.023	0.029	0.031	0.03	0.025
Sales to Total Assets	1.315	1.319	1.146	0.949	1.141	1.352	0.162

Chart 4.5 shows analysis of ratio which is used to Altman Model of Maruti Suzuki India Ltd examines changes in liquidity, profitability, and operational efficiency from 2017–2018 to 2023–2024 using the Altman Z-Score methodology. Throughout the time, the company's liquidity was indicated by the Working Capital to Total Assets (W.C. to Total Assets) ratio, which began at -0.126 in 2017–2018 and continued to decline to -0.046 in 2023–2024. This implies that Maruti Suzuki has continuously struggled with liquidity, perhaps as a result of either a decline in current assets or a high level of short-term liabilities. From -0.089 in 2017–2018 to -0.213 in 2023–2024, the Retained Earnings to Total Assets (R.E. to Total Assets) ratio, which shows the percentage of total assets financed by retained earnings, gradually decreased, suggesting insufficient retained earnings and either increased dividend payments or decreased profitability.

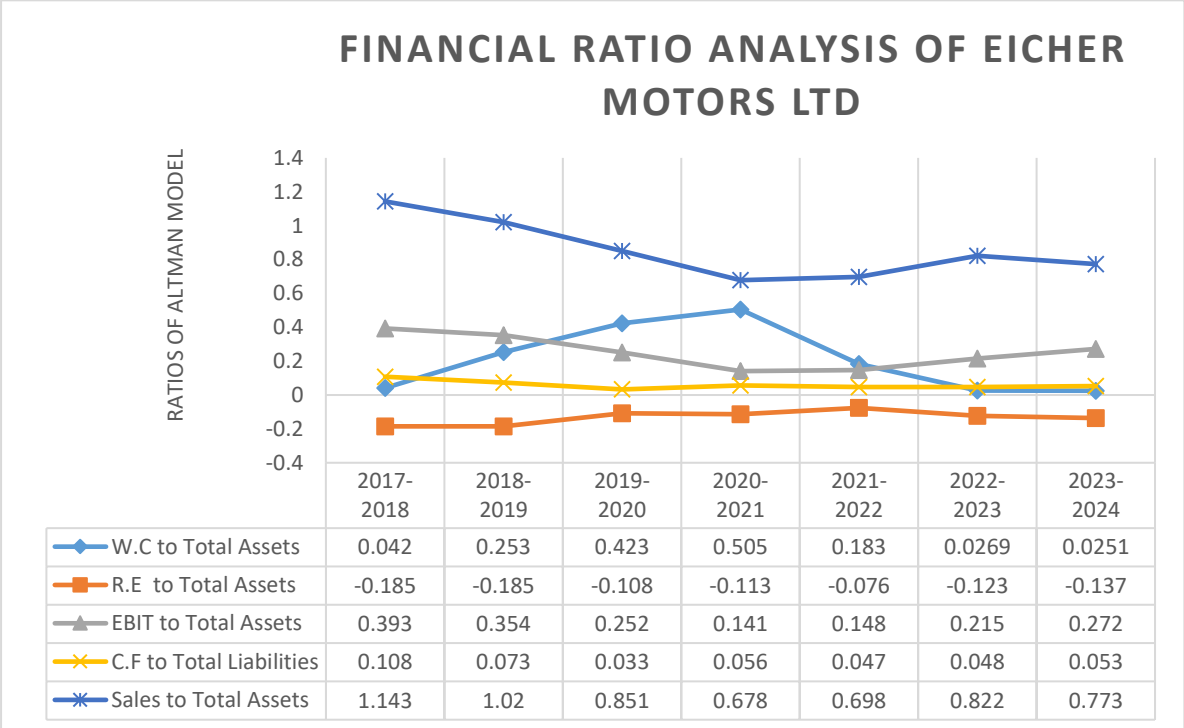
Significant fluctuation was seen in the EBIT to Total Assets ratio, which gauges operational efficiency. It showed remarkable profitability in 2018-2019, when it peaked dramatically at 1.59. But as a result of decreased operational efficiency in 2019–2020 and 2020–2021, the ratio fell sharply to 0.111 and 0.072, respectively. Although it stayed below the 2018–2019 peak, there was a slight improvement in the following years, with the ratio increasing to 0.162 in 2023–2024. Weak cash flow management was highlighted by the low and comparatively steady Cash Flow to Total Liabilities (C.F. to Total Liabilities) ratio, which

ranged from 0.045 in 2017–2018 to 0.025 in 2023–2024 and shows the company's capacity to satisfy its liabilities through available cash flow.

There was a mixed trend in the Sales to Total Assets ratio, which measures the efficiency of revenue production and asset usage. It began in 2017–2018 at 1.315, fell to 0.949 in 2020–2021, then rebounded to reach a peak of 1.352 in 2022–2023, before falling to 0.162 in 2023–2024. Maruti Suzuki needed better liquidity management and operational stability for long-term financial success because of its overall operational volatility, poor liquidity, and diminishing retained earnings.

4.3.6 Altman Model Ratio Analysis of Eicher Motors Ltd

Chart 4.6 Ratio Analysis of Eicher Motors ltd



	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024
W.C to Total Assets	0.042	0.253	0.423	0.505	0.183	0.0269	0.0251
R.E to Total Assets	-0.185	-0.185	-0.108	-0.113	-0.076	-0.123	-0.137
EBIT to Total Assets	0.393	0.354	0.252	0.141	0.148	0.215	0.272
C.F to Total Liabilities	0.108	0.073	0.033	0.056	0.047	0.048	0.053
Sales to Total Assets	1.143	1.02	0.851	0.678	0.698	0.822	0.773

Chart 4.6 shows analysis of ratio which is used to Altman Model of Eicher Motors Ltd, from 2017–2018 to 2023–2024 provides important information about operational efficiency, profitability, and liquidity using the Altman Z-Score methodology. Strong liquidity was seen in 2020–2021, when the Working Capital to Total Assets (W.C. to TA) ratio peaked at 0.505, following a trend of fluctuation that began at 0.042 in 2017–2018. It

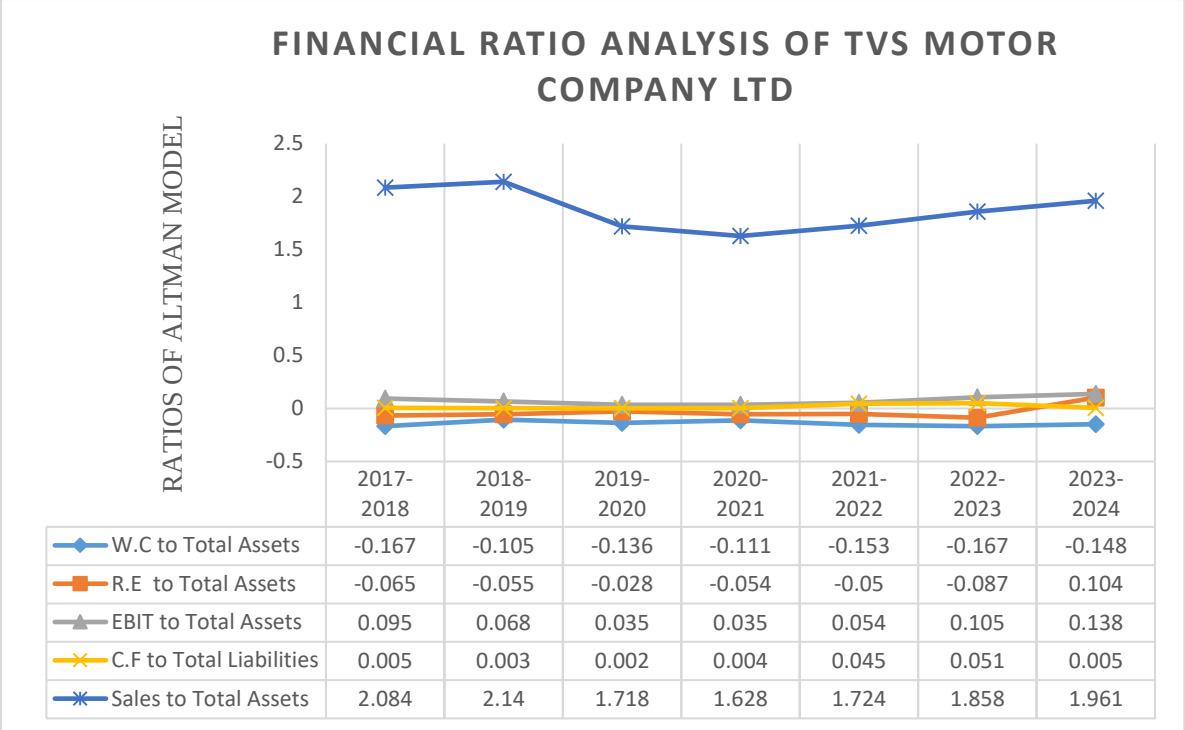
did, however, sharply fall to 0.183 in 2021–2022, and then to 0.0251 in 2023–2024, indicating a decrease in short-term liquidity in recent years. Because there were not enough retained earnings to finance the company's assets, the Retained Earnings to Total Assets (R.E. to Total Assets) ratio stayed negative over the time. It began at -0.185 in 2017–2018, slightly improved to -0.076 in 2021–2022, and then fell once more to -0.137 in 2023–2024, showing poor retention of profits.

From 0.393 in 2017–2018 to 0.141 in 2020–2021, the EBIT to Total Assets ratio, which measures operational efficiency, first shown a downward trend, signifying lower operating profitability during this time. But in the years that followed, the ratio improved, rising to 0.272 in 2023–2024, indicating increased operating efficiency. After declining from 0.108 in 2017–2018 to 0.048 in 2022–2023, the Cash Flow to Total Liabilities (C.F. to Total Liabilities) ratio—which evaluates the company's ability to cover liabilities using available cash flow—slightly improved to 0.053 in 2023–2024, indicating moderate cash flow management.

From 1.143 in 2017–2018 to 0.678 in 2020–2021, the Sales to Total Assets ratio, which measures asset utilization, demonstrated a steady decline, suggesting less effectiveness in generating income from assets. Despite a minor improvement to 0.773 in 2023–2024, the ratio is still below its starting points. In general, Eicher Motors has shown increased operational efficiency in recent years however, issues with preserving cash, holding onto profits, and maximizing asset utilization for long-term growth still exist.

