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The Application of Z-Score and Zavgren Models in Managing Financial Distress at PT Garuda Indonesia (Persero) Tbk.

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Abstract

As an archipelago, the aviation sector in Indonesia plays an important role, but PT Garuda Indonesia (Persero) Tbk. as one of the airline companies has experienced significant financial pressure. In the third quarter of 2023, the company recorded a net loss of US$ 72.07 million. This condition may put the company at risk of financial distress, a situation in which the company experiences financial difficulties before bankruptcy. This study uses the Altman Z-Score Model and the Zavgren Model to predict potential financial distress at PT Garuda Indonesia (Persero) Tbk. The analysis results show that from 2021 to 2023, the Altman Z-Score is consistently in the 'Bankrupt' category, reflecting a high risk of bankruptcy, while the Zavgren model shows vulnerable conditions in 2021 but also indicates bankruptcy in 2022 and 2023. The results of this study are expected to provide early warning and assist management decision-making to reduce the risk of bankruptcy.

Keywords: Financial Distress, Zavgren, Z-Score, Garuda Indonesia.

1. Introduction

Indonesia is an archipelago with more than 17,000 islands, making the role of the transport sector very important to support community mobility and distribution of goods. One of them is the airline industry, which plays an important role in distribution, mobilization, and connecting hard-to-reach areas. Unfortunately, the airline industry that plays an important role is not directly proportional to the condition of its airline companies, such as PT Garuda Indonesia (Persero) Tbk, which has faced financial pressure in recent years. recorded in the third quarter of 2023 net loss of PT Garuda Indonesia (Persero) Tbk, amounting to US $ 72.07 million. Facing the beginning of 2023, in the first quarter the loss of PT Garuda Indonesia (Persero) Tbk, reached US$ 110.03 million. In addition to debt conditions, increasing operational costs including fluctuations in fuel prices can also put companies at risk of financial distress.

Conditions where the company's finances weaken, experience a decline before bankruptcy or liquidation, and are unable to fulfill all obligations and debts are financial distress. Financial distress occurs before bankruptcy and results in a worsening of the company's financial condition.

In an effort to manage the risk of financial distress, various models to identify potential bankruptcy are used. The Altman Z-Score introduced by Edward Altman is one method that has been widely used. The Altman Z-Score method is often combined with other methods, one of which is the Zavgren method developed by Christina Zavgren (Lisnawati et al., 2021).

Some previous studies show that research on financial distress prediction still has limitations, especially in the use of certain models. Research by Lie, D. et al. (2022) which uses the Altman Z-Score model only focuses on predicting the bankruptcy of PT Garuda Indonesia during the 2016-2020 period. The research revealed that PT Garuda Indonesia faced significant financial difficulties, which could lead to bankruptcy, but does not discuss the Zavgren method, so there is still room to explore other relevant models. On the other hand, a study involved several models including Zavgren, but its scope was limited to manufacturing companies in Indonesia and did not specifically address the aviation sector or PT Garuda Indonesia.

It also investigated the prediction of financial distress in PT Garuda Indonesia using several models, including the Altman Z-Score, but did not include the Zavgren model, thus demonstrating the need to compare various prediction models more comprehensively. A research actually uses the Zavgren model to predict bankruptcy in companies delisted on the Indonesia Stock Exchange (IDX), but does not use the Z-Score model. Previous research on this

research can be seen in Table 1.1. This indicates that there is no research that directly compares the two models in the context of the aviation sector.

