

BANKRUPTCY ANALYSIS USING THE ALTMAN Z-SCORE MODEL IN AIRLINE COMPANIES

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ABSTRACT : *Bankruptcy prediction is an essential for evaluating the financial stability of companies, particularly in the aviation industry, which is highly vulnerable to economic fluctuations, high operational costs, and external shocks. The purpose of this study is to evaluate the bankruptcy potential of airlines listed on the Indonesia Stock Exchange using the Altman Z-Score and classify companies into safe, grey, or distress zones. A quantitative descriptive method was employed, utilizing secondary financial data from 2021 to 2024, focusing three companies: PT Air Asia Indonesia Tbk consistently recorded an extremely low Z-Score ranging from -17.52 to -20.24, placing the company in the distress zone throughout the entire period. PT Garuda Indonesia (Persero) Tbk reveals fluctuating performance, with severe distress in 2021 (-12.02), a temporary recovery in 2022 (2.00), but the next period saw a decline into the distress zone in 2023 (-1.42) and 2024 (-1.89). Meanwhile, PT Jaya Trishindo Tbk had a Z-score of 2.82 in 2021, above the safe threshold of 2.60, indicating the safe zone. However, from 2022 to 2024, the company's Z-score declined sharply, falling below 1.10, ranging from -2.96 to 0.98, entering the distress zone, with the lowest in 2022. The Altman Z-Score method indicates that the observed companies experienced significant financial distress during the study period, with Z-Scores below 1.10 from 2021 to 2024, highlighting that external shocks during the COVID-19 pandemic significantly weakened revenue performance while simultaneously accelerating the accumulation of corporate debt, thereby increasing bankruptcy risk in the aviation sector.*

Keywords: *Bankruptcy, Altman Z-Score, Airline.*

Code JEL : G33, G32, L93, C53

INTRODUCTION

As the world's largest archipelagic country, the aviation industry plays a strategic role in Indonesia's connectivity and economic stability, making its financial resilience essential for national mobility and airspace control [1]. In recent years, the sector has faced significant pressure due to global economic instability and the prolonged impact of the COVID-19 pandemic, which has weakened the operational and financial performance of many airlines[2][3][4]. The decline in

passenger demand, operational restrictions, and rising financial obligations have intensified the risk of financial instability within the sector.

However, empirical evidence on predicting financial distress in Indonesian airlines after the pandemic remains limited. Therefore, this study aims to address the lack of comprehensive financial distress assessments, which restricts the understanding of airlines' recovery progress and their exposure to potential bankruptcy risks. This gap highlights the urgency of examining financial performance deterioration and identifying early warning signals of corporate distress. Strengthening empirical evidence in this area is essential to support policy formulation, improve corporate financial sustainability, and enhance the resilience of Indonesia's national transportation system amid ongoing global economic challenges.

LITERATURE REVIEW

There are various factors that can lead a company to be classified as bankrupt. These causes are divided into two main groups: internal factors, such as excessive debt that the company cannot pay back, high operational costs, and external factors, such as unstable global economic conditions[5][6]. The financial health of a company can be reflected in its financial statements[7]. This information is crucial for companies, investors, and creditors involved in business activities. Failure to recognize signals of financial distress can result in losses for companies in both operations and investments.

Financial statements are the final product of a series of processes for recording and summarizing business transaction data in the current period or periods with a more specific time. In order to provide information related to the financial position, performance, and changes in the condition of a company that is useful to a large number of users in decision-making[8]. The financial statements, as stated by [9] are the result of an accounting process at a particular time or a specific period of time, which is used as a means to communicate financial data to interested parties to evaluate the performance and economic state of the company. According to [10] financial statements are the final product of the accounting process that provides information about the company's activities and financial position, so that they can be used as a communication medium for parties who need this information.

Financial statements become more valuable when the information they contain can be utilized to forecast future conditions, thereby assisting users in making well-informed economic decisions. Through further analysis involving comparison, evaluation, and trend examination, it is possible to derive estimates of potential future circumstances[11].

