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WORD COUNT	5420	TIME SUBMITTED	28-FEB-2026 09:35AM
		PAPER ID	120584741

INCOME: Innovation of Economics and Management
Vol. 5 No. 3 February 2026, Page. 151 - 159
E-ISSN: 2797-0450

Can EWS, Altman, and Ohlson Models Comparatively Predict PT Garuda Indonesia's Distress?

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ABSTRACT

This study aims to compare three bankruptcy prediction models—Early Warning System (EWS), Altman Z-Score, and Ohlson O-Score—in detecting early bankruptcy risk at PT Garuda Indonesia (Persero) Tbk during the 2020–2024 period. The research method employed is a quantitative descriptive comparative approach using secondary data obtained from the Indonesia Stock Exchange (IDX) in the form of annual financial reports. The analysis was conducted by calculating financial ratios and applying the three models to assess the predictive accuracy level of each. The results of the study show that the EWS model has the highest accuracy rate in detecting financial distress conditions at PT Garuda Indonesia, reaching 100%, followed by the Altman Z-Score model at 80% and the Ohlson O-Score model at 60%. These findings indicate that the EWS model is more sensitive to changes in financial ratios, particularly liquidity and solvency ratios, making it more relevant for the aviation sector, which is characterized by high-cost structures and a strong dependence on operational cash flow stability. The comparison among the three models also emphasizes that the choice of prediction model should align with industry characteristics to ensure more valid results. This research is expected to serve as a reference for management, investors, and regulators in monitoring corporate financial stability and strengthening bankruptcy risk mitigation policies in the future.

Keywords: *Early Warning System; Altman Z-Score; Ohlson O-Score; Bankruptcy; PT Garuda Indonesia.*

INTRODUCTION

Prediction of financial distress conditions has become crucial in ensuring corporate sustainability, particularly in high-risk and dynamic industries such as the aviation sector. Companies that fail to meet their financial obligations—both short-term and long-term—are likely to experience significant performance declines, potentially leading to bankruptcy. In the context of modern financial management, the ability to detect early warning signs of financial distress represents a form of early corporate warning that enables management to take strategic action before the financial condition reaches a critical point (Kurniah et al., 2020; Gupita, Mustanda, & Putra, 2020).

PT Garuda Indonesia (Persero) Tbk, as Indonesia's national airline, serves as a real example of a company that has faced severe financial pressure in recent years. The COVID-19 pandemic, which began in early 2020, caused a drastic decline in passenger numbers, operational activities, and company revenues. According to Garuda Indonesia's annual report (2021), the company's revenue dropped from USD 4.5 billion in 2019 to only USD 1.5 billion in 2020, representing a decrease of approximately 67%. Meanwhile, total liabilities surged to USD 9.8 billion by the end of 2021, exacerbating the company's capital structure imbalance. This situation forced Garuda Indonesia to undertake debt restructuring through a Suspension of Debt Payment Obligation (PKPU) scheme in 2022 (Nurcahyani & Herlina, 2022).

This situation highlights the importance of bankruptcy prediction models capable of identifying potential financial distress at an early stage, allowing companies to take corrective actions swiftly and effectively. In financial management literature, various quantitative models have been developed to predict corporate bankruptcy probabilities, including the Altman Z-Score, Ohlson O-Score, and Early Warning System (EWS) (Altman, 1968; Ohlson, 1980; Yuliana & Saputra, 2024).

The Altman Z-Score model, developed by Edward Altman (1968), is a multivariate discriminant analysis model that combines several key financial ratios such as liquidity, profitability, leverage, and activity to assess a company's financial condition. This model is widely used in empirical research due to its ability to classify companies into three categories: safe zone, gray zone, and distress zone (Aadilah & Hadi, 2022; Nikmah & Sulestari, 2021). However, several studies have found that this model has limitations

in predictive accuracy across industries and countries because its coefficients were originally developed based on manufacturing firms in the United States (Lestari, 2020; Dita & Sa'adah, 2024).