4.3.7 Altman Model Ratio Analysis of TVS motor company ltd

Chart 4.7 Ratio Analysis of TVS motor company ltd



	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024
W.C to Total Assets	-0.167	-0.105	-0.136	-0.111	-0.153	-0.167	-0.148
R.E to Total Assets	-0.065	-0.055	-0.028	-0.054	-0.05	-0.087	0.104
EBIT to Total Assets	0.095	0.068	0.035	0.035	0.054	0.105	0.138
C.F to Total Liabilities	0.005	0.003	0.002	0.004	0.045	0.051	0.005
Sales to Total Assets	2.084	2.14	1.718	1.628	1.724	1.858	1.961

Chart 4.7 shows analysis of ratio which is used to Altman Model of TVS motor company ltd. From 2017–2018 to 2023–2024, the Altman Z-Score model offers important information on the company's liquidity, profitability, and operational effectiveness. The period-long negative Working Capital to Total Assets (W.C. to Total Assets) ratio suggests persistent liquidity issues. Starting at -0.167 in 2017–2018, the ratio rose marginally to -0.105 in 2018–2019, but by 2023–2024, it had fallen once more to -0.148. This implies that TVS Motor has either too few current assets to pay its debts or relied too much on short-term finance.

Over time, there was some variation in the ratio of retained earnings to total assets, or R.E. to total assets. Its initial values of -0.065 in 2017–2018 and -0.055 in 2018–2019 indicated that the corporation had insufficient retained earnings to finance its assets. Even though its 2023–2024 value of 0.104 showed increased earnings retention, it is still an area that needs constant attention to maintain long-term financial stability.

Operational efficiency is measured by the EBIT to Total Assets ratio, which first exhibited a downward trend from 0.095 in 2017–2018 to 0.035 in 2019–2020 and 2020–2021. After 2021, there was a notable improvement, nevertheless, as the ratio increased to 0.138 in 2023–2024, indicating a favourable recovery in operating profitability. Throughout the period, the Cash Flow to Total Liabilities (C.F. to Total Liabilities) ratio stayed low,

ranging from 0.005 to 0.051, suggesting that there was not enough cash flow to cover liabilities.

4.4 Solvency test of sampled units:

Professor Edward Altman created a new approach in 1968 called the Altman Z-score model instead of looking for a single optimal ratio. The financial economist and liquidity situation can be predicted using the Z-score formula. The Z-score is a multivariate model that assesses the company's financial health and forecasts insolvency within two years. The model addresses both operational and financial issues. X1, X2, X3, X4, and X5 are the five ratios that are used conceptually in the model. Financial issues are represented by the ratios X1, X2, and X4, whereas operating issues are represented by X3 and X5. They are as follows:

1. X1 = Working Capital / Total Assets(for liquidity measure)
2. X2 = Retained Earnings / Total Assets(for measure of reinvested earning)
3. X3 = EBIT / Total Assets(for profitability measure)
4. X4 = Market Value of Equity / Total Liabilities(for leverage measure)
5. X5 = Net Sales / Total Assets(for sales generating ability)

Z-score is a composite credit score for manufacturers that includes metrics of the company's performance, such as sales productivity, leverage, cumulative and present profitability, and corporate liquidity. The weighting of each measure is calculated so that the total Z-score is obtained by adding the five criteria and multiplying the weights by the financial performance.

The Z-score is now widely used by courts, management accountants, auditors, and database systems for assessment. The bus was first created for publicly traded industrial firms with assets over $1 million, but it has been utilized in a number of contexts and nations. The latter produced the Z1-score Altman modification model, which is applicable to privately held manufacturing firms, and Z2-soore for non-manufacturing firms. These are the different Altman models with relevant firms.

Name	Model	Applicable Firms
Z-score	1.2X1+1.4X2+3.3X3+0.6X4+0.999X5	Publicly Manufacturing Companies
Z1-score	0.171X1+0.847X2+3.107X3+0.42X4+0.998 X5	Privately Manufacturing Companies
Z2-score	6.56X1+3.26X2+6.72X3+1.05X4	None-Manufacturing Companies

For privately held manufacturing and non-manufacturing enterprises, the last two equations are frequently referred to as the Altman model. They are as follows:

Zones	Z	Z1	Z2
Safe Zones	Z>2.99	Z>2.9	Z>2.6
Grey Zones	1.81<Z<2.99	1.23<Z<2.9	1.1<Z<2.6
Distress Zones	Z<1.81	Z<1.23	Z<1.1

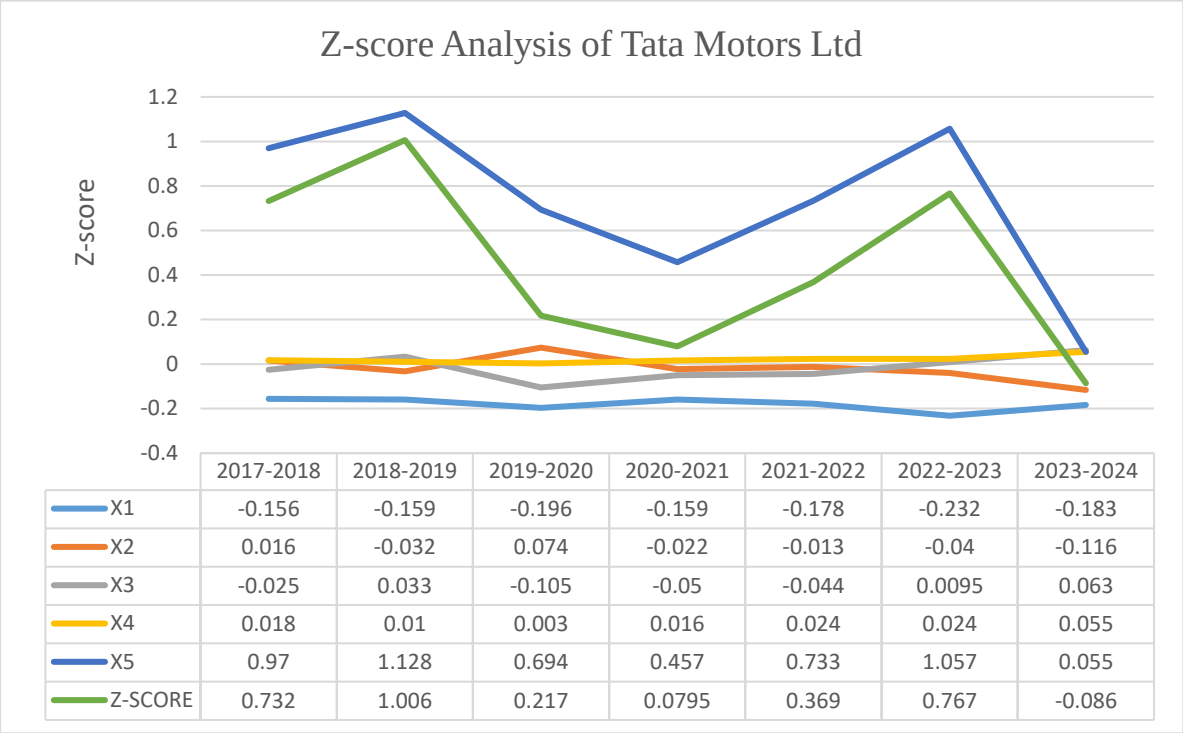
4.4.1 Z-Score Analysis of Tata Motors Ltd:

Table 4.8 Z-score Analysis

Year	X1	X2	X3	X4	X5	Z-SCORE	Zones
2017-2018	-0.156	0.016	-0.025	0.018	0.97	0.732	Distress Zone
2018-2019	-0.159	-0.032	0.033	0.01	1.128	1.006	Distress Zone
2019-2020	-0.196	0.074	-0.105	0.003	0.694	0.217	Distress Zone
2020-2021	-0.159	-0.022	-0.05	0.016	0.457	0.0795	Distress Zone
2021-2022	-0.178	-0.013	-0.044	0.024	0.733	0.369	Distress Zone
2022-2023	-0.232	-0.04	0.0095	0.024	1.057	0.767	Distress Zone
2023-2024	-0.183	-0.116	0.063	0.055	0.055	-0.086	Distress Zone

(Source: Computed in Excel)

Chart 4.8 Z-score Analysis of Tata Motors Ltd



	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024
X1	-0.156	-0.159	-0.196	-0.159	-0.178	-0.232	-0.183
X2	0.016	-0.032	0.074	-0.022	-0.013	-0.04	-0.116
X3	-0.025	0.033	-0.105	-0.05	-0.044	0.0095	0.063
X4	0.018	0.01	0.003	0.016	0.024	0.024	0.055
X5	0.97	1.128	0.694	0.457	0.733	1.057	0.055
Z-SCORE	0.732	1.006	0.217	0.0795	0.369	0.767	-0.086

Table 4.8 represents Z score Analysis of Tata Motors Ltd, A financial indicator called the Altman Z-score is used to evaluate a company's bankruptcy risk. Between 2017 and 2024, the Z-score trend for Tata Motors Ltd. shows periods of both improvement and deterioration, indicating substantial volatility.

Improvements in financial stability are indicated by the Z-score, which rose from 0.732 in 2017–2018 to 1.006 in 2018–2019 (Moderate Stability with Growth). Sales/Total Assets (X5) and EBIT/Total Assets (X3) both increased, which was the main cause of this.

2019–2021 (Financial Health Decline): The Z-score fell sharply from 1.006 in 2018–2019 to 0.217 in 2019–2020 and then to 0.0795 in 2020–2021. This steep drop suggests financial difficulty, which is most likely the result of declining asset efficiency (X5) and profitability (X3), which may be brought on by external market difficulties and economic downturns. 2021–2023 (Partial Recovery): A rise in X5 (Sales/Total Assets) was the primary driver of the Z-score's slight recovery, which saw it reach 0.767 in 2022–2023. Nonetheless, the score continued to be below the safe cut-off of 1.81, suggesting persistent financial

vulnerability. Financial Distress Worsens in 2023–2024: The Z-score dropped to -0.086, indicating extreme financial distress. Higher financial risk and possible liquidity problems are indicated by the falling X5 (Sales/Total Assets) and X2 (Retained Earnings/Total Assets) trends.

The general pattern indicates that Tata Motors Ltd. has been having financial difficulties, with brief recoveries but no steady expansion. In 2023–2024, the most recent negative Z-score (-0.086) raises worries about financial instability and an increased chance of bankruptcy if corrective action is not taken. Regaining financial strength and moving toward stability will need the organization to decrease liabilities, maximize asset usage, and increase profitability.

