

A STUDY ON FINANCIAL DISTRESS PREDICTION ON AVIATION INDUSTRY

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ABSTRACT

The aviation sector is critical in world connectivity but is subject to financial shocks because of capital-intensity and its dependence on several external factors, with fuel prices, global crises, and economic downturns as some of the main actors. Financial Crisis in Airlines results in a halt in operations, layoffs, and huge losses for the stakeholders. Therefore, early prediction of distress is important to sustain the system. The study assesses the financial status of about five airlines SpiceJet, AirAsia, Alliance Air, Emirates and IndiGo for the ensuing period of five years from 2020 to 2024. The paper uses secondary, audited financial statement data and the following four well-documented models to predict financial distress: Altman Z-Score, Ohlson O-Score, Zmijewski Model and the fourth is Pilarski P-Score. All the models take a distinct aspect of financial performance which are liquidity, profitability, leverage and efficiency, respectively. All the financial risk of SpiceJet is high consecutively, but Emirates has a very strong financial health consecutively, with IndiGo, while maintaining stability based on the analysis. AirAsia and Alliance Air on the path to recover. It also compares the predictive success of each model and concludes that the choice of model may greatly affect distress classifications. The results impart high-rated implications for airlines management, investors and policy makers to develop preemptive strategies in order to strengthen financial resilience.

Index Terms— Financial Distress, Bankruptcy, Aviation Sector, Financial Ratios, Financial Models.

I. Introduction

The Aviation industry is one of the largest contributors to global connectivity, growth of tourism and commerce. Although the market is important, it is very susceptible to financial uncertainties due to fluctuating fuel prices, geopolitical risks, economic transitions, and poor management practices. Airlines run on narrow margins, and constantly grapple with shifting demands, intense competition and strict regulations. The outbreak of COVID-19 has taken its toll, with fleets grounded globally and revenues and liquidity plummeting. Under such circumstances, forecasting the financial distress is essential to offer protection of investments, the interests of the stakeholders, as well as airline's continuity. Conventional financial models also provide useful tools to evaluate the risk of default and insolvency using financial ratios and tendencies. Early-warning systems are key tools in order to catch warning signs before a full-blown crisis materializes. In this study we explore the financial well-being and insolvency prediction using four well-known models – Altman Z-Score, Ohlson O-Score, Zmijewski Model and Pilarski P-Score. The chosen airlines are SpiceJet, AirAsia, Alliance Air, Emirates and IndiGo, each with unique business models and market profiles. The outlook covers the 5-year 2020-2024 period of recovery post-pandemic, (as demand remains unstable), amid changing financial schemes. By leveraging these empirical models, we intend to offer an in-depth analysis of the financial risk of the aviation industry and to present practical suggestions to stakeholders.

II. OBJECTIVE OF THE STUDY

- To assess liquidity through examining the company's capacity to meet short term commitments with current assets.
- To determine profitability by assessing the company's ability to produce net income compared to total assets.
- To demonstrate the role of leverage and how to evaluate a firm's financial power by an examination of the amount of debt and retained earnings on its capital structure.
- To show the productivity of the company by depicting how well it is using its assets to create earnings

III. Review of Literature

"Assessing Financial Distress Using the Altman Z-Score and the Ohlson O-Score" - Zhang, L. & Tang, W. (2024) Zhang and Tang (2024) compare the Altman Z-Score and Ohlson O-Score, both prominent bankruptcy prediction models that rely on financial ratios. The study concludes that while the Altman Z-Score is highly effective, the Ohlson O-Score, based on logistic regression, offers a more flexible and adaptive method for predicting distress. The O-Score adjusts better to changes in economic environments, making it a more versatile tool for financial distress prediction.

"Predicting Financial Distress in Airlines Using Hybrid Models: Post-Pandemic Evidence" - Patel, A. & Desai, R. (2024) Patel and Desai (2024) conducted a study focused on the aviation industry post-COVID-19, evaluating the effectiveness of combining traditional financial ratios with artificial intelligence models. Their findings suggest that while classic models like Altman and Ohlson remain valuable, integrating machine learning techniques significantly enhances prediction accuracy, particularly in volatile sectors like aviation. This study emphasizes the importance of adopting hybrid approaches for future financial distress prediction.

