

Prediction Of Financial Distress of Selected Service Sector Companies with Special Reference to Travel, Tourism, And Hospitality Industry: An Empirical Study Using Z-Score And X-Score Models

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ABSTRACT

The travel, tourism, and hospitality industries play a pivotal role in global economic development, job creation, and GDP growth. This study investigates financial distress prediction in this industry, focusing on the comparative analysis of X-score and Z-score models. The analysis uses data from 2018-19 to 2022-23, revealing insights into the financial health of selected companies. Findings suggest that most companies maintain safe zone Z-scores, the X-score model highlights variations in financial health, identifying companies at risk of distress. Companies like Yatra Online Ltd, Asian Hotels (North) Ltd, and Blue Coast Hotels Ltd show financial distress in both models, indicating vulnerabilities. The study emphasizes the importance of continuous monitoring and adaptation to mitigate emerging risks and capitalize on opportunities. Predictive analytics, integrating quantitative and qualitative approaches, offer a comprehensive understanding of industry dynamics. Key factors impacting financial risks, such as geopolitical influences, economic factors, and consumer behaviour, should be considered in strategic decision-making. To navigate financial distress risks, businesses should prioritize operational efficiency, diversification, and stress testing. Collaboration among stakeholders is vital for addressing common challenges, fostering innovation, and developing resilient financial planning and forecasting models.

Keywords: Financial Health, Bankruptcy, Financial Distress, Z-score, X-score, Travel, Tourism, and Hospitality Industries, Service Industry.



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1. Introduction:

The Travel, Tourism, and Hospitality Industry, plays a crucial role in global economic development. However, companies operating in this sector are susceptible to various financial challenges, including financial distress. Predicting financial distress in advance is essential for effective risk management and strategic decision-making.

1.1 Background of the study

The Travel, Tourism, and Hospitality Industry is a dynamic and multifaceted sector that encompasses a wide range of services and experiences, from

transportation and accommodation to entertainment and dining (Dileep, M. R. 2019). The Travel, Tourism, and Hospitality Industry, plays a crucial role in global economic development by contributing significantly to employment, and GDP growth. The Travel, Tourism, and Hospitality Industries have a role in GDP growth all over the world was 9.5 percent till March 2023 which is expected to grow to 15.5 percent by 2033 (Report: WTTC; Oxford Economics 2023), and in employment, before COVID-19, these industries created 10.30% of jobs and US \$9.6 trillion of the global GDP (<https://www.solimarinternational.com>). Till 2022, there were 22 million jobs created in the Travel, Tourism, and

Hospitality Industries (The Latest Hospitality Statistics Updated March 2024). There are so many areas related to these industries like transportation, accommodation, hospitality services, tourism infrastructures, technological innovation, and challenges and opportunities. There are mainly four main types of transportation air traveling Airlines connect destinations worldwide, facilitating both domestic and international travel. Major carriers compete to offer convenient routes, competitive fares, and superior service, train travel provides an efficient and scenic mode of transportation, particularly in regions with well-developed rail networks such as Europe and parts of Asia, by road traveling cars, buses, and coaches remain popular choices for short-distance travel, offering flexibility and convenience, maritime travel cruises and ferries offer leisurely journeys across oceans, rivers, and seas, allowing passengers to explore multiple destinations in a single trip (World Tourism Organization (Madrid) et al. 1997). For accommodation like hotels, hostels vacations. Ranging from budget-friendly motels to luxury resorts, hotels cater to diverse preferences and budgets. They provide amenities such as lodging, dining, recreation, and business facilities, Platforms like Airbnb have revolutionized the hospitality landscape by enabling homeowners to rent out their properties to travellers seeking unique and personalized accommodations, and targeting budget-conscious travellers, hostels offer shared dormitory-style rooms, communal spaces, and social activities, fostering a sense of community among guests. In the hospitality area, there are so many resources for tourists like cafes and restaurants, tour operators, guides, and entertainment venues (Shanker, D. 2008). Culinary experiences are an integral part of travel, with tourists eager to sample local cuisine and international flavours. Restaurants, cafes, food trucks, and street vendors cater to diverse tastes and dietary preferences, Theatres, cinemas, theme parks, museums, and cultural attractions provide recreational opportunities for travellers seeking entertainment and enrichment, and these companies organize guided tours, excursions, and activities, helping tourists explore destinations efficiently while providing insights into local culture, history, and landmarks (Stone, M. J., et al. 2018). For infrastructure related to tourism like travel agencies, destination management organizations, and tourism boards. Agents assist travellers in planning and booking trips, offering expertise, itinerary customization, and logistical support, destination management organizations promote tourism development, marketing, and sustainability initiatives at the local, regional, and national levels, and government agencies or private organizations oversee tourism policies, regulations, and promotional campaigns to attract visitors and stimulate economic growth (Vasilenko, N., et al. 2019, Sep). For innovation and technology like virtual reality, online booking platforms, and sustainable tourism practices. Websites and mobile apps streamline the travel planning process, allowing users to compare prices, read reviews, and make reservations for flights, accommodations, and

activities, virtual reality and augmented reality, are immersive technologies that enhance the travel experience by providing virtual tours, interactive maps, and simulated attractions, enabling travellers to preview destinations before arrival, and growing awareness of environmental conservation and social responsibility has led to the adoption of eco-friendly initiatives, such as carbon offset programs, wildlife conservation projects, and community-based tourism ventures (Pencarelli, T. 2020). In a global sense, there are so many challenges and opportunities like global events under events come natural disasters, political unrest, pandemics, and economic downturns that can disrupt travel patterns, leading to fluctuations in demand and revenue for industry stakeholders. Rapid urbanization, rising disposable incomes, and expanding middle-class populations in countries like China, India, and Brazil present lucrative opportunities for tourism growth and investment in emerging markets. Advances in artificial intelligence, big data analytics, and biometrics are transforming the way travelers research, book, and experience their journeys, driving innovation and competition in the industry through technological disruption (Buhalis, D., et al. 2019).

Alongside international tourism, domestic tourism is vital in India's tourism sector. With a vast population and diverse cultural landscape, domestic travel within India contributes substantially to the industry's growth. The travel, tourism, and hospitality industry in India is a vibrant and rapidly growing sector that contributes significantly to the country's economy, cultural exchange, and employment generation. India's diverse geography, rich cultural heritage, historical landmarks, and culinary delights make it a prime destination for travellers from around the world (Rao, N., & Suresh, K. T. 2013). There are so many contributions of these sectors in India like economic growth the travel, tourism, and hospitality industry in India is a significant contributor to the country's GDP, which was expected to be 201.37 US billion dollars by 2023 ([ibef.org](#)), and tourism is one of the largest sources of foreign exchange earnings for India. The influx of foreign tourists brings in revenue through foreign currency exchange, and expenditure on accommodation, transportation, shopping, and other services foreign exchange earnings were expected to be 16.93 US billion dollars by 2022 (India tourism statistics at a glance 2023, page 8), and employment generation 40.09 million till 2022 ([India 2023 annual research key highlights, page 1](#)). It encompasses various segments such as transportation, accommodation, food and beverage services, tour operators, and travel agencies million. India offers a wide range of accommodation options, including luxury hotels, budget hotels, resorts, guesthouses, homestays, and heritage properties. Major hotel chains have a significant presence in India's key tourist destinations (Shah, C., & Trupp, A. 2021). India's transportation network consists of airlines, railways, roadways, and waterways. Domestic airlines connect major cities, while the Indian Railways network is one of the largest in the world, offering both luxury and budget travel

options. Also, state-owned and private bus services cater to inter-city and intra-city travel. Tour operators and travel agencies play a crucial role in organizing and facilitating travel experiences for both domestic and international tourists. They offer a variety of packages catering to different interests, including cultural tours, adventure tourism, wildlife safaris, and religious pilgrimages. India's rich cultural and historical heritage attracts millions of tourists every year. Iconic landmarks such as the Taj Mahal, Jaipur's palaces, Kerala's backwaters, and the ancient temples of Varanasi are popular tourist attractions. India's diverse landscape offers ample opportunities for adventure tourism, including trekking in the Himalayas, river rafting in the Ganges, paragliding in Himachal Pradesh, and wildlife safaris in national parks like Ranthambore and Jim Corbett. India has emerged as a leading destination for medical tourism, with state-of-the-art medical facilities, highly skilled doctors, and cost-effective treatments attracting patients from around the world. Despite significant progress, infrastructure development remains a challenge in certain regions, affecting accessibility and the overall tourist experience. Investments in infrastructure projects such as roads, airports, and hospitality facilities are crucial for sustainable growth. Streamlining regulatory processes and addressing bureaucratic hurdles can enhance the ease of doing business in the tourism sector. Simplified visa procedures and regulatory reforms can encourage more foreign tourists to visit India. Effective promotion and marketing initiatives are essential to showcase India's diverse tourism offerings on the global stage. Digital marketing, social media campaigns, and participation in international travel fairs can help in attracting more tourists. Sustainable tourism practices, including conservation efforts, waste management, and community involvement, are increasingly important for preserving India's natural and cultural heritage. Emphasizing responsible tourism can ensure the long-term viability of the industry. Enhancing the skills of hospitality professionals, tour guides, and service providers is critical for delivering high-quality tourism experiences. Government initiatives and private sector collaborations can support skill development programs tailored to the industry's needs.