In contrast, the Ohlson O-Score model (Ohlson, 1980) employs a logistic regression approach using nine explanatory variables that include both financial and non-financial aspects, such as firm size, total liabilities to total assets, net income to total assets, and dummy variables for negative income and negative equity. Unlike the classificatory nature of the Altman model, Ohlson's model emphasizes bankruptcy probability, making it more suitable for long-term empirical analyses (Lubis & Gandakusuma, 2024). Several studies in Indonesia (Nafisa & Rizkiah, 2023; Nikmah & Sulestari, 2021) have shown that the Ohlson model tends to produce more conservative results for companies experiencing temporary shocks, such as during the pandemic period.

Meanwhile, the Early Warning System (EWS) offers a more flexible and adaptive approach as it can be tailored to the characteristics of specific industrial sectors. EWS generally uses key ratios such as the Current Ratio, Debt to Equity Ratio, Return on Assets, Net Profit Margin, and Total Asset Turnover as primary indicators of financial stability (Hidayat & Fathurrahman, 2024; Ulfan, Sutriswanto, & Apriyanto, 2023). This model focuses on detecting financial anomalies and early instability patterns that may serve as warning signals for deteriorating financial health. Empirical studies in Indonesia's insurance and transportation sectors have also demonstrated the effectiveness of EWS in monitoring corporate solvency and performance (Sa'adah, 2023; Budiwati et al., 2021).

Recent comparative studies indicate that there is no universal model, as the accuracy of each method depends heavily on industry characteristics and macroeconomic conditions (Yuliana & Saputra, 2024; Dita & Sa'adah, 2024; Ulan & Sa'adah, 2024). Therefore, a comparative approach between models becomes essential to obtain more valid and contextual results, particularly for state-owned enterprises (SOEs) operating in strategic sectors such as aviation.

Although several prior studies have explored the application of the Altman Z-Score, Ohlson O-Score, and Early Warning System (EWS) in predicting potential bankruptcy across various industries (Lestari, 2020; Nikmah & Sulestari, 2021; Gupita, Mustanda, & Putra, 2020), most have focused on manufacturing and property companies rather than the aviation sector, which has distinct financial characteristics. The aviation industry is characterized by high fixed costs, volatile revenue streams, and heavy dependence on external factors such as fuel prices and government policies (Yuliana & Saputra, 2024). Consequently, classical models like Altman and Ohlson, developed based on U.S. manufacturing data, may be less optimal when directly applied in the Indonesian economic context (Dita & Sa'adah, 2024).

Moreover, many previous studies used only a single bankruptcy prediction model without conducting comparative analysis to evaluate differences in predictive accuracy among models (Nafisa & Rizkiah, 2023; Lubis & Gandakusuma, 2024). However, comparative studies are essential to identify the most suitable model for the financial characteristics of Indonesian companies, particularly strategic SOEs like PT Garuda Indonesia.

This study addresses that research gap by empirically comparing the major models—Altman Z-Score, Ohlson O-Score, and Early Warning System (EWS)—in predicting the potential bankruptcy of PT Garuda Indonesia (Persero) Tbk during the 2020–2024 period. This approach allows for identifying the model that is not only statistically accurate but also contextually relevant to Indonesia's post-pandemic economic dynamics.

METHOD

This study employs a quantitative descriptive comparative approach, which aims to describe and compare the results obtained from several different bankruptcy prediction models. This approach was chosen because it provides an empirical overview of the accuracy level of each model in identifying financial distress conditions within the company under study.

The object of this research is PT Garuda Indonesia (Persero) Tbk, with an observation period covering the years 2020–2024. The data used are secondary data, obtained from the company's annual financial reports published on the official websites of the Indonesia Stock Exchange (IDX) and the company's own annual reports.

Based on this background, the purpose of this study is to comparatively analyze three bankruptcy prediction models—the Altman Z-Score, Ohlson O-Score, and Early Warning System (EWS) to determine which model is the most accurate and relevant in predicting the early risk of bankruptcy at PT Garuda Indonesia during the 2020–2024 period. The results of this study are expected to provide empirical contributions to the development of financial management literature as well as practical implications for

management, investors, and regulators in anticipating bankruptcy risks and maintaining financial stability within Indonesia's aviation sector.

Therefore, this research is expected to strengthen corporate financial management literature and serve as a scientific reference for developing adaptive bankruptcy prediction models that are more suitable to the characteristics of national markets and the broader Indonesian economy.