Table 1: Research Gap

Researcher	Research Title	Data Objects	Z-Score Model	Zavgren Model	Research Gap
Lie, D. et al. (2022)	*Analyzing the Potential of Bankruptcy using Altman Z-Score: A Case Study of PT Garuda Indonesia*	PT Garuda Indonesia financial report for the 2016-2020 period	Yes	No	Zavgren model is not used
This research	Penggunaan Model Z-Score dan Zavgren dalam Manajemen Financial Distress pada PT Garuda Indonesia (Persero) Tbk.	PT Garuda Indonesia (Persero) Tbk.	Yes	Yes	Comparing the use of the Z score model and the Zavgren model

This study uses the Z-Score Model and the Zavgren Model with the aim of predicting the financial distress conditions faced by PT Garuda Indonesia (Persero) Tbk. Through this research, it is expected to provide an early warning regarding the company's financial condition, so that it can assist in making the right managerial decisions to prevent further financial crises. This study offers a more comprehensive approach by comparing the Z-Score and Zavgren Models directly in the context of companies in the aviation sector.

2. Literature Review

2.1 Financial Distress

Companies sometimes do not always go according to plan. Under certain conditions, financial difficulties can be faced by the Company. Financial distress is defined when a company experiences financial difficulties and fails to fulfill its obligations to creditors. Meanwhile, according to Platt and Platt (2002) defines financial distress as a stage of decline in financial condition that occurs before bankruptcy or liquidation. Before the onset of bankruptcy or liquidation, an organization faces significant financial challenges. As a result, financial management is carried out to assess the state of the company to anticipate potential financial difficulties that could lead to bank to bankruptcy.

Financial distress refers to a situation where a company experiences a significant decline in its financial health, which could lead to bankruptcy if not addressed. Companies in financial distress may show several warning signs, such as decreasing dividends, factory closures, operating losses, layoffs, and an inability to meet cash flow obligations (Ilyas et al., 2014). Companies experiencing financial difficulties can still recover if they implement effective management strategies. Timely and appropriate actions are crucial to prevent the situation from worsening into bankruptcy.

2.2 Financial Statement Analysis

Financial statement analysis is a crucial technique used by decision makers to assess a company's strengths and weaknesses by examining its financial data. Ratio analysis, one of the most popular methods, helps in understanding the financial health and performance of a business by relating various estimates within the financial statements. These ratios provide insights into a company's profitability, efficiency, liquidity, and solvency, offering valuable information for stakeholders to make informed decisions. According to Sofyan (2019), such analysis is essential to gauge whether a company’s performance is improving or deteriorating over time.

Several key ratios are used in financial statement analysis. For instance, the Working Capital to Total Assets ratio assesses a company's ability to cover short-term liabilities, while Retained Earnings to Total Assets shows the proportion of profits retained rather than distributed as dividends. Additionally, ratios like Earnings Before Interest and Tax (EBIT) to Total Assets, Market Value of Equity to Total Liabilities, and Sales to Total Assets measure

operational efficiency, solvency, and asset utilization effectiveness, respectively. These indicators collectively reflect a company's ability to generate profit, manage obligations, and optimize asset use.

Other significant ratios focus on liquidity and risk management. The Cash Ratio and Quick Ratio help measure a company's capacity to meet short-term liabilities without relying on inventory sales. The Receivable Turnover ratio indicates credit management efficiency, while Inventory Turnover provides insight into how frequently inventory is sold and replaced. Debt Ratio reflects the proportion of assets financed by debt, and Asset Turnover shows how effectively assets contribute to revenue generation. Together, these ratios offer a comprehensive view of financial stability and operational performance (Lisnawati et al., 2021; Jing et al., 2023; Subagyo & Lumbantobing, 2023).

2.3 Model Altman Z-Score

According to Al-Sulaiti (2007) Edward Altman is a distinguished professor and economist at the Stern School of Business in New York, he pioneered the Altman model in 1968. At first, Altman only introduced this model specifically designed for the manufacturing sector, then refined it to accommodate various business sectors. In 1968, Altman introduced the Multiple Discriminant Analysis approach for the first time, showing a 72% accuracy rate regarding companies that had experienced financial distress two years earlier. After initial application to manufacturing firms, Altman revised the model to include public non-manufacturing firms and then private firms. This revision increases the flexibility of the model and allows its use on various types of companies, including those not listed on stock exchanges and companies from various business sectors (Vineet & Richard, 2008).