Financial distress in the travel, tourism, and hospitality industry can stem from various factors, especially considering its susceptibility to external shocks like economic downturns, geopolitical events, natural disasters, and now, pandemics. Events like the COVID-19 pandemic have severely impacted the travel and hospitality sectors, leading to widespread cancellations, travel restrictions, and reduced demand for services. This has resulted in revenue loss, cash flow problems, and increased debt burdens for many companies (Crespí-Cladera, R., et al. 2021). During economic downturns, discretionary spending on travel and tourism tends to decline as individuals and businesses cut back on travel expenses. This reduces the demand for services in the industry, leading to decreased revenues for businesses (Senbeto, D. L., & Hon, A. H. 2020). Natural disasters

such as hurricanes, earthquakes, and wildfires can disrupt travel and tourism activities in affected regions, leading to temporary closures of businesses and decreased tourism revenues. Additionally, concerns about climate change may lead to shifts in consumer behaviour, affecting travel patterns and destinations (Kim, H., & Marcouiller, D. W. 2015). Geopolitical instability, conflicts, and terrorism can deter tourists from visiting certain destinations, leading to decreased revenues for businesses operating in those regions. Political unrest and travel advisories can also disrupt travel plans and impact the industry's profitability (Steiner, C. 2007). Technological advancements and shifts in consumer preferences have disrupted traditional business models in the travel and hospitality industry. Companies that fail to adapt to these changes may face financial difficulties as they lose market share to more innovative competitors (Buhalis, D., et al. 2019). Several businesses in the travel and hospitality sector have high fixed costs, including rent, utilities, and labour expenses. Seasonality can exacerbate financial distress, as companies may struggle to cover these costs during periods of low demand (Pavlatos, O., & Paggios, I. 2007). The few companies in the industry may have high levels of debt, either from financing expansions or acquisitions. High debt levels can increase financial risk, especially during periods of low revenue or economic uncertainty (Hitt, M., et al. 1998). Changes in regulations, such as visa requirements, safety standards, or taxation policies, can increase operating costs for businesses in the travel and hospitality sector. Compliance with these regulations may require additional investments in infrastructure or staff training, further straining financial resources (Barkas, P., Honeck, D., & Rubio, E. 2020). To mitigate financial distress, companies in the travel, tourism, and hospitality industries often focus on cost-cutting measures, diversifying revenue streams, improving operational efficiency, renegotiating contracts, accessing government support programs, and restructuring debt. As well, building resilience through strategic planning, scenario analysis, and risk management can help companies better navigate uncertain economic and operational environments.

1.2 Significance of the study

The X-score and Z-score are financial metrics used to assess the financial health and risk of businesses in the travel, tourism, and hospitality industries. They help identify areas for improvement and innovation, identify companies at risk of financial distress, and inform strategic decisions. These metrics can also be used in market analysis to understand the competitive landscape and identify trends, opportunities, and challenges (Nagendrakumar, N., et al. 2022). X-score can measure customer satisfaction and loyalty, while Z-score assesses a firm's likelihood of bankruptcy based on profitability, leverage, liquidity, solvency, and activity ratios. These scoring systems can help stakeholders gauge a company's resilience and make informed decisions. However, they may not fully capture the broader

challenges and opportunities facing the industry, such as regulatory changes, technological advancements, consumer preferences, and geopolitical events. Integrating both quantitative and qualitative approaches can provide a comprehensive understanding of the industry, informing strategic decision-making and supporting sustainable growth in the post-pandemic era (Abdullah, A., & Achsani, N. A. 2020). The X-score and Z-score are statistical measures used to assess performance in the travel, tourism, and hospitality industries. They help identify patterns and trends, such as peak tourism seasons or high customer satisfaction. The insights can be used to make informed decisions and develop strategies to improve performance. Policymakers can use these findings to support growth and sustainability (Suresh, M. S. P., et al. 2022). Marketing and promotional efforts can be tailored based on X-scores and Z-scores, highlighting high-performance areas and areas of improvement. Regular monitoring and reassessment of strategies ensure ongoing improvement. The X-score represents the actual value of a variable or performance indicator within a dataset, while the Z-score standardizes these scores by expressing them in terms of standard deviations from the mean. These tools enable researchers to assess the performance of individual businesses, destinations, or tourism products, identify emerging trends, and develop theoretical frameworks for understanding risk factors (Nagendrakumar, N., et al. 2022). By analyzing changes in X-scores over time, researchers can identify outliers and potential risks, enabling informed strategic decision-making for businesses, destination management organizations, and policymakers. By analyzing customer satisfaction scores and standard deviations, researchers can uncover patterns or anomalies that suggest novel theories about customer preferences or decision-making processes. They can also refine existing theories about service quality or destination choice, revealing unexpected insights or contradictions in existing beliefs. By examining Z-scores across less conventional or emerging destinations, researchers can challenge the dominance of well-established tourist hotspots and propose alternative strategies for destination marketing. Regular monitoring of X-scores and Z-scores can help businesses adapt to changing consumer preferences and market dynamics, leading to more competitive offerings and enhanced customer satisfaction (Abdullah, A., & Achsani, N. A. 2020).

Using X-score and Z-score in the travel, tourism, and hospitality industries provides innovative research and analysis methods. X-score can be used for customer satisfaction analysis, allowing businesses to understand customer preferences and perceptions. Z-score can be used for performance benchmarking, comparing performance indicators like occupancy rates and revenue per available room. Combining these methodologies can enable predictive analytics, predicting future trends, and adjusting marketing strategies. Dynamic pricing strategies can be informed by X-score and Z-score analysis, allowing businesses to adjust pricing in real-time to maximize revenue and

profitability. Personalized marketing campaigns can be developed by segmenting customer bases and delivering targeted promotional offers (Nagendrakumar, N., et al. 2022). The X-score and Z-score are statistical tools that can help practitioners and stakeholders in the travel, tourism, and hospitality industry make data-driven decisions. They can help forecast demand, assess financial risk management, evaluate customer satisfaction, evaluate marketing effectiveness, and benchmark against competitors (Schregel, J. P. 2021). By analyzing historical data and current trends, practitioners can estimate future demand levels, and make informed decisions about pricing, inventory management, and resource allocation. They can also help identify areas for improvement and allocate resources effectively. By comparing X-scores before and after marketing initiatives, businesses can optimize their strategies and stay ahead in the market. The X-score and Z-score can be used in research on travel, tourism, and hospitality to analyze consumer behaviour, destination competitiveness, sustainability practices, and innovation. These metrics can be used to analyze destination selection, customer satisfaction, market segmentation, destination competitiveness, sustainability, technology adoption, crisis management, and cross-cultural analysis. By examining factors like attractions, amenities, and accessibility, researchers can predict popular destinations and understand emerging trends in tourism preferences. By analyzing customer satisfaction, businesses can identify areas for improvement and tailor marketing efforts to specific target groups. The use of technology can also help enhance the tourist experience and guide businesses in leveraging technology to improve service delivery. Furthermore, the X-score and Z-score can be used to assess crisis management and risk assessment in the tourism industry (Jawad, Z. N., & Balázs, V. 2024).

The X-score and Z-score are statistical measures used in the travel, tourism, and hospitality industries to measure deviations from the mean of a population. X-scores measure customer satisfaction, while Z-scores indicate the standard deviations of a data point from the mean. These scores can inform policy decisions and strategies in areas such as resource allocation, quality improvement, risk management, policy evaluation, and competitive analysis (Nagendrakumar, N., et al. 2022). By analyzing X-scores related to tourism revenue or hotel occupancy rates, policymakers can allocate resources more effectively, identify areas for improvement, and manage risks. Z-scores can help identify outliers or unusual trends in tourism data, allowing for proactive risk management strategies. X-scores can also be used to evaluate the effectiveness of existing policies or initiatives, and Z-scores can be used for competitive analysis (Jawad, Z. N., & Balázs, V. 2024). The study significantly contributes to the broader body of knowledge in the field of travel, tourism, and hospitality industries by employing X-score and Z-score methodologies. These scoring systems allow for a comprehensive evaluation and analysis of various factors impacting these industries, such as customer

satisfaction, service quality, economic performance, and market trends. By applying these methodologies, the study provides valuable insights into the dynamics of these sectors, facilitating a deeper understanding of their complexities and challenges. Furthermore, the findings of the study have the potential to inform strategic decision-making processes within the travel, tourism, and hospitality sectors, leading to improved operational efficiency, enhanced customer experiences, and sustainable growth (Nagendrakumar, N., et al. 2022).