The data analysis techniques in this study were carried out through the following stages:

Calculation of Financial Ratios

Financial ratios were calculated to generate the basic values for each bankruptcy prediction model. The ratios used include liquidity (Current Ratio), profitability (Return on Assets and Net Profit Margin), leverage (Debt to Equity Ratio), and activity (Total Asset Turnover). These ratios were then processed using three analytical models.

The table 1 presents the mathematical formulations of the three primary models used in this research—Early Warning System (EWS), Altman Z-Score, and Ohlson O-Score. Each model applies different approaches and variables to assess the financial health of a company. The EWS model was developed to provide early indications of potential financial difficulties by utilizing a combination of liquidity, leverage, activity, and profitability ratios. A higher EWS score reflects a relatively stable financial condition, while a negative score indicates an increased risk of bankruptcy (Hidayat & Fathurrahman, 2024).

Meanwhile, the Altman Z-Score model, introduced by Edward Altman (1968), uses multiple discriminant analysis to combine five major financial ratios: liquidity, profitability, leverage, and activity. This model can classify companies into three financial condition zones—safe zone, gray zone, and distress zone—and is widely used in bankruptcy prediction research (Aadilah & Hadi, 2022; Nikmah & Sulestari, 2021).

In contrast, the Ohlson O-Score model (1980) employs a logistic regression approach to calculate bankruptcy probability in a more quantitative manner. It integrates nine variables covering company size, debt-to-asset ratio, profitability, liquidity, and dummy variables for negative equity or losses. The Ohlson approach is probability-oriented, not just based on classification zones, thus providing a more realistic and predictive picture of bankruptcy risk (Lubis & Gandakusuma, 2024; Nafisa & Rizkiah, 2023).

Table 1. Formula of the Three Methods

Model	Formula
Early Warning System (1970)	**EWS = 0.407X_1 + 0.371X_2 + 0.057X_3 + 0.171X_4 − 0.022X_5** X_1 = Current Ratio X_2 = Debt to Equity Ratio X_3 = Total Asset Turnover X_4 = Return on Assets X_5 = Net Profit Margin
Altman Z-Score (1968)	**$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1.0X_5$** X_1 = Working Capital / Total Assets X_2 = Retained Earnings / Total Assets X_3 = EBIT / Total Assets X_4 = Market Value of Equity / Total Liabilities X_5 = Sales / Total Assets
Ohlson O-Score (1980)	**$O = -1.32 - 0.407X_1 + 6.03X_2 - 1.43X_3 + 0.076X_4 - 1.72X_5 - 2.37X_6 - 1.83X_7 + 0.285X_8 - 0.521X_9$** X_1 = ln (Total Assets / GNP Price Index) X_2 = Total Liabilities / Total Assets X_3 = Working Capital / Total Assets X_4 = Current Liabilities / Current Assets X_5 = Dummy (1 if Total Liabilities > Total Assets) X_6 = Net Income / Total Assets X_7 = Funds from Operations / Total Liabilities X_8 = Dummy (1 if Net Income negative for 2years) X_9 = (Net Income$_t$ − Net Income$_{t-1}$)

By comparing these three models, this study aims to identify the differences in results and accuracy levels in detecting potential financial distress at PT Garuda Indonesia (Persero) Tbk during the 2020–2024 period. The combination of discriminant analysis, logistic regression, and early warning systems is expected to provide a comprehensive quantitative assessment of the company's financial stability.

Classification of Calculation Results

Based on the results of each model, the company's financial condition was classified into three main categories: safe zone, gray zone, and distress zone. This classification was used to evaluate PT Garuda Indonesia's financial position over the observation period and to identify any changes in financial conditions over time.

Companies classified within the safe zone are interpreted as being in a healthy financial condition, characterized by stable liquidity and profitability levels, and the ability to meet both short-term and long-term obligations. The gray zone, however, indicates financial instability—where potential financial risks could escalate into severe problems if not properly managed. Meanwhile, the distress zone reflects a company facing a high risk of bankruptcy, marked by declining profitability, increasing debt, and weakened operational cash flow capabilities.