According to Altman (1968), the purpose of the Z-Score analysis model is to predict corporate bankruptcy by combining several widely used financial ratios and assigning different weights to each. Z-Score is a score obtained from the calculation of financial ratios. As a result, the Altman Z-Score model can predict or estimate the likelihood of corporate bankruptcy (Al-Sulaiti, 2007).

Although the Altman Z-Score model was developed in the 1960s, it remains a significant tool for predicting financial distress. The Altman Z-Score has shown high predictive accuracy for bankruptcy, with Altman claiming it can predict bankruptcy with an accuracy of around 90% one year in advance and 82% two years in advance. This level of accuracy indicates that the Altman Z-Score is still effective and relevant (Servet, 2024).

2.4 Model Zavgren

Christine V. Zavgren was the first to propose the Zavgren model in 1985. This model is designed to overcome the challenges of predicting corporate bankruptcy, with a particular focus on companies listed on the stock market. Zavgren estimated the model for 5 years to see the probability and accuracy of the model. The model in year 1 can be used because the model in year 1 has significant results (a percentage rate greater than 99%) in distinguishing bankrupt and non-bankrupt companies for 5 years.

This model uses logit analysis to predict bankruptcy. Logit analysis is a statistical technique that models the probability of a binary outcome, such as bankruptcy or non-bankruptcy, based on a set of predictor variables (in this case, the financial ratios). The results of the analysis are shown in the form of probability (in percentage). While the financial ratios that are used in the Zavgren model include Inventory turnover, Receivable turnover, Cash ratio, Quick ratio, ROI, Debt ratio, and Asset turnover.

3. Materials and Methods

3.1 Materials

The object used in this study is the Annual Report of PT Garuda Indonesia for the period 2021 to 2023 which contains financial statements and income statements. Data is taken from the Indonesia Stock Exchange (IDX) website. The tool used for this research is Microsoft Excel.

3.2 Methods

There are two data analysis techniques used, namely:

3.2.1 Model Altman Z-Score

This model is used to determine the company's financial condition with the following steps (Lisnawati et al., 2021):

a. Calculate financial ratios.

b. Perform calculations with the Altman model analysis (Z-Score).

The following in equation (3.1) is the first Altman model equation,

$$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1.0X_5\,, \quad (1)$$

with,

X_1: Working Capital to Total Assets,

X_2: Retained Earning to Total Assets,

X_3: EBIT to Total Asset,

X_4: Market Value of Equity to Total Liabilities,

X_5: Sales to Total Assets.

c. Interpret the results of the calculation or classification in accordance with the cut-off point that has been determined from the Z-Score results. The scores are compared to assess the viability of the company with the following assessment criteria:

a. Not bankrupt if the Z value > 2.99

b. Bankrupt if the Z value < 1.81

c. Grey area if the value of 1.81 < Z < 2.99

3.2.2 Model Zavgren

This model is used to determine the company's financial condition with the following steps (Lisnawati et al., 2021):

a. Calculate financial ratios.

The financial ratios in this model are formulated as in equation (3.2),

$$Y = 0.23883 - 0.108X_1 - 1.583X_2 - 10.78X_3 + 3.074X_4 + 0.486X_5 - 4.35X_6 + 0.11X_7 \quad (2),$$

with,

Y : Multivariable Function,

X_1: Inventory turnover,

X_2: Receivable turnover,

X_3: Cash ratio,

X_4: Quick ratio,

X_5: ROI,

X_6: Debt ratio,

X_7: Asset turnover.