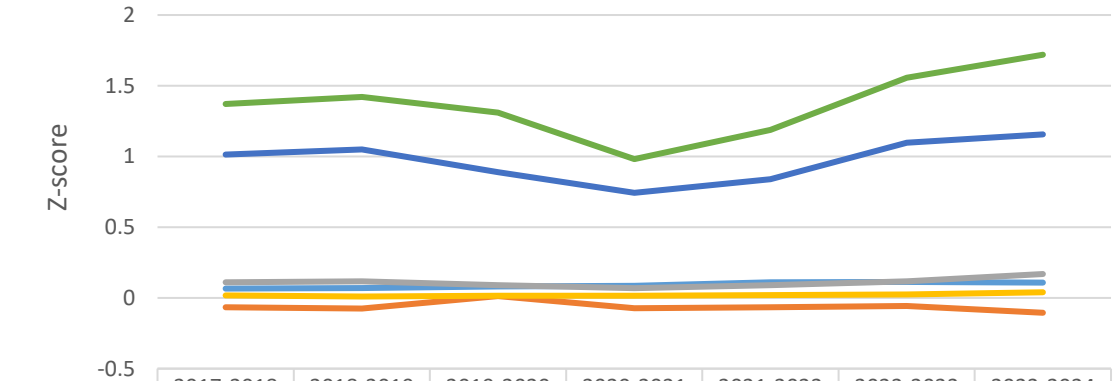
4.4.2 Z-Score Analysis of Mahindra &Mahindra Ltd

Table 4.9 Z-score Analysis

Year	X1	X2	X3	X4	X5	Z-SCORE	Zones
2017-2018	0.066	-0.067	0.11	0.017	1.014	1.371	Distress Zone
2018-2019	0.07	-0.074	0.117	0.01	1.05	1.421	Distress Zone
2019-2020	0.082	0.013	0.09	0.015	0.889	1.310	Distress Zone
2020-2021	0.086	-0.072	0.069	0.015	0.743	0.981	Distress Zone
2021-2022	0.11	-0.066	0.09	0.02	0.839	1.186	Distress Zone
2022-2023	0.113	-0.057	0.118	0.025	1.098	1.557	Distress Zone
2023-2024	0.108	-0.105	0.169	0.04	1.156	1.719	Distress Zone

(Source: Computed in Excel)

Chart 4.9 Z-score Analysis of Mahindra & Mahindra Ltd



	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024
X1	0.066	0.07	0.082	0.086	0.11	0.113	0.108
X2	-0.067	-0.074	0.013	-0.072	-0.066	-0.057	-0.105
X3	0.11	0.117	0.09	0.069	0.09	0.118	0.169
X4	0.017	0.01	0.015	0.015	0.02	0.025	0.04
X5	1.014	1.05	0.889	0.743	0.839	1.098	1.156
Z-SCORE	1.371586	1.42145	1.3107	0.9814	1.1868	1.5571	1.7191

Table 4.9 represents Z score Analysis of Mahindra &Mahindra Ltd when evaluating a company's financial health and bankruptcy risk, one important financial metric is the Altman Z-score.

The financial stability of Mahindra & Mahindra Ltd. fluctuates between 2017 and 2024, although it has been generally increasing in recent years. The Z-score stayed comparatively constant from 2017 to 2020 (Moderate Stability), ranging from 1.31 to 1.42. This implies that Mahindra & Mahindra was able to preserve a moderate level of financial stability while being in the distress zone ($Z < 1.81$).

2020–2021 (Weakest Performance): During this time, financial stability was at its lowest, with the Z-score falling sharply to 0.9814. This decrease may be the result of poorer profitability, more obligations, or economic difficulties. Z-score increased from 1.1868 in 2021-2022 to 1.7191 in 2023-2024, indicating a positive trend in 2021-2024 (Recovery and Growth). Better cost control, profitability, and asset utilization are suggested by the improving financial situation.

Recent developments suggest that Mahindra & Mahindra Ltd. is moving toward financial stability, even though the company is still in the distress zone. The company needs to concentrate on boosting profitability, cutting debt, and maximizing asset usage in order to

fortify its position and move into the safe zone (Z > 2.99). Although the growing trend is encouraging, long-term security requires additional financial strengthening.

4.4.3 Z-Score Analysis of Bajaj Auto Ltd:

Table 4.10 Z-score Analysis

Year	X1	X2	X3	X4	X5	Z-SCORE	Zones
2017-2018	0.215	-0.086	0.287	0.033	1.036	2.139	Grey Zone
2018-2019	0.079	-0.097	0.282	0.03	1.079	1.985	Grey Zone
2019-2020	0.094	0.074	0.325	0.028	1.175	2.479	Grey Zone
2020-2021	0.27	-0.167	0.22	0.033	0.86	1.695	Distress Zone
2021-2022	0.166	-0.04	0.223	0.032	1.067	1.964	Grey Zone
2022-2023	0.11	0.039	0.266	0.035	1.135	2.219	Grey Zone
2023-2024	0.047	0.016	0.317	0.059	1.272	2.431	Grey Zone

(Source: Computed in Excel)

Chart 4.10 Z-score Analysis of Bajaj Auto ltd

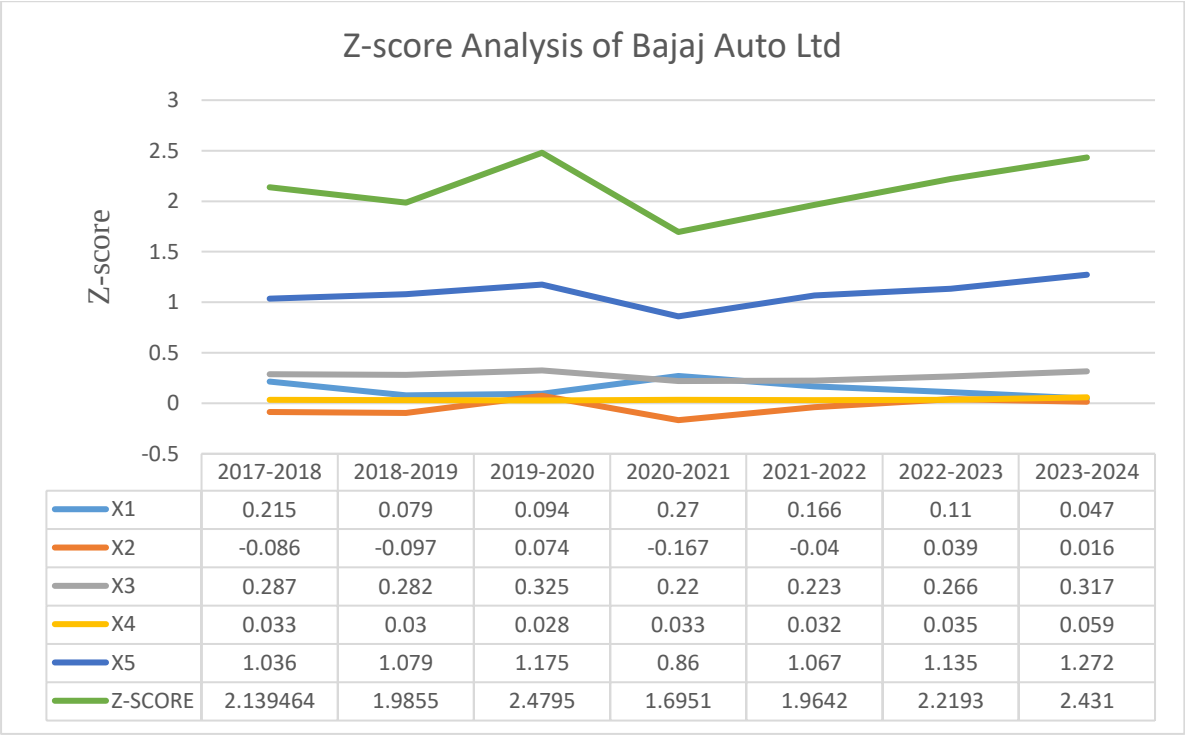


Table 4.4.3 represents Z score Analysis Bajaj Auto Ltd.'s Z-score analysis from 2017–2018 to 2023–2024 shows variations in the company's financial stability. Financial distress is measured by the Altman Z-score, which ranges from 1.6951 (2020–2021) to 2.4795 (2019–2020).

Strong financial health is indicated by the greatest Z-score (2.4795) in 2019–2020, which lowers the chance of bankruptcy. But in 2020–2021, there was a sharp decline to 1.6951, indicating financial weakness that might have been brought either by internal inefficiencies or external market factors. From 2021–2022, the Z-score improved steadily, reaching 2.431 in 2023–2024, indicating a strengthening of the financial position.
A Z-score below 1.81 denotes a significant risk of financial difficulty, whereas a number above 2.99 suggests a low risk. Bajaj Auto is in the "grey area"—financial prudence is required, but bankruptcy danger is not imminent—because its Z-scores are primarily between 1.7 and 2.4. Important financial ratios that positively impact the Z-score are X3 (Earnings before Interest and Taxes to Total Assets) and X5 (Revenue to Total Assets), which both exhibit consistent increase.

Bajaj Auto Ltd. has demonstrated resiliency overall, but it should keep an eye on its financial health to guarantee long-term viability.

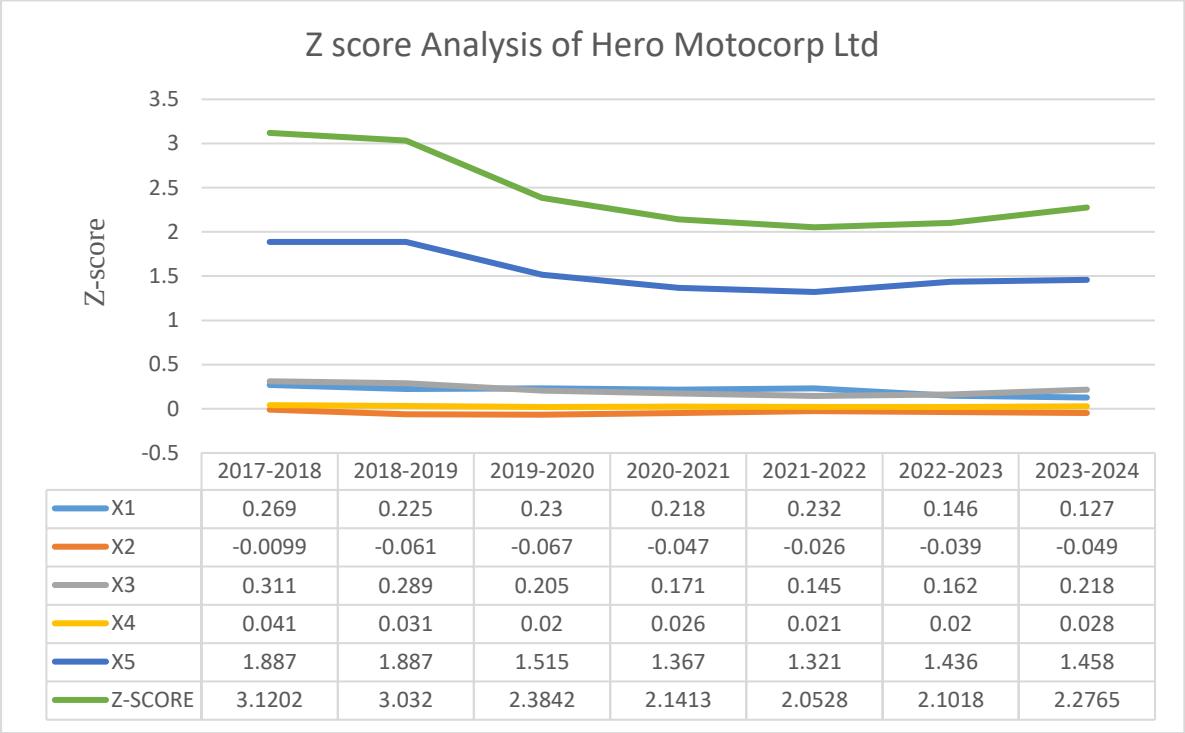
4.4.4 Z-Score Analysis of Hero MotoCorp Ltd