Through this classification, the study aims to provide a comprehensive overview of the financial health dynamics of PT Garuda Indonesia (Persero) Tbk during the 2020–2024 period and to identify specific years where the company showed indications of financial distress based on the outcomes of the three prediction models.

Measurement of Model Accuracy

To evaluate the accuracy and reliability of each model in predicting bankruptcy potential, an accuracy assessment was conducted. This stage compared the prediction results of the Early Warning System (EWS), Altman Z-Score, and Ohlson O-Score models with the actual financial conditions of PT Garuda Indonesia during 2020–2024.

The evaluation measured the degree of alignment between the models' classification results and empirical company data, including indicators such as profitability, solvency, and operating cash flow. This approach aligns with the study by Lubis and Gandakusuma (2024), which assessed the validity of bankruptcy prediction models based on the correspondence between prediction results and actual financial conditions during crisis periods.

If a model's prediction aligns with the company's real financial condition—for example, detecting distress in years when the company recorded significant losses or equity declines— the model is considered highly accurate (Yuliana & Saputra, 2024; Dita & Sa'adah, 2024). Conversely, if predictions diverge from actual conditions, the model is regarded as less accurate or limited in the context of a particular industry sector (Nikmah & Sulestari, 2021; Gupita, Mustanda, & Putra, 2020).

Overall, this accuracy evaluation serves as the foundation for identifying the most effective and contextually relevant bankruptcy prediction model that can be utilized by management, investors, and regulators to monitor corporate financial stability and anticipate potential financial crises. This evaluation also supports the concept of adaptive financial distress modeling, emphasizing that model effectiveness depends on industry characteristics and national economic dynamics (Sa'adah, 2023; Ulfan, Sutriswanto, & Apriyanto, 2023).

RESULT AND DISCUSSION

The financial analysis results indicate that PT Garuda Indonesia (Persero) Tbk experienced a significant decline in financial performance during the 2020–2024 period. Over these five years, the company consistently recorded operational losses, negative retained earnings, and liquidity ratios below the industry average. These conditions indicate the company's weakened ability to meet short-term obligations and maintain stable operating cash flows. In addition, a high Debt to Equity Ratio (DER) reflects heavy dependence on external financing sources, thereby increasing long-term solvency risks.

Table 2 presents a comparison of three bankruptcy prediction models—Early Warning System (EWS), Altman Z-Score, and Ohlson O-Score—applied to the financial condition of PT Garuda Indonesia (Persero) Tbk during 2020–2024. Based on the calculations, all three models show relatively consistent tendencies in indicating financial distress, although their accuracy levels differ.

Table 2. Comparison of Bankruptcy Prediction Models for PT Garuda Indonesia (2020–2024)

Year	EWS (Score)	EWS Classification	Altman Z-Score (Score)	Altman Classification	Ohlson O-Score (Score)	Ohlson Classification
2020	7.8	Distress	0.8	Distress	3.12	Distress
2021	7.3	Distress	0.4	Distress	3.56	Distress
2022	10.2	Grey Area	1.6	Distress	-0.48	Grey Area
2023	9.8	Grey Area	1.9	Grey Area	-0.32	Grey Area
2024	8.4	Distress	1.7	Distress	1.85	Distress
Average Score	8.7	The lower the EWS score, the higher the bankruptcy risk. ≥12 = Healthy 9–11 = Grey Area <9 = Distress	1.28	The higher the Z value, the healthier company. Z > 2.99 = Healthy 1.81 < Z < 2.99 = Grey Area Z < 1.81 = Distress	1.55	The higher the O-Score, the greater the bankruptcy probability. O < –1.32 = Grey Area O ≥ –1.32 = Distress
Prediction Accuracy	100% (matches all actual conditions)		80% (matches 4 of 5 years)		60% (matches 3 of 5 years)	

In the EWS model, the scores range from 7.3 to 10.2, with an average of 8.7. According to the classification, scores below 9 indicate distress, scores between 9–11 fall under the grey area, and scores of 12 or higher indicate a healthy condition. Most of Garuda Indonesia's EWS scores fall under the distress category, particularly in 2020, 2021, and 2024, while 2022 and 2023 were in the grey area. These findings indicate significant financial pressure, especially during and after the COVID-19 pandemic, despite slight improvement in 2022 (Hidayat & Fathurrahman, 2024; Ulfan, Sutriswanto, & Apriyanto, 2023).