According to Foster in [12] Financial distress reflects a company's inability to meet its financial obligations as they fall due, ultimately leading to bankruptcy. Bankruptcy arises when a firm is no longer capable of fulfilling its liabilities because of financial limitations and insufficient cash flows, hindering it from accomplishing its intended goals. In many cases, bankruptcy results in the termination of business activities and the dissolution of relationships among the parties connected to the company. In [13] financial distress is described as a pre-bankruptcy condition

that is, when a company is unable to meet its financial obligations, and if conditions continue to worsen, it could lead to bankruptcy. In addition, bankruptcy prediction analysis is important for stakeholders because it can help strategic decision-making and risk mitigation before company failure actually occurs [14].

The aviation industry is known to carry a high level of financial risk due to its high sensitivity to global economic fluctuations, high operational costs, and dependence on passenger demand. Research shows that the COVID-19 pandemic has exacerbated these conditions and triggered numerous cases of financial distress and airline bankruptcies across the globe. Studies of the global aviation industry confirm that external shocks such as the pandemic significantly increase the risk of airline financial failure [15]. In operating a company, the primary expectation is the sustainable growth and development of its business. Therefore, entrepreneurs will make every possible effort to prevent the company from entering a state of bankruptcy. One such attempt is conducting an analysis of financial statements, which enables entrepreneurs to obtain information on whether the business is demonstrating positive performance or otherwise. The bankruptcy of a company may be caused by financial distress [16]. Financial distress is a condition in which a company is unable to meet its obligations to creditors upon the due date, whether those obligations are short-term or long-term [17].

There are indicators that the company is in a state of bankruptcy, according to Hani in [18]:

Decline in Assets : A decrease in assets can be indicated by a low total asset value on the balance sheet. This condition is reflected through lower asset turnover, accounts receivable turnover, and inventory turnover, as measured by activity ratios. **Decrease in Sales :** This may occur due to difficulties in formulating effective sales strategies. As a result, reduced business growth and productivity lead to a decline in sales performance. **Decreasing Profit and Profitability :** Revenue and expenses are key determinants of a company's profitability. When revenue increases but expenses rise at a similar rate, profit may not experience significant growth. This situation may occur due to increasing costs or tariffs, which will be reflected in the profit margin used to assess profitability. **Reduction in Working Capital :** Working capital is a crucial component in sustaining business operations, as it indicates a company's ability to finance its daily activities. A higher level of working capital is expected to enhance productivity, which in turn can positively impact profitability. **Increasing Level of Debt :** A high level of debt results in greater obligations to creditors, even if the company remains capable of meeting them. However, excessive debt burdens can reduce profitability due to higher interest and repayment expenses.

Several methods have been developed to analyze financial statements, serving as benchmarks for predicting a company's condition. Previous studies show that these models are quite effective and accurate, although some findings vary, likely due to differences in time spans, samples, populations, and sectors studied [19][20][21].

The bankruptcy prediction method was first introduced by Professor Edward I. Altman in 1968, known as the Altman Z-Score Model. Initially, this model was designed to estimate the likelihood of bankruptcy among manufacturing companies in the United States. Over time, the model has undergone several modifications and adjustments to align with changes in the business

environment and financial accounting policies[22]. The Altman Z-Score method is chosen for its ease of application and its proven ability to provide accurate results in predicting a company's performance and future financial condition, whether the company is potentially in the distress zone, within a vulnerable/grey area, or classified as financially healthy[23].

The Z-score analysis is employed to predict the likelihood of a business experiencing bankruptcy based on specific coefficients, by combining various ratios whose scales are determined through discriminant analysis. This approach reflects the significance of these indicators for the future development of the business, according to Taffler in[24].

The Altman ratio model does not solely focus on the financial aspects of a company but can also be associated with various other indicators that influence the resulting ratios. Thus, the application of the Altman method in a business serves not only to predict potential bankruptcy but also to assist the company in identifying and addressing problematic areas by considering factors such as liquidity, profitability, and operational activities, as stated by Suteja in[18]. The following are the financial ratios used to predict bankruptcy:

Based on the explanation above, it can be concluded that the financial health of a company can be assessed through the analysis of financial ratios derived from the company's financial statements, in order to identify potential financial distress that may lead to bankruptcy. One of the methods that can be used to predict bankruptcy is the Altman Z-Score model, which combines various financial ratios into a single indicator that reflects the company's level of risk. In line with previous research, this study aims to examine whether airline companies listed on the Indonesia Stock Exchange for the 2021–2024 period fall within the distress zone according to the Altman Z-Score model.