2. Objective of the Study

1. To evaluate the financial distress levels of selected service sector companies in the travel, tourism, and hospitality industries.
2. To compare the Z-Score and X-Score models in predicting financial distress within the specified industry.
3. To study the impact of financial performance on the Z-Score and X-Score models

3. Review of literature

3.1 Review Related to the Altman Z-score Model

The Z-Score model predicts bankruptcy and firm distress in 31 European and three non-European countries, with an accuracy of 0.75, but country-specific estimation can improve classification accuracy to above 0.90. (Altman, E. I., et al. 2017). The Z-Score Model analysis is crucial for IoT companies' long-term solvency, highlighting the need for diversification and careful investment selection. This study can help reduce crisis probability and promote healthy development (Zhu, L., et al. 2021). Z-scores are useful for measuring thoracic aorta in pediatric patients but have limitations like bias and measurement error. Guidelines and web-based calculators aim to reduce bias, but clinicians must be aware of their limitations (Curtis, A. E., et al. 2016). High-throughput cDNA microarray technology allows simultaneous gene expression analysis using Z score transformation, standardizing data across experiments and allowing comparison, providing rigorous results easily adapted to standard spreadsheet programs (Cheadle, C., et al. 2003). This review discusses a systematic method for computing the Z score equation, utilizing linear, quadratic, and fractional polynomials, and generating mean and standard deviation for laboratory and clinical use (DeVore, G. R. 2017). The Taffler UK-based z-score model, over 25 years, outperforms naïve prediction approaches and shows economic value for banks, highlighting the predictive ability of published accounting numbers and financial ratios (Agarwal, V., & Taffler, R. J. 2007). The study enhances bank insolvency risk measurement using advanced techniques like Z-Score, introduces novel estimators, and compares results against Factiva business news, providing more accurate quantification (Mare, D. S., et al. 2017). The WHO international growth reference reveals discontinuities and differences in Z-score curves, leading to an artifactual drop in low height-for-age, low weight-for-height, and high weight-for-height prevalence at age 2 years (Dibley, M. J., et

al.1987). The paper evaluates the Standardized Precipitation Index (SPI), China-Z Index (CZI), and Z-Score for moisture conditions monitoring in China from 1951 to 1998, finding that CZI and Z-Score offer similar results and easier calculation (Wu, H., et al. 2001). A study in an Italian kindergarten found that the optimal BMI measure for change is BMI z-score, with smaller within-child S.D.S in obese children and an inverse correlation with baseline z-score, emphasizing the importance of stable methods (Cole, T. J., 2005).

3.2 Review Related to the Zmijewski X-score Model

The paper investigates the construct validity of Zmijewski and Ohlson bankruptcy prediction models used in accounting research. It suggests that recent data should be re-estimated to improve the predictive accuracy of these models, highlighting the need for more accurate models (Grice Jr, J. S., & Dugan, M. T. 2003). The study examines the bankruptcy level of PT Atlas Resources, Tbk listed on the Indonesia Stock Exchange from 2015 to 2017. Using audited financial statements and Altman Z-Score and Zmijewski X-Score models, reveals a decline in financial performance, indicating potential bankruptcy and poor investment choice (Soelton, M., et al. 2019). This research investigates the impact of good corporate governance, including managerial, institutional, and independent board of commissioners, on financial distress in consumer goods companies listed on the Indonesia Stock Exchange from 2019 to 2021 as calculated using the Zmijewski model (X-Score). The results show that the independent board of commissioners significantly affects financial distress, while managerial, institutional, and audit committee ownership does not (Saputri, U., & Sari, S. P, 2023). The study evaluates Kuwait stock exchange companies' financial health from 2010-2017 using the Zmijewski X-score model, revealing healthy positions but potential delisting if X-scores decline (AlAli, M. S., et al. 2018). The study analyzes PT Pakuwon Jati Tbk's financial performance using Z-Score Altman, Springate, and X-Score Zmijewski financial distress models from 2015 to 2019, revealing insights that can aid in informed decision-making regarding future strategies, based on secondary data and observation methods (Daryanto, W. M., et al. 2021). This study examines the financial distress likelihood of mobile telecommunications companies in Kuwait using the Zmijewski X-score model, focusing on Zain, Ooredoo, and Viva, revealing Viva as the best performer and least likely to face financial difficulties (AlAli, M. S., et al. 2018). The study found that Altman Modified Z-Score, Zmijewski X-score, and Grover methods are effective in predicting financial distress in 21 Indonesian Retail sub-sector companies, with the highest accuracy rate (Rahayu, S., et al. 2023). The study utilized the Zmijewski method to analyze financial distress in plantation sub-sector companies, revealing two companies, PT. Jaya Agra Wattie and PT. Eagle High Plantations, experiencing financial difficulties (Yanti, N., et al. 2023). The study examines Altman, Springate, Zmijewski, and Grover models for predicting financial distress in 132 Daftar

Efek Syariah companies from 2009-2012, finding the Zmijewski model most suitable due to its higher significance level (Husein, M. F., & Pambekti, G. T. 2015). The research utilized various models to predict financial difficulties and corporate bankruptcy for PT Garuda Indonesia, with the Altman model predicting distress from 2020-2022, Springate indicating bankruptcy, Zmijewski indicating risk, Grover's predicting bankruptcy, and Taffler model being the most accurate (Marsenne, M., et al. 2024).

3.3 Review Related to the Travel, Tourism, and Hospitality Industry

India's tourism and hospitality industry is growing due to domestic travel, high disposable income, and social travel websites. However, challenges like financial issues, global uncertainty, branding, and human resources need immediate attention from stakeholders (Hole, Y. 2019). The paper examines the role of hospitality and tourism in India's sustainable economic growth, recommending measures like infrastructure management, government policy, workforce issues, education, growth strategies, and online marketing (Jauhari, V. 2009). Tourism, a key global economic driver, faces challenges like demographic shifts, war, weather, internationalization, and societal ageing. India's Ministry supports efforts, with visa-on-arrival becoming a reality, impacting both the world and India (BA, I., & Sami, S. 2016). The paper explores the impact of RAISA technologies on travel, tourism, and hospitality companies, predicting a future divide between high-tech, robot-delivered services and high-touch, human-based companies. It highlights the potential for companies to differentiate between these two segments (Ivanov, S. 2019). The tourism and hospitality industry, accounting for over half of service exports in countries like Spain, South Africa, and Mexico, is adapting to digital trends to improve sales, brand image, and awareness. With one website per every 3 internet users worldwide, the online tourism market is crucial (Popescu, M. A., et al. 2015, November). The IH&RA has sponsored two think tanks predicting a future where the hospitality industry uses technology to meet customer needs, providing instant travel information, learning about them, and continuously improving their experience (Olsen, M. D., & Connolly, D. J. 2000). This study reviews research on IT in the tourism and hospitality industry, revealing IT's primary use is for information needs, performance analysis, operations management, innovation, promotion, marketing, customer management, and value creation (Khatri, I. 2019). India, a populated country with a population of one billion, faces challenges in attracting tourists due to its low annual visitor count. To boost tourism and sustainable development, India needs a sound policy that encourages Westerners to invest in the industry. Properly planned, tourism could generate 20+ million jobs and foreign exchange of over \$30 billion (Kuthiala, S. K. 2001). The hospitality industry, with over four million guest rooms and \$550 billion in annual travel spending, requires strong business foundations and customer

service skills. This study aims to identify future trends and research gaps (Rao, R. S. 2014). A study analyzing interviews with 15 industry professionals reveals four major themes: multiskilling, professional development, hygiene, optimism, media roles, crisis preparedness, human resource management, health and hygiene, continuity, and concerns, offering managerial recommendations (Kaushal, V., & Srivastava, S. 2021).

3.4 Review Related to Financial Distress

This study identifies the determinants and consequences of financial distress, categorizing them into firm-level fundamental, macroeconomic, and corporate governance factors. It suggests future research should develop comprehensive models for predicting financial distress, moving away from partial analysis (Habib, A., et al. 2020). Corporate financial distress prediction research has evolved over half a century, with ensemble learning algorithms being the most accurate. However, many methods use biased feature importance measures, which may not accurately reflect the true importance of features. This paper proposes a heuristic algorithm based on permutation importance (PIMP) to modify this bias, improving accuracy and making results more interpretable. The PIMP method offers higher prediction accuracy and clearer interpretation, making it suitable for commercial use (Qian, H., et al. 2022). The study explores financial distress in Swedish SMEs during and after the global financial crisis, finding macroeconomic conditions and firm-specific characteristics as determinants, but no significant relationship with firm size (Yazdanfar, D., & Öhman, P. 2020). Despite SIG's insignificant significance, the study reveals significant predictors of financial distress in Pakistani firms, including profitability, liquidity, leverage, cash flow ratios, and firm size (Waqas, H., & Md-Rus, R. 2018). The study reveals that both listed and unlisted firms in financial difficulties employ income-increasing manipulation, with listed firms exhibiting more opportunistic behaviour, focusing on detection probability over cost (Campa, D. 2019). Poor management leads to more firms in financial distress than economic distress, with management actions affecting recovery and market value improvement, and early distress stages boosting median operating income (Whitaker, R. B. 1999). The study reveals that firms with higher corporate social responsibility (CSR) levels have lower financial distress risk (FDR), indicating that better CSR performance makes firms more creditworthy and access to financing, leading to fewer financial defaults. This relationship is more prevalent in firms with strong governance mechanisms and high product market competition (Boubaker, S., et al. 2020). The study explores the impact of gender diversity on a firm's capital structure and likelihood of financial distress. Results show that the percentage of women directors is the most influential board characteristic, negatively affecting leverage, cost of debt, and debt maturity. Small, independent boards with high women directors reduce financial distress likelihood (García, C. J., & Herrero, B. 2021). The Covid-19 pandemic

significantly impacted businesses in the European Union, leading to increased corporate bankruptcies. A study reveals a deteriorating solvency profile for all firms, with manufacturing, mining, and retail sectors most vulnerable. Policy interventions, such as tax deferral, may be necessary for moderate economic deterioration, but hybrid debt and equity support may exacerbate business shocks (Mirza, N., et al. 2023). The study examines the impact of digital finance on bankruptcy risk in Chinese A-share listed firms. It finds that digital finance reduces firms' financial leverage and improves information transparency, with the negative effect being more pronounced in smaller and riskier firms (Ji, Y., Shi, L., & Zhang, S. 2022).