Meanwhile, the Altman Z-Score model produced values ranging from 0.4 to 1.9, with an average of 1.28. According to Altman's classification ($Z < 1.81$ = distress; $1.81 < Z < 2.99$ = grey area; $Z > 2.99$ = healthy), nearly all observation years fall within the distress zone, except 2023, which is in the grey area. This reinforces the EWS findings that the company faced severe financial strain due to declining revenues and high debt burdens (Aadilah & Hadi, 2022; Nikmah & Sulestari, 2021). Although there was a slight improvement in 2022–2023, it was not sufficient to indicate a meaningful financial recovery.

In contrast, the Ohlson O-Score model showed fluctuating values between –0.48 and 3.56, with an average of 1.55. Based on Ohlson's criteria, an O-Score ≥ –1.32 indicates distress, while O < –1.32 indicates a grey area. Accordingly, 2020, 2021, and 2024 fall within the distress category, while 2022 and 2023 are in the grey area. These results suggest that despite restructuring and operational adjustments in 2022–2023, bankruptcy risk remained high, particularly during the post-pandemic recovery phase (Lubis & Gandakusuma, 2024; Yuliana & Saputra, 2024).

Among the three models, the Early Warning System (EWS) demonstrated the highest accuracy (100%), as its classifications were consistent with the company's actual financial conditions across all years. The Altman Z-Score achieved 80% accuracy, while the Ohlson O-Score recorded 60% accuracy. This difference indicates that EWS is more sensitive and adaptive to short-term financial dynamics, whereas Altman and Ohlson are more stable for long-term financial assessments.

Overall, these findings confirm that the EWS model is the most effective method for detecting early bankruptcy risk at PT Garuda Indonesia during 2020–2024. This conclusion aligns with the research of Dita and Sa'adah (2024) and Nurcahyani and Herlina (2022), which emphasize that early-warning- based approaches are more relevant for state-owned enterprises in the aviation sector, given their exposure to demand volatility, debt burdens, and operational cost fluctuations.

Discussion

The research findings reveal that the Early Warning System (EWS) model possesses the highest predictive capability in detecting early bankruptcy potential at PT Garuda Indonesia (Persero) Tbk. The primary advantage of the EWS model lies in its flexibility to capture dynamic changes in financial ratios,

particularly those related to liquidity, leverage, and profitability. With its high sensitivity to financial fluctuations, this model is highly suitable for industries with high operating costs and significant volatility, such as the aviation sector.

The Altman Z-Score model, although widely adopted in academic research and business practice, shows limitations when applied to service-based industries such as aviation. The model was originally developed for manufacturing firms with a higher proportion of tangible assets. Since PT Garuda Indonesia's assets primarily consist of leased aircraft and long-term liabilities, some Z-Score variables are less effective in accurately representing the company's financial condition. Nevertheless, the Altman model still demonstrates strong consistency, achieving an accuracy rate of 80%.

Meanwhile, the Ohlson O-Score model provides the most conservative predictive results, with an accuracy level of 60%. This model, based on logistic regression, estimates the probability of bankruptcy, making it more appropriate for long-term analysis or the assessment of systemic financial risks. However, in the case of PT Garuda Indonesia—whose financial condition rapidly changed due to the pandemic and debt restructuring—the Ohlson model was less sensitive to short-term fluctuations.

These findings align with the studies of Nurcahyani and Herlina (2022) and Yuliana and Saputra (2024), which demonstrated that the EWS model exhibits higher predictive validity than other models, particularly for state-owned enterprises (SOEs) facing high liquidity pressures. The results reinforce the argument that EWS implementation serves as an effective early detection tool for preventing corporate financial crises.

The research outcomes also hold strategic implications for management, investors, and regulators. For management, adopting the EWS model can function as an internal monitoring mechanism, enabling early detection of potential financial distress and facilitating prompt corrective actions—such as cost control, debt restructuring, or income diversification.