b. Perform calculations with the Zavgren (logit) model with formula (3.3) for each year and classify the results based on the assessment criteria for the Zavgren model,

$$Pi = \frac{1}{1 + e^{Y}} \quad (3)$$

The power of Y represents a multivariable function consisting of constants and coefficients of a set of financial variables or ratios. On the other hand, e has a value of 2.1828 which is a natural number. Financial distress will cluster if the likelihood value almost reaches 1/1 or 100%. The difference between bankrupt and non-bankrupt companies will be seen through this logit analysis. The assessment criteria for the Zavgren model are as follows:

a.The company is declared not bankrupt or healthy if the value of Pi<1.

b. The company is declared bankrupt or potentially bankrupt if the value of Pi = 1 or > 1.

c. Calculate the cut off value using the standard deviation. The determination of the cut off value aims to classify companies in three categories, including healthy, vulnerable, and distress. The lower limit of the interval range determines the maximum score for the determinant of a company said to have poor financial performance so that it can indicate distress or financial difficulties. The upper limit of the interval range determines the minimum score of a company said to have healthy financial performance. Meanwhile, the score between the two limits of the interval range is in the category prone to financial difficulties (Indriyanti & Gustyana, 2021). Standard deviation needs to be sought first before finding the cut off value, the formula for finding the standard deviation is in formula (2.4),

$$SD = \sqrt{\frac{\Sigma(X_i - \bar{X})^2}{n-1}}, \quad (4)$$

where,

SD: Standard Deviation,

Xi : Data i,

$\bar{X}$: Average,

n : Number of samples.

Next is to calculate the Range Interval, with 95% confidence level (α = 0.05).

4. Results and Discussion

4.1 Altman Z-Score Model

Table 2*:* Ratio Values for Altman Z-Score Model in 2021-2023

Ratio	Year			Average
	2021	2022	2023	
Working Capital to Total Assets (X_1)	-0.7599	-0.14112	-0.07601	-0.32567
Retained Earnings to Total Assets (X_2)	-1.0306	-0.58903	-0.5093	-0.70964
EBIT Ratio to Total Assets (X_3)	-0.63	0.63	0.03	0.01
Market Value of Equity to Total Liabilities (X_4)	37.0814	69.5808	21.8596	42.84059
Sales to Total Assets (X_5)	0.185837	0.33682	0.4365	0.3197

Table 4.1, shows that the company has some challenges, such as Working Capital to Total Assets and Retained Earnings to Total Assets are negative throughout 2021 to 2023 with an average of -0.32567 and -0.70964 respectively, reflecting potential liquidity issues and low profit accumulation. The EBIT to Total Assets ratio fluctuates but remains low with an average of 0.01, while the Market Value of Shares to Total Liabilities is quite high with an average of 42.84059, indicating the strength of the company's market value relative to its liabilities. The Sales to Total Assets ratio continued to increase from 2021 to 2023, averaging 0.3197, reflecting the increasing efficiency of sales to assets. Overall, despite liquidity and profitability challenges, strong market value and improved sales efficiency provide a more positive outlook.

Table 3: Calculated Values of Altman Z-Score

Year	Z	Prediction
2021	-4.2475	Bankrupt
2022	1.4277	Bankrupt
2023	-0.25196	Bankrupt

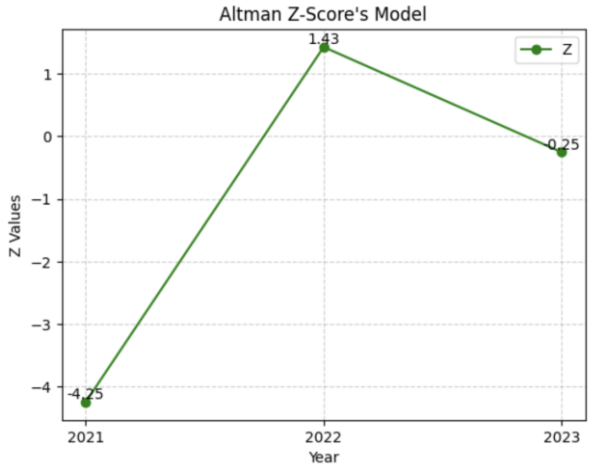

Figure 1: Altman Z-Score calculation results at PT. Garuda Indonesia for the period 2021-2023