Table 4.11 Z-score Analysis

Year	X1	X2	X3	X4	X5	Z-SCORE	Zones
2017-2018	0.269	-0.0099	0.311	0.041	1.887	3.120	Safe Zone
2018-2019	0.225	-0.061	0.289	0.031	1.887	3.032	Safe Zone
2019-2020	0.23	-0.067	0.205	0.02	1.515	2.384	Grey Zone
2020-2021	0.218	-0.047	0.171	0.026	1.367	2.141	Grey Zone
2021-2022	0.232	-0.026	0.145	0.021	1.321	2.052	Grey Zone
2022-2023	0.146	-0.039	0.162	0.02	1.436	2.101	Grey Zone
2023-2024	0.127	-0.049	0.218	0.028	1.458	2.276	Grey Zone

(Source: Computed In Excel)

Chart 4.11 Z-score Analysis of Hero MotoCorp ltd



	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024
X1	0.269	0.225	0.23	0.218	0.232	0.146	0.127
X2	-0.0099	-0.061	-0.067	-0.047	-0.026	-0.039	-0.049
X3	0.311	0.289	0.205	0.171	0.145	0.162	0.218
X4	0.041	0.031	0.02	0.026	0.021	0.02	0.028
X5	1.887	1.887	1.515	1.367	1.321	1.436	1.458
Z-SCORE	3.1202	3.032	2.3842	2.1413	2.0528	2.1018	2.2765

Table 4.11 represents Z score Analysis of Hero MotoCorp Ltd Hero Motocorp Ltd.'s 2017–2024 Z-Score research sheds light on the company's financial stability and possible danger of financial trouble. Altman's Z-Score model, which evaluates the probability of bankruptcy by taking into account five important financial measures (X1 to X5), is used to compute the Z-Score. A company with a Z-Score above 2.99 is considered financially solid; one with a score between 1.81 and 2.99 is in the "grey zone," meaning there is a chance of some hardship; and one with a score below 1.81 indicates a high danger of bankruptcy.

Hero Motocorp has a solid financial position from 2017 to 2019, as evidenced by its Z-Scores of 3.12 and 3.03, respectively, which indicate low risk and financial stability. The Z-Score, however, sharply decreased to 2.38 beginning in 2019–2020, suggesting a shift toward financial instability. With Z-Scores of 2.14 and 2.05, respectively, in 2020–2021, this declining trend persisted, indicating rising financial risk. Reduced profitability (X1), shifting asset efficiency (X3), and dwindling financial leverage (X5) are some of the possible causes of the drop. These modifications imply that the business encountered

financial difficulties, which may have been brought on by external economic issues impacting the auto sector, operational inefficiencies, or market conditions.

The company's Z-Scores improved marginally to 2.10 and 2.28 in 2022–2023 and 2023–2024, indicating a recovery despite the ongoing deterioration. The corporation is still in the "grey zone," which suggests moderate financial risk, even though this shows some financial improvement. Better financial decision-making, cost control, or enhanced operational performance could all be connected to the recovery. To restore a Z-Score above 2.99, guarantee long-term financial stability, and lower the danger of distress, the company must continue to concentrate on increasing profitability, maximizing asset utilization, and fortifying financial leverage. Hero Motocorp can work toward regaining its financial stability if it can continue on its current track.

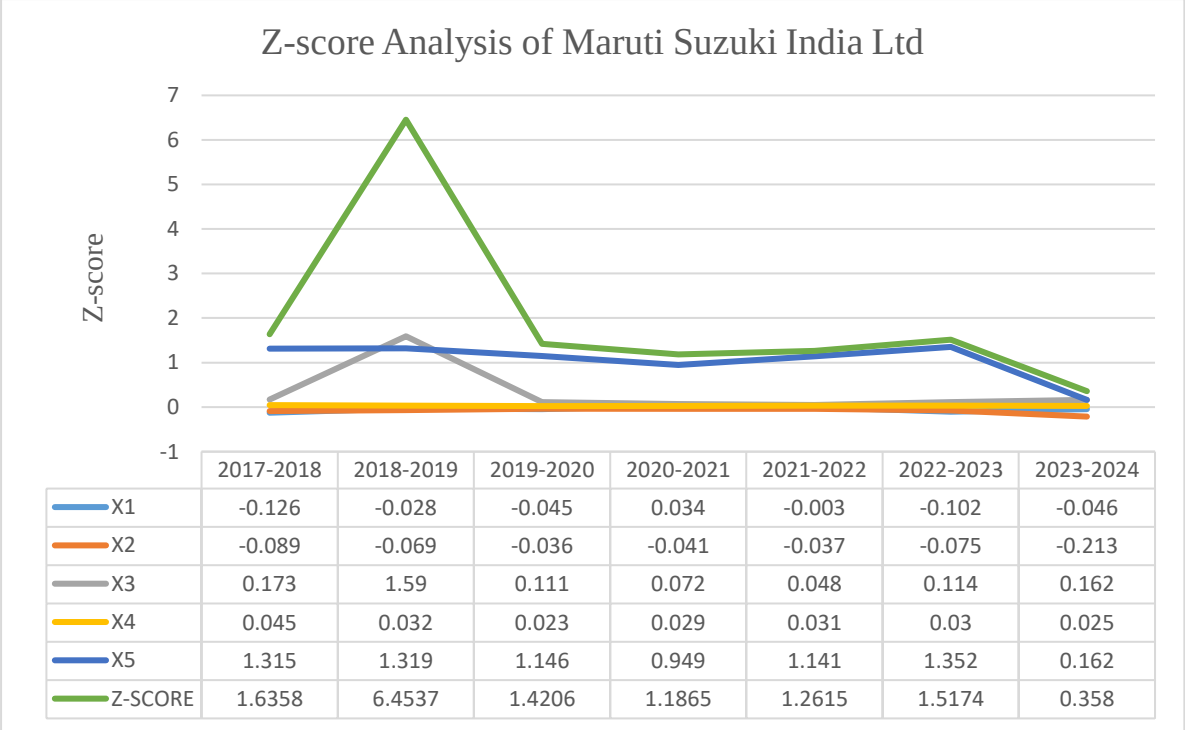
4.4.5 Z-Score Analysis of Maruti Suzuki India Ltd

Table 4.12 Z-score Analysis

Year	X1	X2	X3	X4	X5	Z-SCORE	Zones
2017-2018	-0.126	-0.089	0.173	0.045	1.315	1.635	Distress Zone
2018-2019	-0.028	-0.069	1.59	0.032	1.319	6.453	Safe Zone
2019-2020	-0.045	-0.036	0.111	0.023	1.146	1.420	Distress Zone
2020-2021	0.034	-0.041	0.072	0.029	0.949	1.186	Distress Zone
2021-2022	-0.003	-0.037	0.048	0.031	1.141	1.261	Distress Zone
2022-2023	-0.102	-0.075	0.114	0.03	1.352	1.517	Distress Zone
2023-2024	-0.046	-0.213	0.162	0.025	0.162	0.358	Distress Zone

(**Source: Computed in Excel)**

Chart 4.12 Z-score Analysis of Maruti Suzuki India ltd



	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024
X1	-0.126	-0.028	-0.045	0.034	-0.003	-0.102	-0.046
X2	-0.089	-0.069	-0.036	-0.041	-0.037	-0.075	-0.213
X3	0.173	1.59	0.111	0.072	0.048	0.114	0.162
X4	0.045	0.032	0.023	0.029	0.031	0.03	0.025
X5	1.315	1.319	1.146	0.949	1.141	1.352	0.162
Z-SCORE	1.6358	6.4537	1.4206	1.1865	1.2615	1.5174	0.358

Table 4.12 represents Z score Analysis of Maruti Suzuki India Ltd Maruti Suzuki India Ltd.'s Z-score analysis from 2017–2018 to 2023–2024 offers important information about the company's financial health. Altman's Z-score model is used to determine the Z-score, which aids in determining the probability of financial difficulty.

With a Z-score of 1.6358 in 2017–2018, there was a moderate danger of financial instability. The Z-score, on the other hand, rose sharply to 6.4537 in 2018–2019, indicating sound financial standing and a low chance of bankruptcy. The X3 figure (1.59), which shows the profits before interest and taxes (EBIT) to total assets ratio and indicates great profitability for that year, is mostly responsible for this spike.

The Z-score showed a decrease in financial health after this high, falling sharply to 1.4206 in 2019-2020. As financial strain increased, the Z-score dropped even more to 1.1865 in 2020–2021, continuing this downward trend. In 2021–2022, the company's Z-score was 1.2615, and in 2022–2023, it was 1.5174, but it was still in the financially risky zone.

During 2023–2024, the Z-score fell to 0.358, a dangerously low level that indicates a high likelihood of financial trouble or perhaps insolvency. This is the most worrying observation. The decline is mostly caused by a steep decline in X5 (Sales to Total Assets) and a very negative X2 (Retained Earnings to Total Assets), which indicate a declining financial situation and lower retained earnings.