4. Research Methodology:

In this study researcher has used only two insolvency prediction models as explained under subheading 4.3 with the help of annual financial reports of the companies selected for the purpose for 5 years. Further data will be calculated and measured with the help of Excel and SPSS.

4.1 Sample Selection: - Identify a representative sample of service sector companies within the 20 companies selected from travel, tourism, and hospitality industries for 5 years from 2018-19 to 2022-23.

4.2 Data Collection: - Gather financial data from annual reports, financial statements, and relevant databases of respected companies. Collect information on key financial indicators such as financial ratios, liquidity measures, leverage, profitability, and other relevant variables.

4.3 Model Application: - Apply the Z-Score and X-Score models to calculate distress prediction scores for each selected company. Evaluate the accuracy and reliability of each model in predicting financial distress within the industry. In order to ascertain insolvency prediction models by both models simultaneously each company to know its level of distress in the selected sector.

4.4 Z-Score and X-Score Calculation: The Z-Score and X-Score models will be applied to calculate the financial distress scores for each company in the sample.

4.5 Statistical Analysis tools: - Conduct statistical analyses to identify significant financial indicators influencing distress predictions of the companies by descriptive statistics through SPSS.

4.5.1 Altman Z-score for Emerging Companies

Formula: - $Z = 3.25 + 6.56X1 + 3.26X2 + 6.72X3 + 1.05X4$

Where,

Z-Score= overall variables

X1 = working capital / total assets

X2 = retained earnings / total assets

X3 = earnings before interest and taxes / total assets

X4 = market value of equity / total liabilities

Zones of discrimination:

Z > 2.6 – "safe" zone

1.1 < Z < 2.6 – "grey" zone

Z < 1.1 – "distress" zone (Elia, J., et al. 2021).

4.5.2 Zmijewski X-score Model

Formula: - $X\text{-Score} = -4.3 - 4.5 (X1) + 5.72 (X2) - 0.004 (X3)$

Where,

X-Score = overall variables

X1= (Net income / Total assets)

X2= (Total liabilities / Total assets)

X3= (Current assets/ Current liabilities)

If X-Score > 0 = Unhealthy

If X-Score < 0 = Healthy (Lestari, R. M. E., et al 2021).

4.6 Simple Linear Regression

Simple linear regression is a statistical method to model the relationship between two variables: one independent (predictor) and one dependent (response). It fits a straight line, minimizing the sum of squared differences between observed and predicted values, to estimate how changes in the predictor affect the response variable.

5. Result and Discussion

The empirical study on financial distress prediction in the travel, tourism, and hospitality industry reveals noteworthy results. Employing Z-Score and X-Score models, the analysis elucidates the susceptibility of selected service sector companies. The discussion delves into key indicators, offering insights crucial for strategic risk management in this dynamic sector. Here researcher mentioned only selected model scores to indicate the financial health of the company and the rest of the calculated tables are mentioned in the appendix section.

5.1 Evaluation of the financial distress levels of the selected companies through the Z and X-scores.

Table-5.1

Altman Z-scores of selected Companies

S. No	Company/ Years	2022-23	2021-22	2020-21	2019-20	2018-19
1	IRCTC	12.454	17.341	11.345	8.836	8.206
2	BLS International Services Ltd	82.205	33.577	23.215	11.370	23.719

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3	EASY TRIP PLANNERS	15.640	17.777	9.944	10.519	10.130
4	Thomas Cook (India) Ltd	5.631	6.183	5.920	5.094	7.363
5	Dreamfolks Services Ltd	11.336	14.692	17.304	16.483	19.107
6	International Travel House Ltd	6.936	6.004	4.779	6.450	7.194
7	Transcorp International Ltd	4.525	4.352	5.774	6.132	6.770
8	Cox & Kings Ltd	7.975	8.268	7.942	9.306	8.149
9	Yatra Online Ltd	2.503	1.834	3.095	1.767	0.910
10	International Travel House Ltd	6.936	6.004	4.779	6.450	7.194
11	Mahasagar Travels Ltd	3.073	2.896	2.800	3.066	3.210
12	The Byke Hospitality Ltd	6.548	6.270	6.254	6.957	7.548
13	Mahindra Holidays & Resorts India Ltd	4.318	4.344	4.593	4.243	4.235
14	Coffee Day Enterprises Ltd	8.016	7.995	7.908	9.882	7.011
15	Asian Hotels (North) Ltd	3.323	3.532	0.869	4.723	5.116
16	Delta Corp Ltd	8.999	10.434	9.079	8.054	10.974
17	Indian Hotels Co Ltd	10.682	9.296	5.042	6.244	7.853
18	Wonderla Holidays Ltd	9.069	6.707	6.144	6.838	7.186
19	Blue Coast Hotels Ltd	-6.237	-1.975	-5.069	0.066	-1.714
20	Royal Orchid Hotels Ltd	7.873	6.196	5.578	5.897	7.111

Source: SPSS & Excell
 $Z > 2.6$ – "safe" zone
 $1.1 < Z < 2.6$ – "grey" zone
 $Z < 1.1$ – "distress" zone

Table-5.1.1
Descriptive Statistics of Z-score of selected companies

Years	N	Minimum	Maximum	Mean	Std. Deviation
2022-23	20	-6.24	82.21	10.5903	17.45002
2021-22	20	-1.98	33.58	8.5864	7.65027
2020-21	20	-5.07	23.22	6.8647	5.82158

2019-20	20	.07	16.48	6.9189	3.62677
2018-19	20	-1.71	23.72	7.8636	5.52253

Source: SPSS

Table 5.1 describes the measured values of the Z-score for the selected companies over five years. The above table indicates that the selected companies in the travel, tourism, and hospitality industries were lied in safe zones for the whole year except for three companies namely Yatra Online Ltd, Asian Hotels (North) Ltd, and Blue Coast Hotels Ltd where Yatra Online Ltd was in the safe zone in 2020-21 and 2021-22 and 2022-23, the company was in the grey zone and 2018-19, the company was in the distress zone. Asian Hotels (North) Ltd was in the safe zone for the whole year except 2020-21 when the company was in the distress zone the company will go to bankruptcy upcoming two years. Blue Coast Hotels Ltd was in the distress zone for the whole year of the study which means the company will go to bankruptcy upcoming two years.

Table 5.1.1 shows the descriptive statistics values of the Z-score of the 20 selected companies for the years from 2018-19 to 2022-23 where N indicates the total number of the selected companies which is 20. The minimum

values of the Z-scores were -6.24, -1.98, -5.07, .07, and -1.71 for the respective years 2022-23, 2021-22, 2020-21, 2019-20, and 2018-19. The lowest Z-score was observed among the selected companies for each fiscal year. The maximum values of the Z-scores were 82.21, 33.58, 23.22, 16.48, and 23.72 for the respective years 2022-23, 2021-22, 2020-21, 2019-20, and 2018-19. The highest Z-score was observed among the selected companies for each fiscal year. The mean or average values of the Z-scores were 10.5903, 8.5864, 6.8647, 6.9189, and 7.8636 for the respective years 2022-23, 2021-22, 2020-21, 2019-20, and 2018-19. It represents the central tendency of the Z-scores. The Std. Deviation values of the Z-scores were 17.45002, 7.65027, 5.82158, 3.62677, and 5.52253 for the respective years 2022-23, 2021-22, 2020-21, 2019-20, and 2018-19. These values represented the dispersion or variability of the Z-scores around the mean for each fiscal year. It quantifies the amount of variation or dispersion in the Z-scores.