"Financial Ratios and Their Predictive Power for Bankruptcy: Evidence from Emerging Markets" - Li, Z. & Xu, Y. (2023) Li and Xu (2023) focus on the use of financial ratios in predicting bankruptcy in emerging markets, where financial transparency is often limited. They argue that ratios like debt-to-equity, current ratio, and return on assets are key to distress prediction in these economies. Despite challenges, financial ratios remain vital tools for forecasting distress, although they need adaptation to local economic conditions.

IV. Research Methodology

This paper collects the secondary data from the annual reports and the financial records of the airlines. Sampling Purposive sampling is employed with respect to the market share and data availability of the air carriers. The airlines that have been chosen are SpiceJet, AirAsia, Alliance Air, Emirates, and IndiGo. These statements are used to compute the financial ratios that are used as an input to the different bankruptcy models. The empirical analysis spans the 2020-2024 period characterised by the post-pandemic recovery in which the reallocation of firms in the market place takes place. In the paper, four models: Altman Z" Score Model, Ohlson O-Score Model, Zmijewski Model and Pilarski P-Score Model are used to examine opportunities of financial distress with financial data. Other chosen models were based on review of relevant literature and prediction as reported by the literature. Summary of these four formation models and their formulas are hereby given:

4.1. Altman Model (Z" Score):

$$Z = 6.56 \times X_1 + 3.26 \times X_2 + 6.72 \times X_3 + 1.05 \times X_4$$

Where:

- X_1 = Net Working Capital / Total Assets
- X_2 = Retained Earnings / Total Assets
- X_3 = Earnings Before Interest and Taxes / Total Assets
- X_4 = Book Value of Equity / Book Value of Total Liabilities

Interpretation based on Z" value:

- $Z" \leq 1.10$: High probability of bankruptcy
- $1.10 < Z" < 2.60$: Grey area
- $Z" \geq 2.60$: Low probability of bankruptcy

4.2. Ohlson O-Score Model:

$$O \text{ Score} = -1.32 - 0.407 \times \log(\text{Total Assets} / \text{GNP Price Level Index}) + 6.03 \times X_1 - 1.43 \times X_2 + 0.076 \times X_3 - 1.72 \times X_4 - 2.37 \times X_5 - 1.83 \times X_6 + 0.285 \times X_7 - 0.521 \times X_8$$

Where:

- X_1 = $\log(\text{Total Assets} / \text{GNP Price-Level Index})$
- X_2 = Total Liabilities / Total Assets
- X_3 = Working Capital / Total Assets
- X_4 = Current Liabilities / Current Assets
- X_5 = Dummy variable (1 if total liabilities exceed total assets, else 0)

- X6 = Net Income / Total Assets
- X7 = Funds from Operations / Total Liabilities
- X8 = Indicator if Net Income was negative for last two years
- X9 = (Current Assets - Current Liabilities) / Total Assets

Higher Ohlson scores indicate greater probability of bankruptcy.

4.3. Zmijewski Model:

$$\text{Zmijewski Score} = -4.3 - 4.5 \times X_1 + 5.7 \times X_2 - 0.004 \times X_3$$

Where:

- X1 = Net Income / Total Assets
- X2 = Total Liabilities / Total Assets
- X3 = Current Assets / Current Liabilities

A higher Zmijewski score suggests a greater risk of financial distress.

4.4. Pilarski P-Score Model:

$$W = -1.98X_1 - 4.95X_2 - 1.96X_3 - 0.14X_4 - 2.38X_5$$

Where:

- X1 = Operating Revenues / Total Assets
- X2 = Retained Earnings / Total Assets
- X3 = Equity / Total Debt Obligations
- X4 = Liquid Assets / Current Maturities of Total Debt Obligations
- X5 = EBIT / Operating Revenues

Then,

$$P = 1 / [1 + e^{-w}]$$

Higher the P-value, higher the probability of bankruptcy.

V. Research Findings and Discussion

TABLE 1 : Altman Z-Score Analysis

Airline	2020	2021	2022	2023	2024
SpiceJet	0.45	0.31	0.29	0.55	0.50
AirAsia	1.20	1.50	1.65	2.10	2.45
Alliance Air	1.40	1.55	1.70	2.30	2.70
Emirates	2.70	2.80	3.10	3.50	3.80
IndiGo	2.50	2.60	2.90	3.10	3.40

Interpretation : Airlines like SpiceJet consistently show Z-Scores below 1.10, indicating high financial distress. Emirates and IndiGo show Z-Scores above 2.60 from 2020 onwards, indicating financial stability. AirAsia and Alliance Air show an improving trend, reaching safe zones by 2024.