H1 : Analyze Working Capital to Total Assets on the Altman Z-Score of airline companies.

H2 : Analyze Retained Earnings to Total Assets on the Altman Z-Score of airline companies.

H3 : Analyze Earnings Before Interest and Taxes to Total Assets on the Altman Z-Score of airline companies.

H4 : Analyze Market Value of Equity to Total Liabilities on the Altman Z-Score of airline companies.

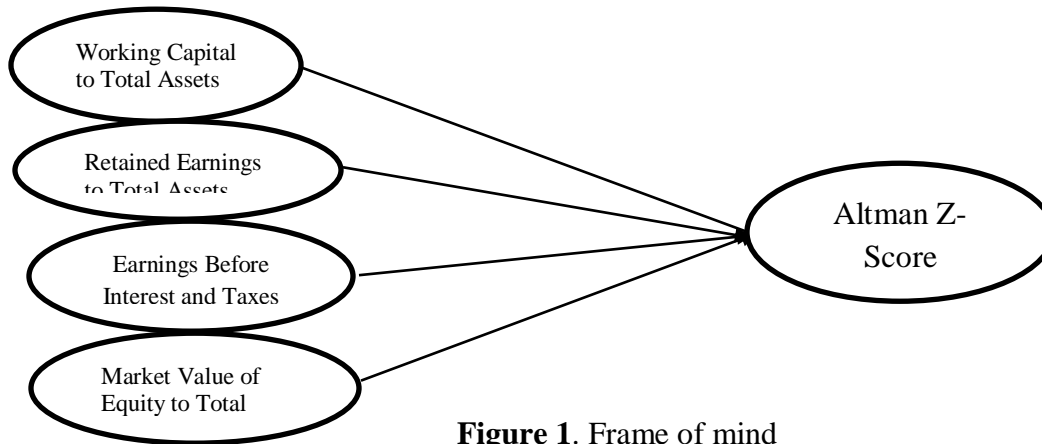


Figure 1. Frame of mind
Resource: owned works

METHODS

This study employs a quantitative descriptive approach, a method used to illustrate, indicate, or constructively summarize data by referring to detailed statistical representations to condense information and identify patterns within a specific data sample [25] it is exploratory in nature, utilizing secondary data collected by other organizations, where the researcher is generally not a member of the organization [26] from a variety of credible sources.

From the availability data on the Indonesia Stock Exchange, we discovered three airline companies: PT Air Asia Indonesia Tbk, PT Garuda Indonesia (Persero) Tbk, and PT Jaya Trishindo Tbk. The primary data include the financial statements for the period 2021 to 2024, comprising the balance sheet, income statement, and cash flow statement, obtained from publications by the Indonesia Stock Exchange.

Although there are various other methods for predicting bankruptcy, such as the Springate and Zmijewski models, this study focuses on a single method, the Altman Z-Score, due to its greater significance in estimating financial distress, as demonstrated by the research conducted by [27]. The Altman Z-Score model employed in this study is the modified Altman model. According to [28] the modified Altman model can be used to predict the potential for bankruptcy across various types of companies, including both manufacturing and non-manufacturing firms. To conduct bankruptcy prediction analysis, this model utilizes financial statement data, such as the balance sheet and income statement. In addition, various studies also state that the Altman model

has a high level of accuracy in predicting bankruptcy, with reported accuracy levels ranging from 80% to more than 90% in various industrial sectors[29].

The ratio values derived from this data are then further analyzed using the Z-score formula as modified by Altman, which is as follows:

$$\mathbf{Z\text{-}Score = 6,56X1 + 3,26X2 + 6,72X3 + 1,05X4}$$

Source: [12],

The modified Altman model can be detailed as follows:

Table 1. Measurement Variable and Indicators

Variable	Indicators
<i>Working Capital to Total Assets</i> [12],[18], [19]	The results of this ratio calculation provide an overview of the company's capability to generate working capital from its total assets. Working capital is defined as the difference between current assets and current liabilities.
<i>Retained Earnings to Total Assets</i> [23],[22], [20]	This ratio reflects the company's ability to generate retained earnings from its total assets.
<i>Earnings Before Interest and Taxes to Total Assets</i> [29], [30], [32]	This ratio provides an indication of the company's ability to generate profit from the assets employed, with profit measured before deducting interest and taxes.
<i>Market Value of Equity to Total Liabilities</i> [34]	This ratio measures the proportion of the company's market value of equity relative to its total liabilities.