Table-5.1.2

Model Summary										
Model	R	R Square	Adjusted Square	Std. Error of the Estimate	Change Statistics					
					R Square Change	F Change	df1	df2	Sig. Change	F
1	.966a	.933	.915	5.09541	.933	51.959	4	15	.000	

a. Predictors: (Constant), X2, X3, X4, X5

Source: SPSS

Table 5.1.2 shows a high R-value of 0.966, indicating a strong correlation between the predictors X2, X3, X4, X5 and the dependent variable. The R² value 0.933 suggests that 93.3% of the variance is explained by the

model, with an adjusted R² of 91.5% accounting for model complexity. The F-statistic 51.959, p < 0.001 confirms the model's significance. The standard error of 5.09541 suggests moderate prediction accuracy.

Table-5.1.3

ANOVAa						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5396.110	4	1349.027	51.959	.000b
	Residual	389.448	15	25.963		
	Total	5785.558	19			

a. Dependent Variable: financial performance ratios

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b. Predictors: (Constant), X2, X3, X4, X5

Source: SPSS

Table 5.1.3 indicates that the regression model significantly predicts financial performance ratios $F = 51.959$, $p < 0.001$. The predictors X2, X3, X4, and X5 explain a substantial portion of the variance in financial

performance, with a total sum of squares of 5785.558 and a regression sum of squares of 5396.110. The low residual sum of squares 389.448 suggests that the model fits the data well.

Table-5.1.4

Coefficients ^a								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	1.769	2.863		.618	.546	-4.333	7.871
	X2	1.558	.422	.683	3.694	.002	.659	2.457
	X3	.484	.856	.162	.566	.580	-1.341	2.309
	X4	-3.587	.695	-.745	-5.163	.000	-5.067	-2.106
	X5	2.153	.733	.682	2.936	.010	.590	3.717

a. Dependent Variable: financial performance ratios

Source: SPSS

Table 5.1.4 shows the regression analysis of financial performance ratios against predictors X2, X3, X4, and X5. Significant predictors include X2, $\beta = 0.683$, $p = 0.002$ and X5, $\beta = 0.682$, $p = 0.010$, positively influencing financial performance. X4 negatively

impacts performance $\beta = -0.745$, $p < 0.001$. X3 is insignificant $p = 0.580$. The confidence intervals validate these relationships, highlighting X4's strong inverse effect.

Table-5.2

Zmijewski X-scores of selected Companies

S. No.	Company/ Years	2022-23	2021-22	2020-21	2019-20	2018-19
1	IRCTC	-0.716	-0.661	-0.441	-0.193	-0.085
2	BLS International Services Ltd	-4.442	-2.126	-3.008	-3.859	-3.254
3	EASY TRIP PLANNERS	-1.987	-0.982	-0.827	-1.383	-1.151
4	Thomas Cook (India) Ltd	-0.468	0.170	0.110	-1.515	-1.436
5	Dreamfolks Services Ltd	-5.689	-3.956	-1.771	-6.269	-6.260
6	International Travel House Ltd	-2.624	-1.751	-0.998	-3.135	-2.946

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8	Cox & Kings Ltd	-2.259	-2.744	-2.666	-1.336	-1.444
9	Yatra Online Ltd	1.097	0.897	-0.412	0.146	-0.420
10	International Travel House Ltd	-2.624	-1.751	-0.998	-3.135	-2.946
11	Mahasagar Travels Ltd	-0.753	-1.034	-0.294	-1.827	-1.572
12	The Byke Hospitality Ltd	-1.289	-1.067	-0.629	-1.444	-2.306
13	Mahindra Holidays & Resorts India Ltd	0.129	0.129	-0.105	-0.008	0.047
14	Coffee Day Enterprises Ltd	-0.196	-0.194	-0.262	-1.409	0.752
15	Asian Hotels (North) Ltd	1.590	1.773	1.947	1.119	0.951
16	Delta Corp Ltd	0.056	0.499	0.264	-0.125	-0.263
17	Indian Hotels Co Ltd	-0.206	0.254	1.103	-0.075	-0.204
18	Wonderla Holidays Ltd	-0.528	0.927	1.316	0.247	0.525
19	Blue Coast Hotels Ltd	-1.291	-1.350	-1.179	-1.265	-33.897
20	Royal Orchid Hotels Ltd	-0.969	-0.068	-0.152	-0.301	-0.555

Source: SPSS & Excell

If X-Score > 0 = Financially Unhealthy

If X-Score < 0 = Financially Healthy

Table-5.2.1
Descriptive Statistics of X-score of selected companies

Years	N	Minimum	Maximum	Mean	Std. Deviation
2022-23	20	-5.69	1.59	-1.1064	1.79467
2021-22	20	-3.96	1.77	-.5952	1.42661
2020-21	20	-3.01	1.95	-.4471	1.19503
2019-20	20	-6.27	1.12	-1.3270	1.71238
2018-19	20	-33.90	.95	-2.8562	7.50097

Sources: SPSS

Table 5.2 describes the measured values of the X-score for the selected companies over five years. The above table indicates that IRCTC, BLS International Services Ltd, EASY TRIP PLANNERS, Dreamfolks Services Ltd, International Travel House Ltd, Cox & Kings Ltd,

International Travel House Ltd, Mahasagar Travels Ltd, The Byke Hospitality Ltd, Coffee Day Enterprises Ltd, Blue Coast Hotels Ltd, and Royal Orchid Hotels Ltd in the travel, tourism, and hospitality industries were financially healthy for the whole year. Thomas Cook

(India) Ltd was financially healthy in the years 2022-23, 2019-20, and 2018-19 but in the years 2020-21 and 2021-22, the company was financially unhealthy which means the company will go to bankruptcy for the upcoming two years. Transcorp International Ltd was financially healthy in the years 2018-19 and 2019-20 but in the years 2020-21, 2021-22, and 2022-23, the company was financially unhealthy which means the company will go to bankruptcy for the upcoming two years. Yatra Online Ltd was financially healthy in the years 2018-19 and 2020-21 but in the years 2019-20, 2021-22, and 2022-23, the company was financially unhealthy which means the company will go to bankruptcy for the upcoming two years. Mahindra Holidays & Resorts India Ltd was financially healthy in the years 2019-20 and 2020-21 but in the years 2018-19, 2021-22, and 2022-23, the company was financially unhealthy which means the company will go to bankruptcy for the upcoming two years. Asian Hotels (North) Ltd was financially unhealthy for the whole year of the study. Delta Corp Ltd was financially healthy in the years 2020-21, 2021-22, and 2022-23 but in the years 2018-19 and 2019-20, the company was financially unhealthy which means the company will go to bankruptcy in the upcoming two years. Indian Hotels Co Ltd was financially healthy in the years 2018-19, 2019-20, and 2022-23 but in the years 2020-21 and 2021-22, the company was financially unhealthy which means the company will go to bankruptcy in the upcoming two

years. Wonderla Holidays Ltd was financially unhealthy which means the company will go to bankruptcy in the upcoming two years for the whole years of the study except the year 2022-23 where the company was financially healthy.

Table 5.2.1 shows the descriptive statistics values of the X-score of the 20 selected companies for the years 2018-19 to 2022-23 where N indicates the total number of the selected companies which is 20. The minimum values of the X-scores were -5.69, -3.96, -3.01, -6.27, and -33.90 for the respective years 2022-23, 2021-22, 2020-21, 2019-20, and 2018-19. The lowest X-score was observed among the selected companies for each fiscal year. The maximum values of the X-scores were 1.59, 1.77, 1.95, 1.12, and .95 for the respective years 2022-23, 2021-22, 2020-21, 2019-20, and 2018-19. The highest X-score was observed among the selected companies for each fiscal year. The mean or average values of the X-scores were -1.1064, -.5952, -.4471, -1.3270, and -2.8562 for the respective years 2022-23, 2021-22, 2020-21, 2019-20, and 2018-19. It represents the central tendency of the X-scores. The Std. Deviation values of the X-scores were 1.79467, 1.42661, 1.19503, 1.71238, and 7.50097 for the respective years 2022-23, 2021-22, 2020-21, 2019-20, and 2018-19. These values represented the dispersion or variability of the X-scores around the mean for each fiscal year. It quantifies the amount of variation or dispersion in the X-scores.

Table-5.2.2

Model Summary										
Model	R	R Square	Adjusted Square	Std. Error of the Estimate	Change Statistics					
					R Square Change	F Change	df1	df2	Sig. Change	F
1	.951a	.905	.880	.62156	.905	35.850	4	15	.000	

a. Predictors: (Constant), X2, X3, X4, X5

Source: SPSS

Table 5.2.2 presents the model summary, showing a high correlation coefficient $R = 0.951$ and $R^2 = 0.905$, indicating that 90.5% of the variance in the dependent variable is explained by predictors X2, X3, X4, and X5.

The adjusted R^2 0.880 accounts for model complexity. The model is statistically significant, with an F-change value of 35.850 and $p = 0.000$ confirming the predictors' strong impact.