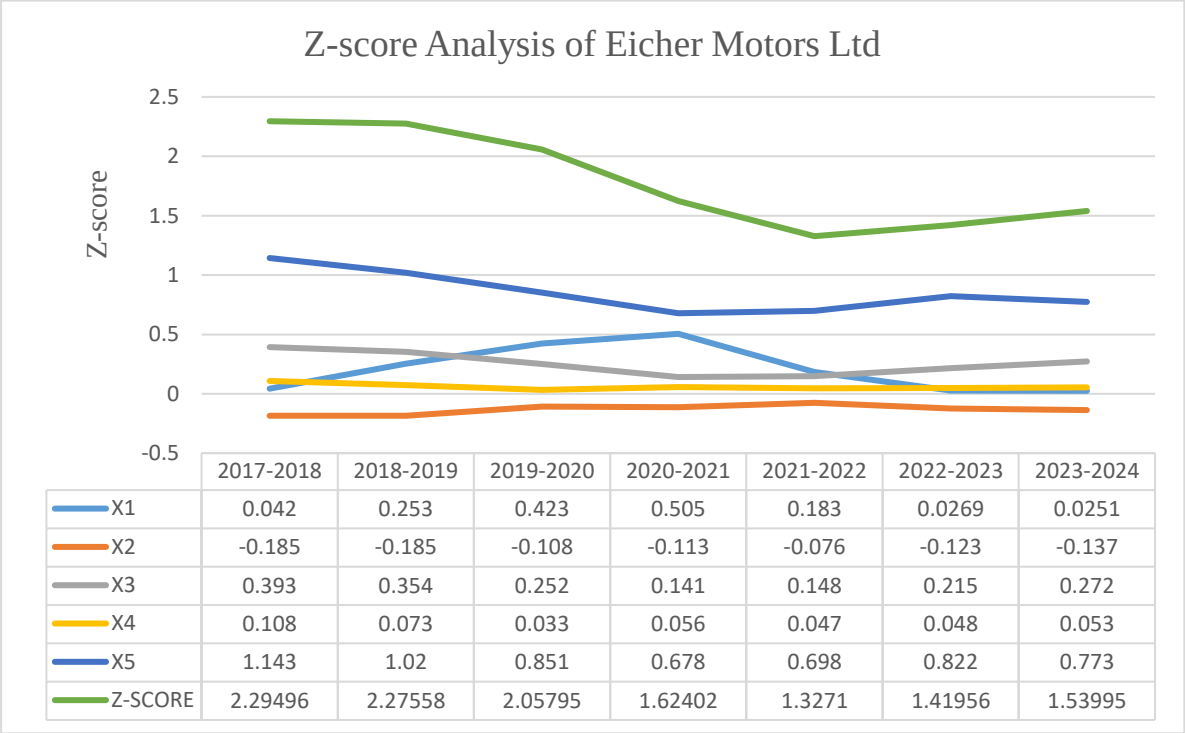
Maruti Suzuki India Ltd.'s overall financial situation has fluctuated greatly over the years. There was a steady fall once the extraordinarily good 2018–2019 performance was not maintained. In order to prevent serious financial problems in the future, significant financial restructuring is required, as indicated by the most recent Z-score of 0.358.

4.4.6 Z-Score Analysis of Eicher Motors Ltd:

Table 4.13 Z-score Analysis

Year	X1	X2	X3	X4	X5	Z-SCORE	Zones
2017-2018	0.042	-0.185	0.393	0.108	1.143	2.294	Grey Zone
2018-2019	0.253	-0.185	0.354	0.073	1.02	2.275	Grey Zone
2019-2020	0.423	-0.108	0.252	0.033	0.851	2.057	Grey Zone
2020-2021	0.505	-0.113	0.141	0.056	0.678	1.624	Distress Zone
2021-2022	0.183	-0.076	0.148	0.047	0.698	1.327	Distress Zone
2022-2023	0.0269	-0.123	0.215	0.048	0.822	1.419	Distress Zone
2023-2024	0.0251	-0.137	0.272	0.053	0.773	1.539	Distress Zone

Chart 4.13 Z-score Analysis of Eicher motors ltd



	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024
X1	0.042	0.253	0.423	0.505	0.183	0.0269	0.0251
X2	-0.185	-0.185	-0.108	-0.113	-0.076	-0.123	-0.137
X3	0.393	0.354	0.252	0.141	0.148	0.215	0.272
X4	0.108	0.073	0.033	0.056	0.047	0.048	0.053
X5	1.143	1.02	0.851	0.678	0.698	0.822	0.773
Z-SCORE	2.29496	2.27558	2.05795	1.62402	1.3271	1.41956	1.53995

Table 4.13 represents Z score Analysis of Eicher Motors Ltd Information about Eicher Motors Ltd.'s financial stability from 2017–2018 to 2023–2024 can be found in the Z-score study. The Altman Z-score, a metric used to forecast bankruptcy risk, exhibits a trend of fluctuation over time.

At 2.29496 in 2017–2018, the Z-score showed a comparatively steady financial situation. Although it fell a little to 2.27558 in 2018–2019, it was still within a safe range. A negative trend persisted, though, as the Z-score fell to 2.05795 in 2019–2020 and then to 1.62402 in 2020–2021. According to this, the company's financial situation was deteriorating at the time. In 2021–2022, the lowest Z-score of 1.3271 was recorded, indicating a higher probability of financial trouble.

But in the years that followed, the business showed signs of improvement, as seen by the Z-score rising to 1.41956 in 2022–2023 and 1.53995 in 2023–2024. This increasing tendency implies that the business has strengthened its financial situation.

According to an analysis of the individual financial ratios (X1 to X5), X3 (Earnings until Interest and Taxes to Total Assets) fluctuated, peaking at 0.393 in 2017–2018 and then

declining over the next several years until marginally improving to 0.272 in 2023–2024. The ratio of working capital to total assets, or X1, increased in the first few years and peaked in 2020–2021, but then sharply decreased. Throughout, X2 (Retained profits to Total Assets) stayed negative, suggesting either minimal retained profits or accumulating losses. While X5 (Sales to Total Assets) shown a declining tendency before marginally rebounding over the past two years, X4 (Market Value of Equity to Total Liabilities) was steady with only tiny fluctuations.

Overall, the business faced financial difficulties in 2020–2022, but the modest improvement in 2023–2024 points to a promising future. To preserve long-term financial stability, Eicher Motors Ltd. must concentrate on raising profitability, cutting liabilities, and improving asset utilization, as the Z-score is still near the distress zone.

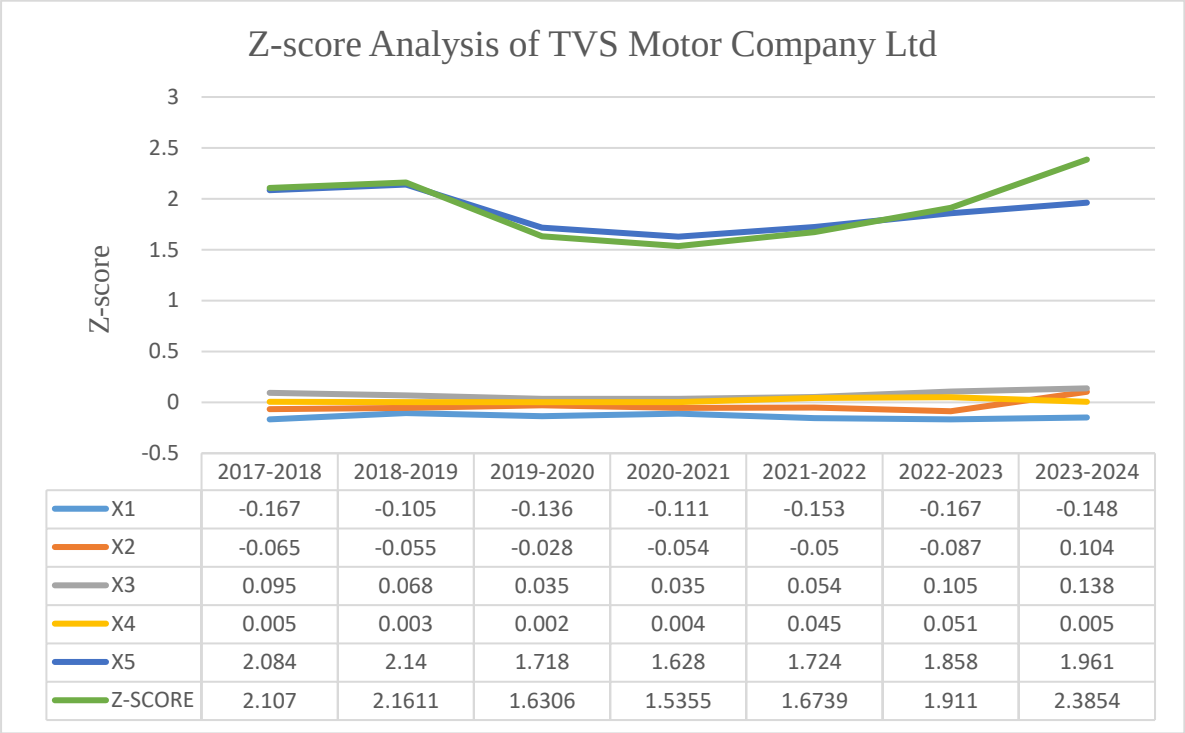
4.4.7 Z-Score Analysis of TVS Motor Company Ltd:

Table 4.14 Z-score Analysis

Year	X1	X2	X3	X4	X5	Z-SCORE	Zone
2017-2018	-0.167	-0.065	0.095	0.005	2.084	2.107	Grey Zone
2018-2019	-0.105	-0.055	0.068	0.003	2.14	2.161	Grey Zone
2019-2020	-0.136	-0.028	0.035	0.002	1.718	1.630	Distress Zone
2020-2021	-0.111	-0.054	0.035	0.004	1.628	1.535	Distress Zone
2021-2022	-0.153	-0.05	0.054	0.045	1.724	1.673	Distress Zone
2022-2023	-0.167	-0.087	0.105	0.051	1.858	1.911	Grey Zone
2023-2024	-0.148	0.104	0.138	0.005	1.961	2.385	Grey Zone

(Source: Computed in Excel)

Chart 4.14 Z-score Analysis of TVS motor Company ltd



	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024
X1	-0.167	-0.105	-0.136	-0.111	-0.153	-0.167	-0.148
X2	-0.065	-0.055	-0.028	-0.054	-0.05	-0.087	0.104
X3	0.095	0.068	0.035	0.035	0.054	0.105	0.138
X4	0.005	0.003	0.002	0.004	0.045	0.051	0.005
X5	2.084	2.14	1.718	1.628	1.724	1.858	1.961
Z-SCORE	2.107	2.1611	1.6306	1.5355	1.6739	1.911	2.3854

Table 4.14 represents Z score Analysis of TVS Motor Company Ltd a thorough understanding of TVS Motor Company Ltd.'s financial health and distress risk over time is offered by the Z-score analysis conducted from 2017 to 2024. The Z-score, which is determined by Altman's model, aids in determining the probability of financial difficulty; a score above 2.99 denotes financial stability, a score between 1.8 and 2.99 denotes a grey region, and a score below 1.8 indicates a significant risk of bankruptcy.