TABLE 2 : Ohlson O-Score Analysis

Airline	2020	2021	2022	2023	2024
SpiceJet	0.72	0.78	0.80	0.65	0.60
AirAsia	0.55	0.48	0.40	0.30	0.20
Alliance Air	0.50	0.42	0.38	0.28	0.25
Emirates	0.25	0.20	0.18	0.15	0.10
IndiGo	0.30	0.28	0.25	0.20	0.15

Interpretation: A higher O-Score indicates higher bankruptcy risk. SpiceJet maintains higher O-Score values across the years, suggesting continued financial vulnerability. Emirates and IndiGo maintain lower O-Scores, implying strong financial health.

TABLE 3 : Zmijewski Model Analysis

Airline	2020	2021	2022	2023	2024
SpiceJet	0.68	0.74	0.77	0.60	0.55
AirAsia	0.40	0.35	0.30	0.25	0.20
Alliance Air	0.42	0.36	0.32	0.26	0.22
Emirates	0.18	0.15	0.14	0.10	0.08
IndiGo	0.20	0.18	0.16	0.13	0.10

Interpretation: The Zmijewski Model indicates that SpiceJet faces a consistently higher probability of distress. Emirates and IndiGo demonstrate strong resilience with very low Zmijewski scores over the years.

TABLE 4 : Pilarski P-Score Analysis

Airline	2020	2021	2022	2023	2024
SpiceJet	0.88	0.92	0.94	0.89	0.92
AirAsia	0.08	0.07	0.07	0.07	0.00
Alliance Air	0.25	0.27	0.26	0.16	0.08
Emirates	0.24	0.22	0.23	0.15	0.08
IndiGo	0.19	0.25	0.17	0.15	0.12

Interpretation: Pilarski P-Score results show that SpiceJet consistently faces a high probability of bankruptcy. In contrast, AirAsia, Alliance Air, Emirates, and IndiGo show significantly lower P-Scores by 2024, indicating reduced bankruptcy risk.

SUMMARY OF FINDINGS:

- SpiceJet exhibited high financial distress risk, in all four models, for the full 5 years.
- For AirAsia and Alliance Air, financial improvements were also relatively low to moderate, as in most models, they transitioned from high risk area to medium risk area.
- Financially strong carriers Emirates and IndiGo had medium scores in all models suggesting they were not at a high risk of bankruptcy.
- The model was successful in identifying turnaround in performance of Alliance Air and AirAsia through Altman Z-Score.
- The Pilarski P-Score is shown to be applicable to airline specific risk influences at industry.

VI. SUGGESTION:

- Keep the current ratio at a level that will ensure short term financial viability.
- Maximize revenue streams and minimize costs to improve margins, ROI, and asset turnover.
- Lower dependence on heavy debt investments by retaining and creating a balanced structure.
- Optimize process management and return on asset effectiveness to improve operational efficiency and sustainability.
- Continuously review financial indicators through several models for risk management.
- Levy on digital and automation to improve cost efficiency and performance monitoring.
- Use scenario planning and risk management to develop better responses to game-changing events

VII. CONCLUSION:

The importance of financial distress prediction models in the airline industry is shown in this investigation. Using four well-known models (Altman Z-Score, Ohlson O-Score, Zmijewski Model and Pilarski P-Score) allowed for a holistic picture of the financial health of large-scale airlines over a five-year period of time. SpiceJet's financial health was consistently proving to be weak necessitating strategic repositioning on a war footing. On the other hand, Emirates and IndiGo both have features of strong financials and operational efficiencies and therefore financially sound. AirAsia and Alliance Air captures moderate risk levels with incremental performance enhancements. Each model emphasized different dimensions of financial distress, including liquidity, profitability, leverage, and efficiency. The Altman model worked particularly well in detecting improvements, and Pilarski's model was more airline-specific. The results indicate that combining models enhances the accuracy of distress prediction. These nuggets of information might be reassuring to policymakers and airline executives to help with future financial planning and crisis management. The results affirm the value of continuous financial monitoring, especially post-pandemic. Investing in predictive analysis tools can prevent major financial collapses. In summary, the study reinforces the importance of multi-model financial diagnostics in securing the sustainability of aviation operations in a volatile economic landscape.

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