Table-5.2.3

ANOVAa						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	55.401	4	13.850	35.850	.000b
	Residual	5.795	15	.386		

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	Total	61.196	19			
a. Dependent Variable: financial performance ratio						
b. Predictors: (Constant), X2, X3, X4, X5						

Source: SPSS

Table 5.2.3 presents the ANOVA results for the regression model assessing financial performance ratios. The model is statistically significant $F = 35.850$, $p < 0.001$ indicating that the predictors X2, X3, X4, and X5 explain a significant portion of the variance in the

dependent variable. The regression accounts for 55.401 of the total sums of squares 61.196, while the residual variance is minimal at 5.795 confirming a strong model fit.

Table-5.2.4

Coefficients ^a								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-.123	.198		-.620	.545	-.546	.300
	X2	.748	.266	.595	2.812	.013	.181	1.315
	X3	-.025	.225	-.017	-.110	.913	-.504	.455
	X4	.436	.165	.416	2.645	.018	.085	.788
	X5	-.010	.020	-.043	-.513	.615	-.053	.033

a. Dependent Variable: financial performance ratio

Source: SPSS

Table 5.2.4 The regression analysis suggests that **X2** Beta = 0.595, $p = 0.013$ and **X4** Beta = 0.416, $p = 0.018$ are significant predictors of the financial performance ratio, with positive effects. **X3** and **X5** show no significant influence $p > 0.05$. The constant term is also non-significant $p = 0.545$. These findings indicate that X2 and X4 substantially impact financial performance, while other variables are less influential.

6.2 The comparison of the Z and X-scores for predicting the financial distress of the selected companies.

Tables 5.1 and 5.2 show the measured scores of the 20 selected companies of the travel, tourism, and hospitality industry to compare the selected Z-score and X-score models for predicting financial distress and which model is more suitable for measuring the financial health of the company.

Table-6.3
Comparing between Z-score and X-score of selected companies

S. No	Company/ Years	2022-23		2021-22		2020-21		2019-20		2018-19	
		Z-score	X-score								
1	IRCTC	12.454	-0.716	17.341	-0.661	11.345	-0.441	8.836	-0.193	8.206	-0.085

How to cite: Dr Alyas Ahmed, Dr. Rohit Bhagat, Arshe Azam, Rajinder Kumar, Amit, Prediction of Financial Distress of Selected Service Sector Companies with Special Reference to Travel, Tourism, And Hospitality Industry: An Empirical Study Using Z-Score And X-Score Models, *Advances in Consumer Research*, vol. 3, no. 2, 2026, pp. 1209-1227.

2	BLS International Services Ltd	82.205	-4.442	33.577	-2.126	23.215	-3.008	11.370	-3.859	23.719	-3.254
3	EASY TRIP PLANNERS	15.640	-1.987	17.777	-0.982	9.944	-0.827	10.519	-1.383	10.130	-1.151
4	Thomas Cook (India) Ltd	5.631	-0.468	6.183	0.170	5.920	0.110	5.094	-1.515	7.363	-1.436
5	Dreamfolks Services Ltd	11.336	-5.689	14.692	-3.956	17.304	-1.771	16.483	-6.269	19.107	-6.260
6	International Travel House Ltd	6.936	-2.624	6.004	-1.751	4.779	-0.998	6.450	-3.135	7.194	-2.946
7	Transcorp International Ltd	4.525	1.041	4.352	1.132	5.774	0.060	6.132	-0.773	6.770	-0.661
8	Cox & Kings Ltd	7.975	-2.259	8.268	-2.744	7.942	-2.666	9.306	-1.336	8.149	-1.444
9	Yatra Online Ltd	2.503	1.097	1.834	0.897	3.095	-0.412	1.767	0.146	0.910	-0.420
10	International Travel House Ltd	6.936	-2.624	6.004	-1.751	4.779	-0.998	6.450	-3.135	7.194	-2.946
11	Mahasagar Travels Ltd	3.073	-0.753	2.896	-1.034	2.800	-0.294	3.066	-1.827	3.210	-1.572
12	The Byke Hospitality Ltd	6.548	-1.289	6.270	-1.067	6.254	-0.629	6.957	-1.444	7.548	-2.306
13	Mahindra Holidays & Resorts India Ltd	4.318	0.129	4.344	0.129	4.593	-0.105	4.243	-0.008	4.235	0.047
14	Coffee Day Enterprises Ltd	8.016	-0.196	7.995	-0.194	7.908	-0.262	9.882	-1.409	7.011	0.752
15	Asian Hotels (North) Ltd	3.323	1.590	3.532	1.773	0.869	1.947	4.723	1.119	5.116	0.951
16	Delta Corp Ltd	8.999	0.056	10.434	0.499	9.079	0.264	8.054	-0.125	10.974	-0.263
17	Indian Hotels Co Ltd	10.682	-0.206	9.296	0.254	5.042	1.103	6.244	-0.075	7.853	-0.204
18	Wonderla Holidays Ltd	9.069	-0.528	6.707	0.927	6.144	1.316	6.838	0.247	7.186	0.525

19	Blue Coast Hotels Ltd	-6.237	-1.291	-1.975	-1.350	-5.069	-1.179	0.066	-1.265	-1.714	-33.897
20	Royal Orchid Hotels Ltd	7.873	-0.969	6.196	-0.068	5.578	-0.152	5.897	-0.301	7.111	-0.555

Sources: tables 6.1 and 6.2. Financially Healthy, Financial Unhealthy, and Grey Zone

Table 5.3 shows the measured scores of the selected Z-score and X-score models for the comparisons between both models to determine which model was more suitable to predict financial distress. It uses five years of 2018-19 to 2022-23 of financial data to measure the scores of selected companies and both Z-scores and X-scores indicate that in 2022-23, the Z-scores were in the safe zone which means the low likelihood of bankruptcy for the whole companies except Blue Coast Hotels Ltd that was in the financial distress zone which means high risk of bankruptcy and Yatra Online Ltd in the grey zone which means moderate risk of bankruptcy but the X-scores were financially healthy which means the low likelihood of bankruptcy for the whole companies except Transcorp International Ltd, Yatra Online Ltd, Mahindra Holidays & Resorts India Ltd, Asian Hotels (North) Ltd, and Delta Corp Ltd was in financially unhealthy which means high risk of bankruptcy. In 2021-22, the Z-scores indicate that the selected companies were in the safe zone which means a low likelihood of bankruptcy for whole companies except Blue Coast Hotels Ltd which was in the financial distress zone which means a high risk of bankruptcy, and Yatra Online Ltd in the grey zone which means moderate risk of bankruptcy but the X-scores were financially healthy which means the low likelihood of bankruptcy for the whole companies except Thomas Cook (India) Ltd, Transcorp International Ltd, Yatra Online Ltd, Mahindra Holidays & Resorts India Ltd, Asian Hotels (North) Ltd, Delta Corp Ltd, Indian Hotels Co Ltd, and Wonderla Holidays Ltd was in financially unhealthy which means high risk of bankruptcy. In 2020-21, the Z-scores indicate that the selected companies were in the safe zone which means a low likelihood of bankruptcy for whole companies except Asian Hotels (North) Ltd and Blue Coast Hotels Ltd which were in the financial distress zone which means a high risk of bankruptcy but the X-scores were financially healthy which means the low likelihood of bankruptcy for the whole companies except Thomas Cook (India) Ltd, Transcorp International Ltd, Asian Hotels (North) Ltd, Delta Corp Ltd, Indian Hotels Co Ltd, and Wonderla Holidays Ltd was in financially unhealthy which means a high risk of bankruptcy. In 2019-20, the Z-scores indicate that the selected companies were in the safe zone which means a low likelihood of bankruptcy for whole companies except Blue Coast Hotels Ltd which was in the financial distress zone which means a high risk of bankruptcy, and Yatra Online Ltd in the grey zone which means moderate risk of bankruptcy but the X-scores were financially healthy which means the low likelihood of bankruptcy for the whole companies except Yatra Online Ltd, Asian

Hotels (North) Ltd, and Wonderla Holidays Ltd was in financially unhealthy which means a high risk of bankruptcy. In 2018-19, the Z-scores indicate that the selected companies were in the safe zone which means a low likelihood of bankruptcy for whole companies except Yatra Online Ltd and Blue Coast Hotels Ltd which were in the financial distress zone which means a high risk of bankruptcy but the X-scores were financially healthy which means the low likelihood of bankruptcy for the whole companies except Asian Hotels (North) Ltd, and Wonderla Holidays Ltd were in financially unhealthy which means a high risk of bankruptcy. The X-score indicates five companies in 2022-23, eight companies in 2021-22, six companies in 2020-21, three companies in 2019-20, and three companies in 2018-19 were financially unhealthy which means a high risk of bankruptcy but the Z-score indicates one company Blue Coast Hotels Ltd was in financially unhealthy till 2019-20 but in 2018-19 two companies Blue Coast Hotels Ltd and Yatra Online Ltd were financially unhealthy which means a high risk of bankruptcy. The X-score indicates more companies were financially unhealthy compared to the Z-score. Hence, the X-score was more effective for measuring the financial health of the company compared to the Z-score.