The Z-score of TVS Motor was 2.107 in 2017–2018 and 2.1611 in 2018–2019, indicating a comparatively stable financial situation. But the business suffered in the years that followed, with the Z-score dropping to 1.6306 in 2019–2020 and then to 1.5355 in 2020–2021. This decreasing trend indicates that the business was under financial strain at the time, either as a result of increased debt, decreased asset efficiency, or declining profitability. The corporation approaches distress when the Z-score reaches its lowest point, which denotes a higher level of financial risk.

But starting in 2021–2022, TVS Motor started to show indications of financial recovery. Its Z-score increased to 1.6739 in 2021–2022, then to 1.911 in 2022–2023, and then to 2.3854 in 2023–2024. This consistent upward trend indicates that the business made calculated efforts to strengthen its financial position, either by increasing profitability, improving asset utilization, or improving cost control.

The years 2019–2021 were a financial setback for TVS Motor overall, but the company bounced back and improved in the years that followed. According to the company's most recent Z-score of 2.3854 for 2023–2024, it is on the right track and heading toward a more secure financial position. But in order to totally eradicate the possibility of financial crisis, TVS Motor must keep enhancing its profitability, liquidity, and leverage management. If this upward trend persists, the business may enter the safe zone (Z-score above 2.99), guaranteeing growth and long-term financial stability.

4.8 Analysis of Single Factor (One – way) ANOVA in Z-score model – Based financial solvency of selected automobile companies of India

A statistical technique called One-way Analysis of Variance (ANOVA) is used to assess whether the means of several independent groups differ significantly from one another. A one-way ANOVA can be used to examine the average Z-scores of various companies over time in the context of financial solvency analysis of chosen Indian automakers using the Altman Z-Score model. This research assists in determining whether there are notable differences between these companies' financial health and insolvency risk. Researchers can understand the relative financial health of the main companies in the Indian auto industry by identifying differences in the Z-scores, which will help stakeholders and investors make wise choices.

4.8.1 Tata Motors Ltd

The financial performance of Tata Motors Ltd., a prominent Indian automaker, has fluctuated over time as a result of shifting market conditions and operational difficulties. Examining Tata Motors' Altman Z-Scores over a seven-year period using a one-way ANOVA test allows one to determine whether the company's financial stability has changed significantly over time. The yearly Z-scores are compared in this study to find trends in financial health improvement or decline.

ANOVA results help stakeholders assess the long-term stability and solvency of Tata Motors by revealing if these variations are statistically significant.

The following hypothesis was tested in this section using one-way ANOVA

H_0: There is no significant difference in the financial solvency (Z-Score) of Tata Motors Ltd. over the 7-year period.

H_1: There is a significant difference in the financial solvency (Z-Score) of Tata Motors Ltd. over the 7-year period.

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.61	6	0.11	0.65	0.69	2.38
Within Groups	5.46	35	0.15			
Total	**6.06**	**41**				

(Table 4.15 Single Factor ANOVA Test on Tata Motors Ltd)

Interpretation: With a P-value of 0.69, higher above the significance level (usually 0.05), the One-way ANOVA findings for Tata Motors Ltd. demonstrate no discernible change in the company's financial solvency (Z-Score) throughout the course of the seven-year period. Given that the computed F-value (0.65) is below the critical value F crit (2.38), the null hypothesis is accepted, indicating that Tata Motors' financial performance has stayed mostly stable over time.

4.8.2 Mahindra & Mahindra Ltd

A major Indian manufacturer of cars and tractors, Mahindra & Mahindra Ltd., has had fluctuating financial performance throughout the years as a result of shifting market conditions and operational difficulties. To ascertain whether Mahindra & Mahindra's financial stability has changed significantly over time, a one-way ANOVA test was used to analyze the company's Altman Z-Scores over a seven-year period. In order to find trends

in financial health, this study examines the annual Z-scores, emphasizing any increases or decreases. Through the determination of whether these variations are statistically significant, the ANOVA results help stakeholders assess Mahindra & Mahindra Ltd.'s long-term solvency and financial stability.

The following hypothesis was tested in this section using one-way ANOVA:

H_0: There is no significant difference in the financial solvency (Z-Score) of Mahindra & Mahindra Ltd. over the 7-year period.

H_1: There is a significant difference in the financial solvency (Z-Score) of Mahindra & Mahindra Ltd. over the 7-year period.

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.17	6	0.02	0.08	0.99	2.38
Within Groups	12.85	35	0.36			
Total	**13.03**	**41**				

(Table 4.16 Single Factor ANOVA Test on Mahindra & Mahindra Ltd)

Interpretation: There was no significant change in Mahindra & Mahindra Ltd.'s financial solvency (Z-Score) during the course of the seven-year period, according to the P-value of 0.99 from the one-way ANOVA results, which is significantly greater than the significance level (0.05). The null hypothesis is accepted since the F-value (0.08) is significantly less than the critical value F crit (2.38), indicating that Mahindra & Mahindra Ltd.'s financial performance has kept steady over this time.

4.8.3 Bajaj Auto Ltd:

The financial performance of Bajaj Auto Ltd., a well-known two- and three-wheeler manufacturer in India, has fluctuated throughout time as a result of shifting market dynamics and operational difficulties. Bajaj Auto's Altman Z-Scores during a seven-year

period were subjected to a one-way ANOVA test in order to ascertain whether the company's financial stability had altered significantly over time. To find patterns in financial health, this study examines the yearly Z-scores, emphasizing any increases or decreases. By determining whether these differences are statistically significant, the ANOVA results give stakeholders important information to determine the long-term solvency and financial stability of Bajaj Auto Ltd.

The following hypothesis was tested in this section using one-way ANOVA:

H_0: There is no significant difference in the financial solvency (Z-Score) of Bajaj Auto Ltd. over the 7-year period.

H_1: There is a significant difference in the financial solvency (Z-Score) of Bajaj Auto Ltd. over the 7-year period.

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.21	6	0.03	0.04	0.99	2.38
Within Groups	25.81	35	0.73			
Total	**26.11**	**41**				

(**Table 4.17 Single Factor ANOVA Test on Bajaj Auto Ltd)**

Interpretation: Bajaj Auto Ltd.'s one-way ANOVA findings reveal a P-value of 0.99, far over the significance level of 0.05, suggesting that there was no discernible change in the company's financial solvency (Z-Score) over the course of seven years. The null hypothesis is accepted since the F-value (0.04) is significantly less than the critical value F crit (2.38), indicating that Bajaj Auto Ltd.'s financial performance stayed largely consistent during this time.

4.8.4 Hero Motocorp Ltd:

The biggest two-wheeler manufacturer in India, Hero MotoCorp Ltd., has seen changes in its financial performance over time as a result of shifting market conditions and operational

difficulties. Hero MotoCorp's Altman Z-Scores during a seven-year period were analyzed using a one-way ANOVA test to see if the company's financial stability has altered significantly over time. In order to find patterns in financial health, this study looks at the annual Z-scores, emphasizing any increases or decreases. Stakeholders can evaluate Hero MotoCorp Ltd.'s long-term solvency and financial stability by using the ANOVA results to determine whether these variations are statistically significant.

The following hypothesis was tested in this section using one-way ANOVA

H_0: There is no significant difference in the financial solvency (Z-Score) of Hero MotoCorp Ltd. over the 7-year period.

H_1: There is a significant difference in the financial solvency (Z-Score) of Hero MotoCorp Ltd. over the 7-year period.

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.61	6	0.10	0.09	0.99	2.38
Within Groups	37.69	35	1.08			
Total	**38.30**	**41**				

(Table 4.18 Single Factor ANOVA Test on Hero Motocorp Ltd)

Interpretation: Hero MotoCorp Ltd.'s One-way ANOVA findings reveal a P-value of 0.99, significantly over the significance level of 0.05, suggesting that there was no discernible change in the company's financial solvency (Z-Score) over the course of the seven years. The null hypothesis is accepted since Hero MotoCorp Ltd.'s financial performance appears to have been comparatively steady during this time, as indicated by the F-value (0.09), which is significantly lower than the critical value F crit (2.38).

4.8.5 Maruti Suzuki India Ltd:

The biggest passenger car manufacturer in India, Maruti Suzuki India Ltd., has seen variations in its financial performance over time as a result of shifting market dynamics and operational difficulties. Maruti Suzuki's Altman Z-Scores during a seven-year period were analyzed using a one-way ANOVA test to see if the company's financial stability has altered significantly over time. The annual Z-scores are analyzed in this study to find patterns in financial health, emphasizing any increases or decreases. Stakeholders can evaluate Maruti Suzuki India Ltd.'s long-term solvency and financial stability by using the ANOVA results to determine whether these variations are statistically significant.

The following hypothesis was tested in this section using one-way ANOVA:

H_0: There is no significant difference in the financial solvency (Z-Score) of Maruti Suzuki India Ltd. over the 7-year period.

H_1: There is a significant difference in the financial solvency (Z-Score) of Maruti Suzuki India Ltd. over the 7-year period.

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	7.79	6	1.29	1.05	0.41	2.38
Within Groups	43.13	35	1.23			
Total	**50.91**	**41**				

(Table 4.19 Single Factor ANOVA Test on Maruti Suzuki India Ltd)

Interpretation: The P-value of 0.41, which is higher than the significance level (0.05) in the One-way ANOVA results for Maruti Suzuki India Ltd., indicates that there was no

discernible change in the financial solvency (Z-Score) throughout the course of the seven years. The null hypothesis is accepted since the F-value (1.05) is less than the critical value (F crit) (2.38), indicating that Maruti Suzuki India Ltd.'s financial performance stayed comparatively steady over this time.

4.8.6 Eicher Motors Ltd:

As market conditions and operational factors have changed over time, Eicher Motors Ltd., a prominent Indian company famous for its commercial vehicles and the legendary Royal Enfield motorcycles, has seen fluctuating financial performance. In order to ascertain whether Eicher Motors' financial stability has undergone substantial changes over time, the company's Altman Z-Scores during a seven-year period were analyzed using a one-way ANOVA test. This study highlights any improvements or falls in financial health by looking at the annual Z-scores. Through the determination of statistical significance, the ANOVA results assist stakeholders in evaluating the long-term solvency and financial stability of Eicher Motors Ltd.

The following hypothesis was tested in this section using one-way ANOVA:

H_0: There is no significant difference in the financial solvency (Z-Score) of Eicher Motors Ltd. over the 7-year period

H_1: There is a significant difference in the financial solvency (Z-Score) of Eicher Motors Ltd. over the 7-year period.