Table 2. Assessment Criteria

Z-Score	Indicators
Z < 1,10	Distress Zone (red area)
1,10 < Z < 2,60	Watch Zone (grey area)
2,60 < Z	Safe Zone (green area)

Source: [30]

If the Z-Score is below 1,10, then the company is in the distress zone that could lead to bankruptcy, and the company must pay more attention to exit this zone. Meanwhile, a Z-Score between 1,10 and 2,60 is in the gray area, indicating a financial risk that requires attention but does not necessarily mean bankruptcy. Lastly, a Z-Score above 2,60 indicates the company is safe and free from bankruptcy risk, showing good financial health and strong management stability.

RESULT & DISCUSSION

Before conducting an analysis using the modified Altman Z-Score method on airline companies for the 2021–2024 period. Each ratio reflects different dimensions of corporate financial performance, including liquidity, cumulative profitability, operating efficiency, and market-based solvency.

Table 3. Working Capital to Total Assets period of 2021-2024

Year	Working Capital	Total Assets	Result
PT. Air Asia Indonesia Tbk			
2021	-6.436.187	5.149.094	-1,25
2022	-7.167.036	5.356.962	-1,34
2023	-8.246.183	6.116.294	-1,35
2024	-8.693.368	5.716.560	-1,52
PT Garuda Indonesia (Persero) Tbk			
2021	-5.465.588	7.192.745	-0,76
2022	-879.875	6.235.010	-0,14
2023	-511.382	6.727.645	-0,08
2024	-619.363	6.618.614	-0,09
PT Jaya Trishindo Tbk			
2021	2.775.991	301.477.751	0,01
2022	-59.698.739	226.862.555	-0,26
2023	-102.112.051	205.207.375	-0,50
2024	-28.976.964	178.309.954	-0,16

Source: Processed Data (2025)

The calculation of Working Capital to Total Assets for PT Garuda Indonesia (Persero) Tbk and PT Air Asia Indonesia Tbk during the 2021–2024 period, Table 3 shows negative values each year. If this situation persists, it could lead both companies into a more critical condition, namely, financial distress, and may even result in bankruptcy if not addressed promptly and effectively. In contrast, PT Jaya Trishindo Tbk recorded a positive value in 2021, indicating that the company was able to meet its obligations. However, in the subsequent period from 2022 to 2024, the values turned negative, implying that the company was unable to fulfill its obligations. If this trend continues, PT Jaya Trishindo Tbk may face the same fate as PT Garuda Indonesia (Persero) Tbk and PT Air Asia Indonesia Tbk.

Table 4. Retained Earnings to Total Assets period 2021-2024

Year	Retained Earnings	Total Assets	Result
PT. Air Asia Indonesia Tbk			
2021	-11.580.239	5.149.094	-2,25
2022	-13.230.134	5.356.962	-2,47
2023	-14.311.462	6.116.294	-2,34

Year	Retained Earnings	Total Assets	Result
2024	-15.838.936	5.716.560	-2,77
PT Garuda Indonesia (Persero) Tbk			
2021	-7.418.846	7.192.745	-1,03
2022	-3.678.709	6.235.010	-0,59
2023	-3.432.485	6.727.645	-0,51
2024	-3.505.981	6.618.614	-0,53
PT Jaya Trishindo Tbk			
2021	51.555.673	301.477.751	0,17
2022	-34.162.632	226.862.555	-0,15
2023	-33.502.603	205.207.375	-0,16
2024	-26.441.304	178.309.954	-0,15

Source: Processed Data (2025)

It is observed that the Retained Earnings to Total Assets ratio for PT Air Asia Indonesia Tbk and PT Garuda Indonesia (Persero) Tbk during the 2021–2024 period is negative. Table 4 shows to negative retained earnings, which resulted from continuous losses incurred throughout this period. Meanwhile, PT Jaya Trishindo Tbk recorded a positive Retained Earnings to Total Assets ratio in 2021. However, from 2022 to 2024, the values turned negative, reflecting a trend similar to that experienced by PT Garuda Indonesia (Persero) Tbk and PT Air Asia Indonesia Tbk.