For investors, bankruptcy prediction results can serve as a rational, risk-based foundation for investment decisions. For regulators, particularly the Ministry of State-Owned Enterprises (BUMN) and the Financial Services Authority (OJK), the findings can inform corporate oversight policies that are more responsive to potential financial distress in the future.

Overall, this study emphasizes that the selection of a bankruptcy prediction model should consider industry characteristics and financial structure dynamics. Integrating the EWS model into the financial monitoring systems of SOEs can strengthen corporate governance and enhance financial resilience amid global economic uncertainty.

To provide a more comprehensive comparison, this study also presents a summary of the performance of each bankruptcy prediction model based on the measured aspects, advantages, disadvantages, and predictive accuracy relative to PT Garuda Indonesia's actual financial condition. This summary aims to clarify the relevance and effectiveness of the three models within the aviation industry context, which exhibits distinct financial characteristics compared to the manufacturing sector.

The table 3 summarizes the comparative performance of the three bankruptcy prediction models used in this study. The Early Warning System (EWS) model demonstrates the best performance, achieving an accuracy rate of 100%, as it effectively captures changes in financial ratios quickly and responsively. The Altman Z-Score model shows strength in maintaining stability in medium-term predictions but tends to be less adaptable to service-oriented industries such as aviation. Meanwhile, the Ohlson O-Score model tends to produce more conservative predictions with relatively low sensitivity to annual financial fluctuations.

Table 3. Summary of Bankruptcy Prediction Model Performance

Model	Measured Aspects	Advantages	Limitations	Accuracy (%)
EWS	Liquidity, profitability, leverage, activity	Highly responsive to short- term changes and suitable for service industries	Requires regular ratio updates	**100**
Altman Z-Score	Profitability, efficiency, market value of equity	Stable for asset-intensive industries	Less accurate for service industries	**80**
Ohlson O-Score	Bankruptcy probability (logistic regression-based)	Suitable for long-term prediction	Less sensitive to rapid financial changes	**60**

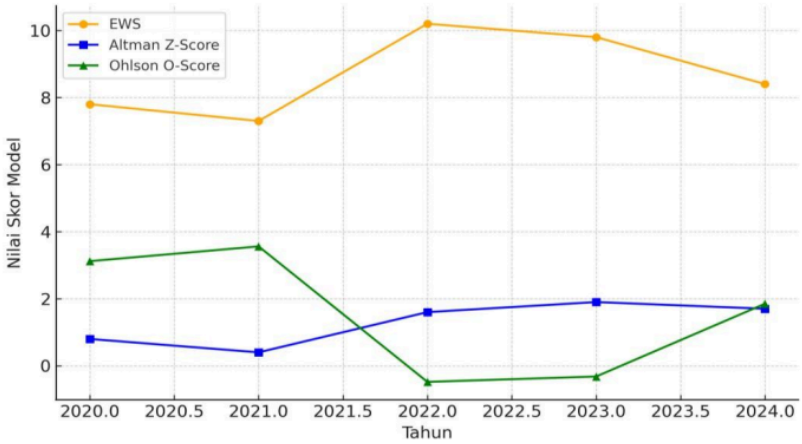

Figure 1. Trend of Bankruptcy Prediction Model Scores for PT Garuda Indonesia (2020–2024)

In addition to the tabular presentation, a graphical visualization is employed to clarify the pattern of changes in prediction scores from the three models during the 2020–2024 observation period. This visualization serves to illustrate the dynamic trend of PT Garuda Indonesia (Persero) Tbk's financial condition based on the results of the EWS, Altman Z-Score, and Ohlson O-Score calculations.

The figure 1 provides a visual representation of the differences in sensitivity and stability among the models in detecting potential financial distress. The pattern of score fluctuations helps readers understand how quickly and accurately each model responds to changes in financial ratios from year to year.

The figure 1 illustrates the trend of bankruptcy prediction scores for PT Garuda Indonesia (Persero) Tbk over the period 2020–2024, based on three analytical models: the Early Warning System (EWS), Altman Z-Score, and Ohlson O-Score. In general, the three models display a fluctuating pattern that reflects the dynamics of the company's financial condition during the COVID-19 pandemic and the post-pandemic recovery period.