5.3 Insights and recommendations for mitigation of financial distress risks in the travel, tourism, and hospitality industry

The X-score and Z-score models are used to assess financial distress risks in the travel, tourism, and hospitality industries. They provide valuable insights into financial health, identifying companies at risk, and guiding strategic decisions. Regular monitoring and adaptation are crucial for identifying emerging risks and opportunities. Predictive analytics can be used to forecast future trends and adjust strategies accordingly. Z-scores facilitate benchmarking against industry standards and competitors, while X-scores help understand customer satisfaction levels compared to competitors. Integrating quantitative and qualitative approaches provides a comprehensive understanding of the industry. By leveraging these models, businesses can mitigate financial distress risks, optimize operational efficiency, and ensure sustainable growth in the post-pandemic era.

Market analysis should indicate present situations of the market, condition of market trends, competitor strategy, and projection related to customer demands in the domestic and international markets with the consideration of key factors like geopolitical influences factors, Economic influencing factors,

performance, etc. Financial risk assessment should be measured through natural disasters, pandemics, regulatory changes, taxation, visa policies, safety standards, consumer attitudes, distribution channels, pricing wars in competitive pressure, and economic recessions impacting flexible spending. The financial health evaluation should involve assessing individual businesses within an industry, identifying early warning signs of distress, and developing scenarios to anticipate potential shocks or crises. Operational efficiency should be crucial with opportunities to improve efficiency and cost optimization. Diversification strategies should be encouraged to reduce dependency on vulnerable markets. Stress testing should be used to evaluate resilience and implement mitigation measures. Financial planning and contingency measures should be developed, including emergency funds and financing sources. Collaboration among industry stakeholders should be encouraged to address common challenges. Adaptability and innovation should be fostered, with businesses embracing digital transformation and investing in research and development. Financial planning and forecasting models should be developed to anticipate future challenges and opportunities. Cost management strategies should be implemented to optimize operational costs without compromising service quality. Diversification of revenue streams should be explored, and cash flow management practices should be implemented to ensure liquidity. Debt management strategies should be developed to reduce the impact of debt on financial health. Insurance coverage should be ensured, and stakeholder communication should be maintained to build trust and support during challenging times.

6. Conclusions

The travel, tourism, and hospitality industries are crucial sectors that significantly contribute to global economic development, job creation, and GDP growth. However, these industries are vulnerable to various external shocks, as demonstrated by the recent COVID-19 pandemic. This study has examined financial distress prediction in this sector, using the X-score and Z-score models to analyze the financial health of selected companies from 2018-19 to 2022-23. The analysis reveals that while most companies maintain safe Z-scores, the X-score model highlights variations in financial health, identifying companies at risk of distress. Companies such as Yatra Online Ltd, Asian Hotels (North) Ltd, and Blue Coast Hotels Ltd exhibit distress signals in both models, indicating vulnerabilities. It underscores the importance of continuous monitoring and adaptation to mitigate emerging risks and capitalize on opportunities. To navigate financial distress risks, businesses in these industries should prioritize operational efficiency, diversification, and stress testing. Collaboration among stakeholders is vital for addressing common challenges, fostering innovation, and developing resilient financial planning and forecasting models. Considering key factors impacting financial risks, such as geopolitical influences, economic factors, and consumer behaviour,

is crucial in strategic decision-making. This study focused only on travel, tourism, and hospitality industries over five years of data with two insolvency prediction models Z-score and x-score so there is a scope for further study to focus on other sectors through using more financial years with more than two insolvency prediction models.

References

1. Abdullah, A., & Achsani, N. A. Bankruptcy analysis of national airlines companies in Regional asia after covid-19 pandemic. *Jurnal Aplikasi Bisnis dan Manajemen (JABM)*, 6(3), 691-691(2020).
2. Agarwal, V., & Taffler, R. J. (2007). Twenty-five years of the Taffler z-score model: Does it really have predictive ability? *Accounting and business research*, 37(4), 285-300 (2020).
3. AlAli, M. S., AlShamali, M. M., AlAwadhi, K. M., & AlSabah, A. M. The use of Zmijewski model in examining the financial soundness of oil and gas companies listed at Kuwait Stock Exchange. *International Journal of Economics, Commerce and Management Research Studies*, 1(2), 15-21(2018).
4. AlAli, M. S., Bash, A. Y., AlForaih, E. O., AlSabah, A. M., & AlSalem, A. S. The adaptation of Zmijewski Model in appraising the financial distress of mobile telecommunications companies listed at Bursa Kuwait. *International Academic Journal of Accounting and Financial Management*, 5(4), 129-136 (2018).
5. Altman, E. I., Iwanicz-Drozowska, M., Laitinen, E. K., & Suvas, A. Financial distress prediction in an international context: A review and empirical analysis of Altman's Z-score model. *Journal of International Financial Management & Accounting*, 28(2), 131-171 (2017).
6. BA, I., & Sami, S. *Journal of Tourism & Hospitality*, doi:10.4172/2167-0269.1000193 pP-1-3 (2016).
7. Barkas, P., Honeck, D., & Rubio, E. International trade in travel and tourism services: Economic impact and policy responses during the COVID-19 crisis (No. ERSD-2020-11). *WTO staff working paper* (2020).
8. Boubaker, S., Cellier, A., Manita, R., & Saeed, A. Does corporate social responsibility reduce financial distress risk? *Economic Modelling*, 91, 835-851 (2020).
9. Buhalis, D., Harwood, T., Bogicevic, V., Viglia, G., Beldona, S., & Hofacker, C. Technological disruptions in services: lessons from tourism and hospitality. *Journal of Service Management*, 30(4), 484-506 (2019).
10. Buhalis, D., Harwood, T., Bogicevic, V., Viglia, G., Beldona, S., & Hofacker, C. Technological disruptions in services: lessons from tourism and hospitality. *Journal of Service Management*, 30(4), 484-506 (2019).

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11. Campa, D. Earnings management strategies during financial difficulties: A comparison between listed and unlisted French companies. *Research in International Business and Finance*, 50, 457-471 (2019).
12. Cheadle, C., Vawter, M. P., Freed, W. J., & Becker, K. G. Analysis of microarray data using Z score transformation. *The Journal of molecular diagnostics*, 5(2), 73-81 (2003).
13. Cole, T. J., Faith, M. S., Pietrobelli, A., & Heo, M. What is the best measure of adiposity change in growing children: BMI, BMI%, BMI z-score or BMI centile?. *European journal of clinical nutrition*, 59(3), 419-425 (2005).
14. Crespi-Cladera, R., Martín-Oliver, A., & Pascual-Fuster, B. Financial distress in the hospitality industry during the Covid-19 disaster. *Tourism Management*, 85, 104301 (2021).
15. Curtis, A. E., Smith, T. A., Ziganshin, B. A., & Elefteriades, J. A. The mystery of the Z-score. *Aorta*, 4(04), 124-130 (2016).
16. Daryanto, W. M., Pricillia, M., & Andarini, K. Financial Report Analysis of Pt Pakuwon Jati Tbk Using Z-Score Altman, S-Score Springate, And X-Score Zmijewski Models to Analyze Company's Bankruptcy. *South East Asia Journal of Contemporary Business*, 87-91 (2021).
17. DeVore, G. R. Computing the Z score and centiles for cross-sectional analysis: a practical approach. *Journal of Ultrasound in Medicine*, 36(3), 459-473 (2017).
18. Dibley, M. J., Staehling, N., Nieburg, P., & Trowbridge, F. L. Interpretation of Z-score anthropometric indicators derived from the international growth reference. *The American journal of clinical nutrition*, 46(5), 749-762 (1987).
19. Dileep, M. R. *Tourism, transport, and travel management*. Routledge (2019).
20. Elia, J., Toros, E., Sawaya, C., & Balouza, M. Using Altman Z'-score to predict financial distress: Evidence from Lebanese alpha banks. *Management Studies and Economic Systems*, 6(1/2), 47-57 (2021).
21. García, C. J., & Herrero, B. Female directors, capital structure, and financial distress. *Journal of Business Research*, 136, 592-601 (2021).
22. Grice Jr, J. S., & Dugan, M. T. Re-estimations of the Zmijewski and Ohlson bankruptcy prediction models. *Advances in Accounting*, 20, 77-93 (2003).
23. Habib, A., Costa, M. D., Huang, H. J., Bhuiyan, M. B. U., & Sun, L. Determinants and consequences of financial distress: review of the empirical literature. *Accounting & Finance*, 60, 1023-1075 (2020).
24. Hitt, M., Harrison, J., Ireland, R. D., & Best, A. Attributes of successful and unsuccessful acquisitions of US firms. *British Journal of Management*, 9(2), 91-114 (1998).
25. Hole, Y. Challenges and Solutions to the Development of the Tourism and Hospitality Industry in India. *African Journal of Hospitality, Tourism and Leisure*, 8(3), 1-11 (2019).
26. <https://unilever-professional.com/blogs/news/the-latest-hospitality-statistics>
27. <https://www.solimarinternational.com/10-of-jobs-are-worldwide-connected-to-the-tourism-industry-what-does-that-mean/>
28. <https://www.statista.com/statistics/206897/foreign-exchange-earnings-from-tourism-in-india/>
29. <https://www.statista.com/statistics/233223/travel-and-tourism-total-economic-contribution-worldwide/>
30. <https://www.statista.com/statistics/313724/total-contribution-of-travel-and-tourism-to-gdp-in-india>
31. Husein, M. F., & Pambekti, G. T. Precision of the models of Altman, Springate, Zmijewski, and Grover for predicting the financial distress. *Journal of Economics, Business, & Accountancy Ventura*, 17(3), 405-416 (2015).
32. Ivanov, S. Ultimate transformation: how will automation technologies disrupt the travel, tourism and hospitality industries?. *Zeitschrift für Tourismuswissenschaft*, 11(1), 25-43 (2019).
33. Jauhari, V. The hospitality and tourism industry in India: conclusions and solutions. *Worldwide Hospitality and Tourism Themes*, 1(1), 75-80 (2009).
34. Jawad, Z. N., & Balázs, V. Machine learning-driven optimization of enterprise resource planning (ERP) systems: a comprehensive review. *Beni-Suef University Journal of Basic and Applied Sciences*, 13(1), 4 (2024).
35. Ji, Y., Shi, L., & Zhang, S. Digital finance and corporate bankruptcy risk: Evidence from China. *Pacific-Basin Finance Journal*, 72, 101731 (2022).
36. Kaushal, V., & Srivastava, S. Hospitality and tourism industry amid COVID-19 pandemic: Perspectives on challenges and learnings from India. *International journal of hospitality management*, 92, 102707 (2021).
37. Khatri, I. Information technology in tourism & hospitality industry: A review of ten years' publications. *Journal of Tourism and Hospitality Education*, 9, 74-87 (2019).
38. Kim, H., & Marcouiller, D. W. Considering disaster vulnerability and resiliency: The case of hurricane effects on tourism-based economies. *The Annals of Regional Science*, 54, 945-971 (2015).
39. Kuthiala, S. K. Tourism and hospitality industry in India. *Journal of Services Research*, 1(1) pP-35-56 (2001).
40. Lestari, R. M. E., Situmorang, M., Pratama, M. I. P., & Bon, A. T. Financial distress analysis using Altman (Z-score), Springate (S-score), Zmijewski (X-score), and Grover (G-score) models in the tourism, hospitality, and restaurant subsectors listed on the Indonesia Stock Exchange period. In *Proceedings of the 11th Annual International Conference on Industrial Engineering and Operations Management Singapore* (Vol. 4249, p. 4259) (2021).