Based on Table 4.2, the company's Altman Z-Score results show a trend that indicates a significant risk of bankruptcy during the period 2021 to 2023. In 2021, the Z-Score stands at -4.2475, indicating the company's condition is highly vulnerable to bankruptcy, in line with negative financial ratios, such as Working Capital to Total Assets and Retained Earnings to Total Assets which reflect liquidity issues and low accumulated profits. In 2022, the Z-Score improves slightly to 1.4277, although it is still in the high-risk category. This improvement is supported by a significant increase in the Market Value of Equity to Total Liabilities ratio, reflecting the company's better market strength. However, some ratios such as Retained Earnings to Total Assets and Working Capital to Total Assets remain negative, indicating unresolved financial issues. In 2023, the Z-Score drops again to -0.25196, signaling another deterioration in financial condition, in line with the sharp decline in Market Value of Equity to Total Liabilities.

Although the Sales to Total Assets ratio improved, the efficiency of sales to assets was not enough to fix the underlying liquidity and profitability issues. Overall, the Z-Score results and financial ratios indicate that the company faces serious financial challenges and has remained at risk of bankruptcy for the past three years.

4.2 Zavgren Model

Table 4.3 shows the results of the calculation of ratios for the Zavgren model at PT Garuda Indonesia for the period 2021 to 2023.

Table 4: Ratio Values for Zavgren Model in 2021-2023

Ratio	Year			Average
	2021	2022	2023	
Inventory Turnover	22.28	22.05	18.05	20.79333
Receivable Turnover	12.91	15.9	17.8	15.53667
Cash Ratio	0.84%	8.63%	4.5%	4.66%
Quick Ratio	0.03	0.39	0.39	0.27
ROI	-0.000194	-0.000095	0.000057	-0.000077
Debt Ratio	0.00985	0.01298	0.010145	0.01099
Asset Turnover	0.15	0.31	0.45	0.3033

Based on Table 4.3, it can be seen that the company experienced a decrease in Inventory Turnover from 22.28 in 2021 to 18.05 in 2023, while Receivable Turnover increased from 12.91 to 17.8, reflecting better receivable efficiency. Cash Ratio fell from 8.63% in 2022 to 4.5% in 2023, and Quick Ratio stabilised at 0.39, indicating still low liquidity. While ROI was negative in 2021 and 2022, there was a slight improvement in 2023, although it was still negative overall (-0.000077). The company's Debt Ratio is very low with an average of 0.01099, while Asset Turnover increased significantly from 0.15 in 2021 to 0.45 in 2023, signalling improved asset efficiency. Overall, the company shows improved operational efficiency but faces challenges in improving investment profitability.

Table 4.4 shows the calculation data from the Zavgren model for the 2021-2023 period for the company PT Garuda Indonesia.

Table 5: Calculated Values of Zavgren Model

Year	Y	Pi	Prediction
2021	-22.846	0.9999	Not Bankrupt
2022	-29.532	1	Bankrupt
2023	-31.666	1	Bankrupt

Based on table 4, it is obtained that Y for each year decreases, this is due to the company's poor performance. In 2021, the average value of the probability of financial difficulties (Pi) of the company experiencing the risk of difficulties is 0.9999, meaning that the probability of the company going bankrupt is 99.99% with a very small probability of the company being healthy, namely 0.01%. Whereas for 2022 and 2023 the value of Pi increases to reach 1, indicating that the company has the potential to experience bankruptcy or is in a very risky financial condition.