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.42	6	0.07	0.14	0.99	2.38
Within Groups	18.78	35	0.53			
Total	**19.20**	**41**				

(Table 4.20 Single Factor ANOVA Test on Eicher Motors Ltd)

Interpretation: Analysis of Variance (ANOVA) findings show that the P-value is 0.99, which is significantly higher than the normal significance threshold (usually 0.05), and the F-value is 0.14, which is significantly lower than the critical value (F crit) of 2.38. Since the P-value is higher than 0.05, it is not possible to rule out the null hypothesis. In terms of the chosen car businesses' financial solvency (Z-score) over the studied time, this indicates that there is no statistically significant difference. The low F-value further support the idea that the variations in the companies' financial solvency ratios are not statistically significant since it shows that the variance between groups is small in comparison to the variance within groups.

4.8.7 TVS Motor Company Ltd

The financial performance of TVS Motor Company Ltd., one of the top producers of two- and three-wheelers in India, has fluctuated throughout time as a result of shifting market conditions and operational difficulties. The Altman Z-Scores of TVS Motor Company were analyzed using a one-way ANOVA test during a seven-year period in order to ascertain whether the company's financial stability has altered significantly over time. This study highlights any improvements or falls in financial health by looking at the annual Z-scores. Through the determination of statistical significance, the ANOVA results assist stakeholders in evaluating the long-term solvency and financial stability of TVS Motor Company Ltd.

The following hypothesis was tested in this section using one-way ANOVA:

H_0: There is no significant difference in the financial solvency (Z-Score) of TVS Motor Company Ltd. over the 7-year period.

H_1: There is a significant difference in the financial solvency (Z-Score) of TVS Motor Company Ltd. over the 7-year period.

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.30	6	0.04	0.05	0.99	2.38
Within Groups	34.97	35	0.99			
Total	**35.27**	**41**				

(Table 4.21 Single Factor ANOVA Test on TVS Motor Company Ltd)

Interpretation: TVS Motor Company Ltd.'s one-way ANOVA results reveal a P-value of 0.99, which is significantly higher than the significance level (0.05). This suggests that there was no discernible change in the financial solvency (Z-Score) throughout the course of the seven-year period. Given that TVS Motor Company Ltd.'s financial performance

remained comparatively constant during this time, the null hypothesis is accepted because the F-value (0.05) is significantly lower than the critical value F crit (2.38).

CHAPTER – 5 SUMMARY, FINDINGS & CONCLUSION

Index

5.1 Introduction

A summary of the complete research endeavour is given in the Summary, Findings, and Suggestions section. A brief description of the research topic, goals, methodology, main conclusions, and findings is provided in the summary. Highlighting important discoveries, patterns, and connections found through data analysis, the results section ensures objectivity and evidence-based analysis. Finally, the proposals outline concrete actions for improvement, future research topics, and improved use of financial models, providing stakeholders with pertinent and useful advice. These suggestions should be applicable, feasible, and consistent with the setting of the study.

5.2 Summary of the Study

The entire research dissertation is divided into the following chapters:

1. Introduction to the Automobile sector and challenges faced by companies:

With 7.1% of GDP and 49% of manufacturing GDP, the Indian automobile industry plays a significant role in the nation's economy and employs about 37 million people. Passenger cars, commercial vehicles, two- and three-wheelers, and electric vehicles are among its segments; India is a major producer of two-wheelers. Global automakers like Hyundai and Honda entered India after liberalization in 1991, which increased competition and spurred innovation. Issues including high GST, volatile fuel prices, and semiconductor shortages are intended to be addressed by government programs like FAME, PLI, and AMP 2026. The industry is well up for future expansion, enhancing India's standing as a major global automotive hub, thanks to factors like growing urbanization, rising incomes, and an emphasis on green mobility.

2. Literature Review

The literature on evaluating the financial health of the Indian automobile sector is reviewed in this chapter, with particular attention to research on financial solvency, performance evaluation, and the influence of regulatory frameworks. In addition to emphasizing important discoveries regarding the financial performance of significant automakers, it also points out areas that need more investigation. To

assess the sector's long-term viability and financial stability, the evaluation offers a conceptual framework that facilitates the selection of relevant research approaches and analytical models, such as the Altman Z-Score model.

3. Research Methodology

This study uses solvency tests, financial component analysis, and Altman Z-Score analysis to assess the financial health of a subset of Indian automakers during a seven-year period. The annual financial performance is compared using a one-way ANOVA test to determine whether there is a statistically significant change over time. Key aspects influencing the companies' performance are highlighted in the findings, which offer significant insights into their financial stability and solvency trends. The findings provide a basis for future study and policy recommendations and aid in understanding the long-term financial viability of the Indian auto industry.

4. Data Analysis & Data Interpretation

Using financial component analysis, Altman Z-Score analysis, and solvency tests, the data analysis and interpretation chapter looks at the financial performance of a few Indian automakers during a seven-year period. Analysing the data yields insights into the financial soundness of the companies by evaluating trends in important financial ratios and solvency indicators. To compare the annual financial performance and identify any significant fluctuations during the study period, a one-way ANOVA test is also performed. The data' analysis reveals important trends that facilitate a deeper comprehension of the variables affecting financial health and help formulate pertinent conclusions and suggestions.

5. Summary, Findings and Conclusions

This Chapter summarizes the study's key findings, emphasizing how the financial performance of particular automakers changed according on the evaluation criteria that were adopted. It highlights the observed advantages and disadvantages, offering information about what needs to be improved. In order to improve the financial stability, operational effectiveness, and competitiveness of the Indian automotive industry, the chapter ends with practical proposals and policy ideas.

5.3 Findings Based on Z-score model:

Objective: To use the Altman Z-score model to assess the financial solvency of a chosen group of automakers.

5.4 Findings of Financial Components of Z score:

5.4.1 Tata Motors Ltd

The results show that between 2018 and 2024, Tata Motors Ltd.'s financial performance fluctuated noticeably. Even though the company's assets and net sales increased, indicating continued investments and higher market demand after the epidemic, questions about financial risk and solvency still exist. While total liabilities climbed in tandem with rising assets, showing a strong dependency on debt, current liabilities increased dramatically, and indicating higher short-term financial constraints. Retained earnings remained negative, falling precipitously to ₹-7,673.46 Cr in 2023–24, indicating difficulties in profit retention, despite EBIT improving to ₹4,175.45 Cr in 2023–24, demonstrating operational efficiency. To maintain long-term financial stability, Tata Motors must concentrate on cutting liabilities, lowering interest rates, and increasing retained earnings, even in the face of gains in stock value and operational performance.

5.4.2 Mahindra & Mahindra Ltd

According to the results, Mahindra & Mahindra Ltd. showed consistent growth in net sales, assets, and EBIT between 2018 and 2024, a sign of increased operational effectiveness and sound financial standing. With an increase in current assets from ₹16,474.47 million to ₹35,105.8 million, the company's short-term liquidity improved. EBIT and net sales both rose sharply, indicating improved profitability and efficient use of resources. Additionally, the market value of equities increased, indicating an increase in investor confidence. Long-term financial sustainability was questioned, though, since negative retained earnings continued to decline, falling to ₹-8,880.83 million in 2023–2024. Mahindra & Mahindra must concentrate on boosting retained earnings to guarantee long-term stability and solidify its position in the automotive industry, even in the face of strong growth and increased financial leverage.

5.4.3 Bajaj Auto Ltd

According to the results, Bajaj Auto Ltd. showed consistent growth in sales, assets, and EBIT between 2018 and 2024, indicating both financial stability and

operational effectiveness. While current liabilities steadily rose from ₹4,111.29 million to ₹8,725.7 million, showing higher short-term obligations, current assets averaged ₹10,141.19 million throughout the time, with swings indicating changes in short-term asset management. The substantial growth in total assets and liabilities suggests ongoing investments and expansion, but the increase in liabilities emphasizes the necessity of prudent debt management. Revenue grew from ₹24,700.3 million in 2017–18 to ₹43,578.87 million in 2023–24 because to product diversification and effective market tactics. EBIT showed high profitability as it increased progressively from ₹6,847.02 million to ₹10,874.62 million. However, maintaining net profitability may be difficult given the steep rise in interest costs, which are expected to reach ₹53.5 million in 2023–2024. Bajaj Auto should concentrate on controlling interest expenses and managing its growing liabilities in order to guarantee long-term financial stability.

5.4.4 Hero Moto Corp Ltd

According to the findings, Hero MotoCorp Ltd. increased its total assets from ₹16,738.8 crore to ₹25,571.55 crore and its net revenues from ₹24,700.3 crore to ₹43,578.87 crore, demonstrating consistent revenue growth and asset expansion from 2018 to 2024. Since current assets averaged ₹9,189.15 crore, liquidity stayed steady and short-term liabilities were well covered. The reduced interest expenses show that the corporation kept a limited reliance on debt. Internal financial ability may be weakened, nevertheless, as retained earnings were negative during the period, either as a result of larger dividend distributions or compounded losses. Although it fluctuated, reflecting shifts in investor opinion, market capitalization improved by 2023–2024. Despite fluctuations brought on by industry difficulties, EBIT recovered to ₹5,599.49 crore in 2023–2024, indicating increased operational efficiency. Hero MotoCorp has general financial stability, but long-term financial health will depend on resolving negative retained earnings and enhancing internal financial management.

5.4.5 Maruti Suzuki India Ltd

According to the data, Maruti Suzuki India Ltd. saw consistent growth in both net sales and total assets between 2018 and 2024. During that time, net sales

increased from ₹78,104.8 crore to ₹1,34,937.8 crore, while total assets increased from ₹59,370.1 crore in 2017–18 to ₹1, 10,284.8 crore in 2023–24. Despite rising current obligations and shifting current assets, liquidity stayed constant. Due to supply chain disruptions and market conditions, EBIT fluctuated significantly, peaking at ₹1, 00,077 crore in 2018–19, falling precipitously in 2021–22, and then rising to ₹17,872.9 crore in 2023–24. Interest costs stayed low, suggesting less need for borrowed money. But negative retained earnings continued to exist, rising from ₹-5,326.2 crore in 2017–18 to ₹-23,593.8 crore in 2023–24, indicating worries about internal financing and profitability. Growing liabilities underscore the necessity of efficient cost control and a balanced strategy to expansion in order to guarantee long-term financial stability, even as rising stock values show investor confidence.