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41. Mare, D. S., Moreira, F., & Rossi, R. Nonstationary Z-score measures. *European Journal of Operational Research*, 260(1), 348-358 (2017).
42. Marsenne, M., Ismail, T., Taqi, M., & Hanifah, I. Financial distress predictions with Altman, Springate, Zmijewski, Taffler and Grover models. *Decision Science Letters*, 13(1), 181-190 (2024).
43. Mavengere, K. Predicting Corporate Bankruptcy and Earnings Manipulation Using the Altman Z-Score and Beneish M Score. *The Case of Z Manufacturing Firm in Zimbabwe. International Journal of Management Sciences and Business Research* (2015).
44. Mirza, N., Rahat, B., Naqvi, B., & Rizvi, S. K. A. Impact of Covid-19 on corporate solvency and possible policy responses in the EU. *The Quarterly Review of Economics and Finance*, 87, 181-190 (2023).
45. Nagendrakumar, N., Alwis, K. N. N., Eshani, U. A. K., & Kaushalya, S. B. U. The impact of sustainability practices on the going concern of the travel and tourism industry: Evidence from developed and developing countries. *Sustainability*, 14(24), 17046 (2022).
46. Nagendrakumar, N., Alwis, K. N. N., Eshani, U. A. K., & Kaushalya, S. B. U. The impact of sustainability practices on the going concern of the travel and tourism industry: Evidence from developed and developing countries. *Sustainability*, 14(24), 17046 (2022).
47. Olsen, M. D., & Connolly, D. J. Experience-based travel: How technology is changing the hospitality industry. *Cornell Hotel and Restaurant Administration Quarterly*, 41(1), 30-40 (2000).
48. Pavlatos, O., & Paggios, I. Cost accounting in Greek hotel enterprises: an empirical approach. *Tourismos*, 2(2), 39-59 (2007).
49. Pencarelli, T. The digital revolution in the travel and tourism industry. *Information Technology & Tourism*, 22(3), 455-476 (2020).
50. Popescu, M. A., Nicolae, F. V., & Pavel, M. I. Tourism and hospitality industry in the digital era: General overview. In *Proceedings of the 9th International Management Conference* pp. 163-168 (Nov 2015,).
51. Qian, H., Wang, B., Yuan, M., Gao, S., & Song, Y. Financial distress prediction using a corrected feature selection measure and gradient boosted decision tree. *Expert Systems with Applications*, 190, 116202 (2022).
52. Rahayu, S., Yudhawati, D., & Suharti, T. Analysis of Financial Distress Predictions Using Altman (Z-score), Zmijewski (X-score) and Grover (G-score) Methods. *Manager*, 6(4), 20-30 (2023).
53. Rao, N., & Suresh, K. T. Domestic tourism in India. *The native tourist*, 198-228 (2013).
54. Rao, R. S. Emerging trends in hospitality and tourism. *International Journal of Research Granthaalayah*, 1(1), 1-8 (2014).
55. Saputri, U., & Sari, S. P. Zmijewski (X-Score) Model for Financial Distress
56. Schregel, J. P. Can Strategic Management of Professional Football Clubs Lead to a Sustainable Advantage? (2021).
57. Senbeto, D. L., & Hon, A. H. The impacts of social and economic crises on tourist behaviour and expenditure: an evolutionary approach. *Current Issues in Tourism*, 23(6), 740-755 (2020).
58. Shah, C., & Trupp, A. Trends in consumer behaviour and accommodation choice: perspectives from India. In *Tourism in India* (pp. 68-83). Routledge (2021).
59. Shanker, D. ICT and Tourism: challenges and opportunities 50-58 (2008).
60. Soelton, M., Muhsin, M., Saratian, E. T. P., Arief, H., & Vizano, N. A. Analysis of Bankruptcy Prediction With Altman Z-Score And Zmijewski X-Score Model In Coal Mining Industry Listed In Indonesia Stock Exchange 2015-2017 Period. *South East Asia Journal of Contemporary Business Economics Law*, 20 (5), 158-166 (2019).
61. Steiner, C. Political instability, transnational tourist companies and destination recovery in the Middle East after 9/11. *Tourism and Hospitality Planning & Development*, 4(3), 169-190 (2007).
62. Stone, M. J., Soulard, J., Migacz, S., & Wolf, E. Elements of memorable food, drink, and culinary tourism experiences. *Journal of Travel*
63. SuS63. Suresh, M. S. P., Al Subhi, M. A. S. M., Al Siyabi, M. M. M. M., & Al Afari, M. A. A. M. PREDICTING FINANCIAL DISTRESS OF OMANI TOURISM COMPANIES DURING COVID-19 USING ZMIJEWSKI MODEL. *International Journal of Accounting Research*, 7(1), 95-101 (2022).
64. Vasilenko, N., Lavrova, T., & Tokareva, O. Digital infrastructure of service logistics: the case of the tourism industry. In *International Conference on Digital Technologies in Logistics and Infrastructure (ICDTLI 2019)* (pp. 414-6). Atlantis Press (Sept, 2019).
65. Waqas, H., & Md-Rus, R. Predicting financial distress: Importance of accounting and firm-specific market variables for Pakistan's listed firms. *Cogent Economics & Finance*, 6(1), 1545739 (2018)
66. Waqas, H., & Md-Rus, R. Predicting financial distress: Importance of accounting and firm-specific market variables for Pakistan's listed firms. *Cogent Economics & Finance*, 6(1), 1545739 (2018).
67. Whitaker, R. B. The early stages of financial distress. *Journal of economics and finance*, 23(2), 123-132 (1999).
68. World Tourism Organization (Madrid), Network, W. E., University of Hawaii (Manoa), University of Calgary (Calgary, Canada), & James Cook University (Australia). *International tourism: a global perspective*. World Tourism Organization (1997).
69. Wu68. Wu, H., Hayes, M. J., Weiss, A., & Hu, Q. I. An evaluation of the Standardized Precipitation Index, the China-Z Index, and the statistical Z-Score.
70. Wu68. Wu, H., Hayes, M. J., Weiss, A., & Hu, Q. I. An evaluation of the Standardized Precipitation Index, the China-Z Index, and the statistical Z-Score.

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70. Yazdanfar, D., & Öhman, P. Financial distress determinants among SMEs: empirical evidence from Sweden. *Journal of Economic Studies*, 47(3), 547-560 (2020).
71. Zhu, L., Li, M., & Metawa, N. Financial risk evaluation z-score model for intelligent IoT-based enterprises. *Information Processing & Management*, 58(6), 102692 (2021).