Further analysis for the Y value uses Standard Deviation. Table 4.5 displays the cut off value for each observation year. The determination of this cut off value aims to group companies into three categories, namely healthy, vulnerable, and distress. The lower limit of this interval determines the maximum score at which a company is considered to have poor financial performance and is potentially in distress. Meanwhile, the upper limit of the interval shows the minimum score which indicates that a company has a healthy financial performance. Companies with scores between the two interval limits are considered to be in a condition that is vulnerable to financial problems. (Indriyanti & Gustyana, 2021)

Table 6: Calculated Values of Cut Off

Standar Deviasi	4.6015
Lower Bound	-39.445
Upper Bound	-16.584

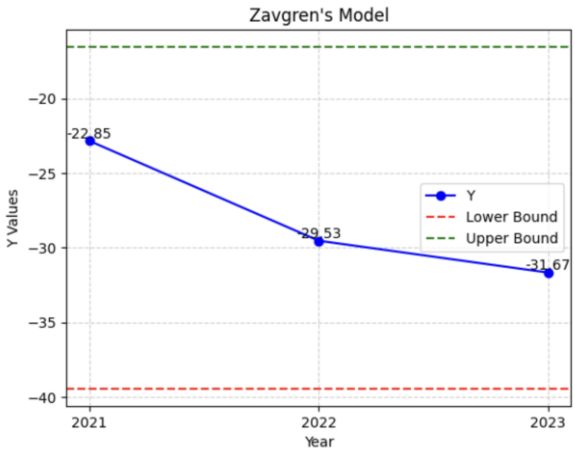

Figure 2: Zavgren calculation results at PT. Garuda Indonesia for the period 2021-2023

In table 4.5, the Y value continues to decline from -22.84 in 2021 to -31.67 in 2023, which also supports the potential worsening of the company's financial condition during that period. However, based on the results of the cut off value obtained, the Y score each year is in the lower bound and upper bound range, meaning that the company is vulnerable to financial difficulties.

4.3 Comparison of Altman Z-Score and Zavgren Model

Table 4.6 shows a comparison of the prediction results between the Altman Z-Score and Zavgren models at PT Garuda Indonesia for the period 2021 to 2023.

Table 7: Comparison of Altman Z-Score and Zavgren model results

Year	Altman Z-Score	Zavgren	
		Pi	Cut-off Point
2021	Bankrupt	Not Bankrupt (High potentially)	Vulnerable
2022	Bankrupt	Bankrupt	Vulnerable
2023	Bankrupt	Bankrupt	Vulnerable

Based on the table, the Altman Z-Score and Zavgren models show different results in 2021. Altman Z-Score states that the company is Bankrupt, while Zavgren assesses the company as Not Bankrupt but with a very high bankrupt potential and in a vulnerable state. However, in 2022 and 2023, both models show that the company is Bankrupt and vulnerable, indicating that the risk of bankruptcy remains high and the company's financial condition is still vulnerable.

5. Conclusion

The Altman Z-Score model consistently shows the risk of bankruptcy from 2021 to 2023, with the Z-Score remaining in the ‘Bankrupt’ category each year.The efforts made by PT Garuda Indonesia (Persero) Tbk. can also be seen from the Sales to Total Assets which continue to increase, indicating the company is successful in using assets to produce optimal sales volume. However, other financial indicators such as Working Capital to Total Assets and Retained Earnings to Total Assets are negative signalling serious problems in liquidity and profitability.

Meanwhile, the results of the Zavgren model show an important difference in 2021, where Zavgren predicts the company is ‘Not Bankrupt’ but in a vulnerable condition. Although the company is vulnerable every year, the potential for bankruptcy remains very high, especially in 2022 and 2023 when the probability of bankruptcy reaches 100%. This is supported by the decline in Y-value, which further worsens the company's financial performance. Then, in 2022 and 2023 it can also be seen that both models agree that the company is at risk of bankruptcy, showing an increase in financial vulnerability.

The Zavgren model also shows an increase in operational efficiency, such as an increase in Receivable Turnover and Asset Turnover. However, profitability indicators such as ROI remain negative, and Cash Ratio and Quick Ratio show low liquidity, reflecting that efficiency improvements have not been sufficient to mask other financial issues.

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