5.4.6 Eicher Motors Ltd

According to the data, Eicher Motors Ltd. had consistent revenue recovery and asset growth between 2018 and 2024. Net sales increased from ₹8,913.43 crores to ₹15,827.33 crores during that time, while total assets increased from ₹7,794.67 crores in 2017–18 to ₹20,472.81 crores in 2023–24. The company recovered well despite brief drops in sales in 2019–20 and 2020–21, which were fuelled by a rise in demand for Royal Enfield motorcycles. EBIT varied but recovered significantly in 2023–2024, reaching ₹5,579.06 crores, which reflected better cost control and operating efficiency. Retained earnings, on the other hand, continued to decline, going from -₹14,449.59 crores in 2017–18 to -₹2,806.68 crores in 2023–24, suggesting that gains were probably reinvested or paid out as dividends. Interest costs stayed reasonable despite liabilities rising in tandem with expansion activity, demonstrating efficient debt management. Eicher Motors must continue its global expansion and product innovation while concentrating on preserving profitability, controlling liabilities, and bolstering retained earnings in order to secure long-term success.

5.4.7 TVS Motor Company Ltd

According to the results, TVS Motor Company Ltd. demonstrated robust growth in net sales, total assets, and EBIT between 2018 and 2024. During that time,

net sales increased from ₹14,966.78 crore in 2017–18 to ₹31,502.49 crore in 2023–24, while total assets increased from ₹7,179.47 crore to ₹16,062.24 crore. As seen by the strong increase in EBIT to ₹2,228.84 crore in 2023–2024, the company's operational efficiency significantly improved. Notwithstanding this development, overall liabilities and interest expenses rose as well, suggesting a stronger dependence on outside funding for growth.As a result of increased investor confidence, the equity value increased steadily from ₹308.9 crore in 2017–18 to ₹570.3 crore in 2023–24. Retained earnings showed a significant improvement, turning positive at ₹1,683.19 crore in 2023–2024, indicating increased financial stability and profitability. In order to ensure long-term financial sustainability and increase shareholder value, it will be crucial to manage obligations, optimize interest expenses, and sustain sales growth.

5.5 Findings of Z-score Analysis or Solvency Test

5.5.1 Tata Motors Ltd:

According to the Altman Z-Score model, the results show that Tata Motors Ltd. continuously stayed in the trouble Zone from 2017–18 to 2023–24, indicating a high likelihood of financial trouble. Throughout the decade, the Z-Score values stayed below the 1.81 threshold; in 2023–2024, they further declined to -0.086, indicating deteriorating financial stability. Weak liquidity and low profitability were indicated by the negative or marginal values of important components like X1 (Working Capital/Total Assets) and X3 (EBIT/Total Assets). The overall financial situation declined in 2023–2024, despite modest gains in X3 and X4, indicating the need for better operational effectiveness and more robust financial management to increase long-term solvency.

5.5.2 Mahindra & Mahindra Ltd:

According to the Altman Z-Score model, Mahindra & Mahindra Ltd. continuously stayed in the trouble Zone (Z-Score < 1.81) from 2017–18 to 2023–24, indicating a high likelihood of financial trouble during that time. From 1.371 in 2017–18 to 1.719 in 2023–24, the Z-Score gradually improved, but it was still below the safe threshold. Moderate liquidity and operational efficiency were reflected in the positive but erratic movements of key metrics like X1 (Working Capital/Total Assets) and X3 (EBIT/Total Assets). The company needs to improve its financial performance and strengthen its solvency in order

to move to a safer financial position, even though the increasing X5 (Sales/Total Assets) over time shows improved asset utilization.

5.5.3 Bajaj Auto Ltd:

According to the Altman Z-Score model, Bajaj Auto Ltd. mainly stayed in the Grey Zone (Z-Score between 1.81 and 2.99) from 2017–18 to 2023–24, indicating a moderate risk of financial hardship. The Z-Score showed financial oscillations, ranging from 1.695 in 2020–21 (in the Distress Zone) to a high of 2.479 in 2019–20. As a result of shifts in liquidity and operational performance, key metrics like X1 (Working Capital/Total Assets) and X3 (EBIT/Total Assets) shown some unpredictability. After a temporary decline in 2020–21, the company moved back into the Grey Zone; nevertheless, continuous gains in asset utilization and profitability are required to move the company back into the Safe Zone and guarantee long-term financial stability.

5.5.4 Hero MotoCorp Ltd:

The Altman Z-Score model's results for Hero MotoCorp Ltd. from 2017–18 to 2023–24 show that the business was in the Safe Zone in 2017–18 (3.120) and 2018–19 (3.032), indicating high financial stability during this time. However, the company entered the Grey Zone (Z-Score between 1.81 and 2.99) from 2019–20 onward, indicating a moderate level of financial risk. In 2021–2022, the Z-Score dropped steadily to a low of 2.052, indicating declining asset efficiency and profitability. Despite a little rebound in 2023–2024 (2.276), Hero MotoCorp stayed in the Grey Zone, suggesting that in order to reclaim a spot in the Safe Zone and ensure long-term financial stability, operational effectiveness and profitability must be increased.

5.5.5 Maruti Suzuki India Ltd:

Using the Altman Z-Score model, the results for Maruti Suzuki India Ltd. from 2017–18 to 2023–24 indicate that, with the exception of 2018–19, when it momentarily moved into the Safe Zone with a high Z-Score of 6.453, indicating strong financial health, the company spent the majority of the period in the Distress Zone. But the Z-Score drastically dropped in the years that followed, putting the business back in the Distress Zone. The Z-Score of 0.358, which indicates extreme financial difficulty and a higher probability of insolvency, was at its lowest in 2023–2024. The steady deterioration of financial health

indicates that in order to maintain stability over the long run, better profitability, asset management, and liquidity are required.

5.5.6 Eicher Motors Ltd:

The Altman Z-Score model's results for Eicher Motors Ltd. from 2017–18 to 2023–24 show that the business was mostly in the Grey Zone from 2017–18 to 2019–20, indicating modest financial stability. But starting in 2020–2021, the Z-Score continuously positioned the business in the Distress Zone, indicating heightened financial risk and possible vulnerability. A little improvement to 1.539 in 2023–2024 followed the lowest Z-Score of 1.327 in 2021–2022, suggesting some recovery but still falling short of a secure position. Concerns about diminishing profitability, rising liabilities, and decreased operational efficiency are brought to light by the move to the Distress Zone, which calls for better financial management to guarantee long-term stability.

5.5.7 TVS Motor Company Ltd

The Altman Z-Score model's results for TVS Motor Company Ltd. from 2017–18 to 2023–24 show erratic financial performance. From 2017–18 to 2018–19, the business stayed in the Grey Zone, indicating a modest level of financial stability. However, with Z-Scores ranging from 1.535 to 1.673, TVS Motor entered the Distress Zone between 2019–20 and 2021–22, indicating increased financial risk and susceptibility. With a Z-Score of 2.385 in 2023–24, indicating moderate improvement, the corporation returned to the Grey Zone after demonstrating improvement in 2022–23 and 2023–24. Even if the business seems to be on the mend, it still has to improve its profitability and financial structure to guarantee stability in the long run.

5.6 Finding on the basis of Single factor ANOVA

Sr No.	*Company*	*P - Value*	*H0 (Accepted/Rejected)*
1	Tata motors Ltd	0.688856	Accepted
2	Mahindra & Mahindra Ltd	0.997829	Accepted
3	Bajaj Auto Ltd	0.999535	Accepted
4	Hero Moto Corp Ltd	0.996527	Accepted
5	Maruti Suzuki India Ltd	0.407965	Accepted

6	Eicher Motors Ltd	0.991348	Accepted
7	TVS Motor Company Ltd	0.999434	Accepted

(Table 5.1 Overall AONVA Results)

The table shows the results of hypothesis testing for several automakers based on their P-values. Since every P-value is greater than the conventional significance level of 0.05, the null hypothesis (H0) is accepted in every case. This suggests that there is no statistically significant evidence to reject H_o since the measured parameter—which could be related to market efficiency, financial performance, or any other characteristic under study—does not show a significant departure from the assumed norm. In essence, the data indicates that there isn't a strong enough statistical case to conclude that the component being studied varies significantly. Throughout these organizations.

5.7 Suggestions on the basis of Z score model components :

Tata Motors Ltd:

- Focus on improving liquidity by optimizing working capital management.
- Increase profitability by enhancing operational efficiency and cost control.
- Explore debt restructuring to reduce financial distress and improve solvency.

Mahindra & Mahindra Ltd:

- Strengthen financial performance through strategic cost reductions and revenue growth.
- Enhance asset utilization to improve overall efficiency and profitability.
- Reduce financial leverage to move towards a safer financial position.

Bajaj Auto Ltd:

- Focus on stabilizing liquidity and improving operational performance to reduce financial oscillations.
- Diversify revenue streams to mitigate risks associated with market fluctuations.
- Strengthen cost controls to enhance profitability and ensure financial stability.

Hero Moto Corp Ltd:

- Increase profitability through innovation and higher-margin products.
- Improve asset efficiency by optimizing production and inventory management.
- Strengthen financial reserves to move back into the Safe Zone.

Maruti Suzuki India Ltd:

- Address declining financial health by improving cost management and operational efficiency.
- Strengthen liquidity through better working capital management.
- Explore market expansion opportunities to boost revenue and profitability.

Eicher Motors Ltd:

- Focus on improving profitability by optimizing production costs and increasing sales.
- Reduce liabilities to improve financial stability and solvency.
- Enhance operational efficiency to regain a stronger financial position.

TVS Motor Company Ltd:

- Work on profitability improvement strategies to maintain positive momentum.
- Strengthen financial structure by reducing financial risk and increasing reserves.
- Enhance market competitiveness through product innovation and expansion.

5.8 Conclusion

The Altman Z-Score model's financial solvency analysis of a few chosen Indian automakers offers important information about their stability and financial health from 2017–18 to 2023–24. A higher risk of insolvency was highlighted by the findings, which show that while some businesses, like Hero Moto Corp Ltd. and Bajaj Auto Ltd., maintained moderate financial stability within the Grey Zone, others, like Tata Motors Ltd., Mahindra & Mahindra Ltd., and Eicher Motors Ltd., experienced ongoing financial distress. Maruti Suzuki India Ltd.'s financial health declined precipitously, causing company to move from the Safe Zone to the Distress Zone. This suggests that better asset management and liquidity are required. TVS Motor Company Ltd. has shown signs of revival in recent years, notwithstanding fluctuations. Overall, the study emphasizes how crucial strong financial strategies, operational efficacy, and good working capital management are to enhancing solvency. Businesses are better positioned to transition to financial stability and resilience if they prioritize asset utilization, cost reduction, and profitability development. While industry developments and external market conditions have an impact on financial performance, the study highlights that proactive financial management and smart decision-making are essential for maintaining long-term financial health in the cut throat auto business.

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