Table 5. Earnings Before Interest and Taxes to Total Assets period 2021-2024

Year	EBIT	Total Assets	Result
PT. Air Asia Indonesia Tbk			
2021	-1.676.231	5.149.094	-0,33
2022	-1.314.863	5.356.962	-0,25
2023	-701.928	6.116.294	-0,11
2024	-1.098.855	5.716.560	-0,19
PT Garuda Indonesia (Persero) Tbk			
2021	-3.960.812	7.192.745	-0,55
2022	4.347.814	6.235.010	0,70
2023	691.371	6.727.645	0,10
2024	398.538	6.618.614	0,10
PT Jaya Trishindo Tbk			
2021	19.023.398	301.477.751	0,06
2022	-73.288.238	226.862.555	-0,32
2023	8.527.351	205.207.375	0,04
2024	12.941.785	178.309.954	0,07

Source: Processed Data (2025)

Based on the calculations presented in Table 5, the Earnings Before Interest and Taxes to Total Assets ratio for PT Air Asia Indonesia Tbk from 2021 to 2024 is negative. This is attributed to the impact of the COVID-19 pandemic, which, according to [18][3], led to a decline in the company's revenue, thereby reducing operating profit and delaying recovery in subsequent periods. For PT Garuda Indonesia (Persero) Tbk, the X3 ratio in 2021 was also negative due to the same factors affecting PT Air Asia Indonesia Tbk. However, in the 2022–2024 period, PT Garuda Indonesia (Persero) Tbk recorded positive values, reflecting an increase in operating income from both scheduled and non-scheduled flight operations. Meanwhile, PT Jaya Trishindo Tbk recorded a favorable X3 ratio in 2021, indicating the company was able to generate profit from revenue after deducting operational expenses. In 2022, the ratio turned negative due to the impact of the COVID-19 pandemic, which caused a decline in operating revenue, compounded by the global economic contraction resulting from the Russia-Ukraine conflict, leading to increases in commodity prices, as reflected in the financial statements of PT Jaya Trishindo Tbk (2022). Meanwhile, in the 2023 and 2024 periods, PT Jaya Trishindo Tbk recorded positive values, supported by a surge in revenue and the company's ability to optimize expense management.

Table 6. Market Value of Equity to Total Liabilities period 2021-2024

Year	Market Capital	Total Liabilities	Result
PT. Air Asia Indonesia Tbk			
2021	1.966.062	10.330.589	0,19
2022	2.051.543	12.172.269	0,17
2023	1.335.640	14.018.410	0,10
2024	918.920	14.018.410	0,06
PT Garuda Indonesia (Persero) Tbk			
2021	5.746.819	189.910.845	0,03
2022	18.570.599	122.573.487	0,15
2023	6.312.174	125.162.066	0,05
2024	6.312.174	130.278.015	0,05
PT Jaya Trishindo Tbk			
2021	271.513.138	160.316.617	1,69
2022	233.201.468	171.960.549	1,36
2023	336.476.404	149.635.941	2,25
2024	224.872.844	115.627.172	1,94

Source: Processed Data (2025)

It can be observed that PT Air Asia Indonesia Tbk experienced a continuous decline in X4 from 2021 to 2024. This was caused by a persistent increase in both short-term and long-term liabilities, which was not proportional to the fluctuating market capitalization, reaching its lowest

value of 0.06 in 2024. For PT Garuda Indonesia (Persero) Tbk, the X4 value increased from 2021 to 2022 due to the company issuing additional shares, raising the number of outstanding shares from 25.88 billion to 91.48 billion by the end of 2024, while liabilities tended to decrease compared to the previous year. However, in 2023 and 2024, the X4 value declined by 66% from the prior year, reaching 0.05, caused by a decrease in market capitalization while liabilities continued to rise. The X4 values for PT Jaya Trishindo Tbk from 2021 to 2024 showed a fluctuating trend. This was influenced by volatile market capitalization, even though liabilities generally decreased from 2022 to 2024. The highest value was recorded in 2023, driven by an increase in market capitalization alongside a reduction in liabilities compared to the previous year.