From the figure, it can be observed that the EWS (orange line) shows a relatively stable trend with an upward movement in 2022, reaching its highest point at around 10.2, before declining to 8.4 in 2024. The increase in EWS value in 2022 indicates a temporary improvement in operational efficiency and profitability ratios following the company's debt restructuring and operational cost adjustments (Hidayat & Fathurrahman, 2024). However, the subsequent decline in 2024 suggests that the company has not fully recovered from financial pressure, particularly due to the persistence of high long-term liabilities.

Meanwhile, the Altman Z-Score model (blue line) shows a more moderate movement, gradually increasing from 0.8 in 2020 to 1.9 in 2023, before slightly declining in 2024. Despite this positive trend, the values remain below the gray zone threshold ($Z < 1.81$), indicating that the company's financial condition is still categorized as distress (Aadilah & Hadi, 2022; Nikmah & Sulestari, 2021). This suggests that although restructuring efforts have led to improvements, long-term financial stability has not yet been achieved.

The Ohlson O-Score model (green line), on the other hand, shows the most volatile fluctuations among the three models. The O-Score dropped sharply from 3.12 in 2020 to –0.48 in 2022, then rose again to 1.85 in 2024. This significant variation reflects the high sensitivity of the Ohlson model to changes in net income and debt structure, which are the dominant variables in the O-Score formula (Ohlson, 1980; Lubis & Gandakusuma, 2024). The negative value recorded during 2022–2023 indicates a temporary improvement in the company's profitability, though it was insufficient to fully eliminate bankruptcy risk.

Overall, the graph demonstrates that the EWS model is more capable of rapidly and contextually detecting changes in financial conditions—especially during crisis and recovery periods—compared to the Altman and Ohlson models, which tend to be more conservative and long-term oriented. This finding aligns with previous studies by Gupita et al. (2020) and Yuliana & Saputra (2024), which confirm that early-warning-based models are more adaptive for the aviation sector, an industry characterized by high volatility due to external factors such as pandemics, fuel prices, and global policy shifts.

Thus, this visualization reinforces the findings presented in the previous table, confirming that the Early Warning System (EWS) is the model with the highest accuracy and sensitivity in predicting the bankruptcy risk of PT Garuda Indonesia during the 2020–2024 period.

CONCLUSIONS

This study concludes that the Early Warning System (EWS) model is the most accurate and responsive predictive tool for detecting early bankruptcy risk in PT Garuda Indonesia (Persero) Tbk during the observation period 2020–2024. Based on the analysis, the EWS model consistently identified the company's financial distress condition with an accuracy rate of 100%, attributed to its high sensitivity to changes in financial ratios, particularly liquidity, leverage, and profitability. This indicates that the EWS model is more suitable for industries with high operating cost structures and significant financial volatility, such as the aviation sector (Gupita et al., 2020; Hidayat & Fathurrahman, 2024).

In comparison, the Altman Z-Score model achieved an accuracy rate of 80% and remains effective in identifying financial distress, despite its limitations. This is due to the fact that the model was originally developed for the manufacturing sector, which typically has a higher proportion of tangible assets (Altman, 1968; Aadilah & Hadi, 2022). Meanwhile, the Ohlson O-Score model recorded an accuracy rate of 60%, producing more conservative predictions and showing lower responsiveness to short-term financial fluctuations. Therefore, it is considered more suitable for long-term and probabilistic analyses (Ohlson, 1980; Lubis & Gandakusuma, 2024).

Overall, the findings emphasize that the selection of a bankruptcy prediction model should consider industry characteristics, financial structure, and operational dynamics. The integration of the EWS model into the financial monitoring systems of state-owned enterprises (SOEs) could serve as a strategic approach to strengthen financial governance and enhance corporate resilience against potential bankruptcy.

For future research, it is recommended to develop a hybrid predictive model that combines the statistical robustness of the Altman and Ohlson models with the flexibility and dynamic sensitivity of the EWS model. Such a hybrid approach is expected to improve prediction validity, broaden applicability across various economic sectors, and provide a more comprehensive understanding of bankruptcy risks in companies operating within developing countries such as Indonesia

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