Based on the calculations of the four variables above, the Altman Z-Score can be determined as follows:

Table 7. Altman Z-Score Modification Model period 2021-2024

Year	6,56(X1)	3,26(X2)	6,72(X3)	1,05(X4)	Z-Score	Zone
PT. Air Asia Indonesia Tbk						
2021	-8,20	-7,33	-2,19	0,20	-17,52	Distress
2022	-8,78	-8,05	-1,65	0,18	-18,30	Distress
2023	-8,84	-7,63	-0,77	0,10	-17,14	Distress
2024	-9,98	-9,03	-1,29	0,06	-20,24	Distress
PT Garuda Indonesia (Persero) Tbk						
2021	-4,98	-3,36	-3,70	0,03	-12,02	Distress
2022	-0,93	-1,92	4,69	0,16	2,00	Watch
2023	-0,50	-1,66	0,69	0,05	-1,42	Distress
2024	-0,61	-1,73	0,40	0,05	-1,89	Distress
PT Jaya Trishindo Tbk						
2021	0,06	0,56	0,42	1,78	2,82	Safe
2022	-1,73	-0,49	-2,17	1,42	-2,96	Distress
2023	-3,26	-0,53	0,28	2,36	-1,16	Distress
2024	-1,07	-0,48	0,49	2,04	0,98	Distress

Source: Processed Data (2025)

Based on Table 7, the Altman Z-Score calculation for PT Air Asia Indonesia Tbk is below 1.10, with the lowest value recorded in 2024 at -20.24, indicating that the company has been in a dangerous financial condition from 2021 to 2024. This is caused by negative working capital, retained earnings, and EBIT relative to total assets, as well as a low market capitalization-to-liabilities ratio, reflecting a high likelihood of financial distress. This situation can be linked to declining operational performance due to inefficient asset utilization and high operational expenses, highlighting the need for cost efficiency and financial restructuring.

For PT Garuda Indonesia (Persero) Tbk, the Z-score indicates a dangerous condition in 2021, 2023, and 2024, although in 2022 the score temporarily increased to 2.00, placing the company in the grey area. This improvement was due to increased revenue from the issuance of additional shares and a reduction in liabilities compared to the previous year. However, this improvement was not sustained in 2023 and 2024, as the company returned to a dangerous

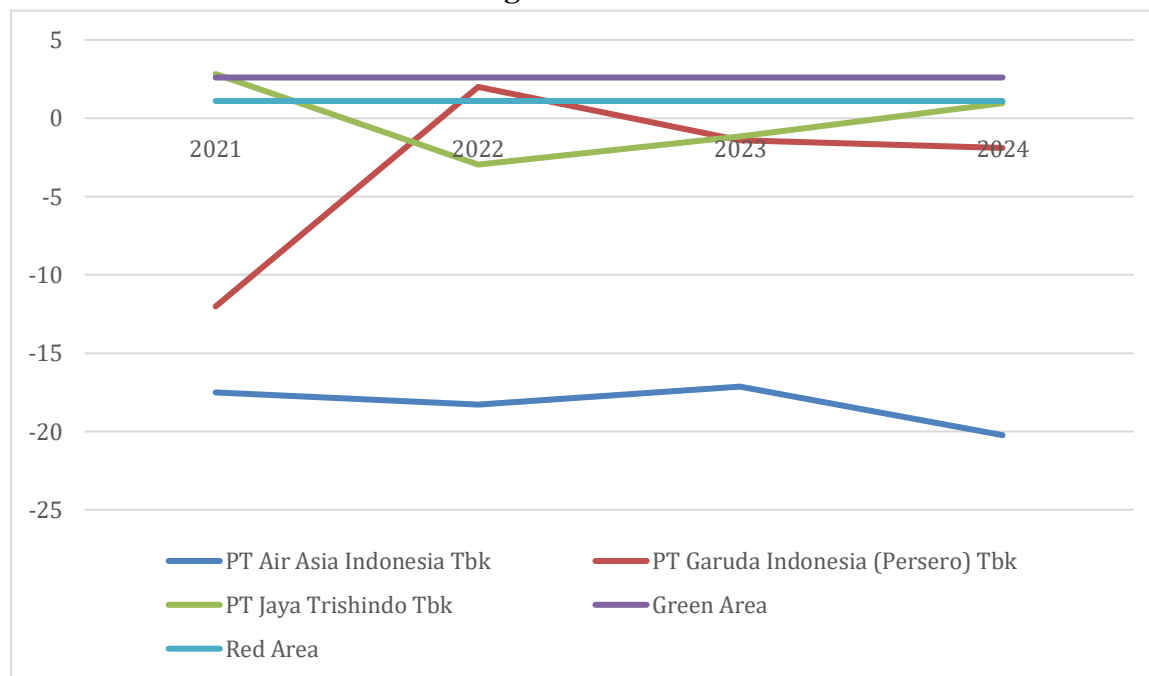
financial state due to negative working capital and retained earnings relative to total assets, declining EBIT from 2023 to 2024, and a weakened market capitalization-to-liabilities ratio. This demonstrates that temporary improvements are insufficient without ongoing operational efficiency.

Meanwhile, PT Jaya Trishindo Tbk was in a healthy condition in 2021, with a Z-score above 2.60. However, from 2022 to 2024, the company fell into a dangerous category due to declining revenue during the COVID-19 pandemic and rising liabilities compared to 2021, which pressured financial performance. Nevertheless, the gradual increase in Z-score from 2022 to 2024 indicates managerial efforts to improve the financial structure, such as debt management, enhanced operational cost efficiency, and increased economic activity post-pandemic.

Based on the above, each company faces financial pressure at different levels but shares common needs: implementing efficiency strategies, restructuring capital, and adapting to external economic factors. These measures are expected to help the companies emerge from financial distress and achieve sustainable financial stability.

Regarding the illustration of the conditions of the three companies, it can be seen in Table 7 below:

Figure 1. Z-Score Trend



Source: Processed Data (2025)

From the table 7, the green area and red area thresholds are indicated, with the zone between them representing the grey area. PT Air Asia Indonesia Tbk recorded its highest value in 2023 at -17.14 and its lowest in 2024 at -20.24. PT Garuda Indonesia (Persero) Tbk achieved its highest value in 2022, reaching 2.00 in the grey area, and its lowest in the previous year at -12.02.

Meanwhile, PT Jaya Trishindo Tbk had its highest value in 2021 at 2.82, within the green area, and its lowest in 2022 at -2.96.

This study aligns with the research of [18], [32], [33] and [34] on bankruptcy prediction in airline companies, which also indicated that the companies fall within the distress zone/red area. From a theoretical perspective, the findings strengthen financial distress theory by confirming that airline bankruptcy risk is driven by multidimensional financial deterioration rather than single financial indicators. From a managerial perspective, the results highlight the importance of liquidity management, cost efficiency strategies, and sustainable capital restructuring. Airline companies must balance operational expansion with prudent liability management to maintain financial resilience, particularly in industries vulnerable to external shocks.

CONCLUSION

This study aims to analyze the potential bankruptcy conditions of Indonesian airline companies listed on the Indonesia Stock Exchange using the Altman Z-Score method for the period 2021–2024. The Altman Z-Score indicates that all three airlines consistently fall into the distress zone ($Z < 1.10$). This reflects weak financial performance due to low operational efficiency and high liability burdens; temporary improvements in financial performance were not sustainable. Also, external factors during the COVID-19 pandemic caused pressure on revenue and increased liabilities. This condition demands strategic steps, such as strengthening cost-efficiency strategies, optimizing the capital structure, adjusting operational policies to enhance financial stability, and adapting to external dynamics, such as the post-pandemic economic recovery and market fluctuations.

The researcher provides the following recommendations for the companies PT Air Asia Indonesia Tbk, PT Garuda Indonesia (Persero) Tbk, and PT Jaya Trishindo Tbk to improve corporate management and become more effective and efficient, thereby avoiding worst-case financial scenarios in the future. For investors, exercise caution when making investment decisions and carefully select companies to minimize potential losses. For future researchers, incorporate additional bankruptcy prediction methods such as Springate, Grover, and Zmijewski to achieve more accurate forecasts by comparing multiple approaches, and consider extending the study period to include a larger dataset.

Author contribution

Conceptualization: S.A.N; S.R.

Methodology: S.A.N; S.R.

Investigation: S.A.N; S.R.

Original Draft Preparation S.A.N; S.R.

Review and Editing: S.R.

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Conflicts of interest

The authors declare no conflicts of interest.

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