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NEW CRITERIA FOR GREEN INDUSTRY BASED ON FINANCIAL DISTRESS

BAGUS SUMARGO[1]*, RENSY HASIBUAN[2], AGUS WIBOWO[3], BAGUS SHANDY NARMADITYA[4], HENITA RAHMAYANTI[5] AND JAMAL M. GAWI[6]

[1]Department of Statistics, Faculty of Mathematics and Natural Science, Universitas Negeri Jakarta, Indonesia. [2]Statisticians, BPS Statistics, Indonesia. [3]Department of Economics Education, Faculty of Economics, Universitas Negeri Jakarta, Indonesia. [4]Faculty of Economics and Business, Universitas Negeri Malang, Indonesia. [5]Faculty of Economics, Universitas Negeri Jakarta, Indonesia. [6]School of Environmental Science, Universitas Indonesia..

**Corresponding author: bagussumargo@unj.co.id*
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Abstract: Companies that receive green industry awards should be healthy companies in terms of capital and technology. However, some companies that have financial issues have also won green industry awards. The purpose of this study is to discover additional variables that supplement existing green industry variables in Indonesia. This study applies a discriminant analysis method to investigate 14 companies that received green industry awards in 2017. Using financial distress criteria, new green industry criteria were proposed. The findings of this study indicate that ten of the companies tested were not in financial distress, while the remaining four had varying degrees of financial distress. This study proposes that financial ratio variables like accounts receivable turnover, working capital turnover and returns on equity be used as new criteria to test the health of green Industry companies.

Keywords: Green Industry, financial distress, discriminant analysis, supplement criteria.

Introduction

Sustainable Development Goals (SDGs) are a global action plan agreed to by world leaders from all 191 United Nations member states, including Indonesia, to end poverty, reduce inequality, and protect the environment. The SDGs contain 17 objectives and 169 targets, which are expected to be achieved by 2030. One of the SDGs' is to build resilient infrastructure, improve inclusive and sustainable industries, and encourage innovation. The World Health Organisation (2016) pointed out that approximately 12.6 million people suffer from environmental health risks each year and the fourth-highest risk factor for premature death worldwide is air pollution. Since this has a significant impact on industrialisation , policymakers and scholars have highlighted the importance of dealing with these issues (Geng *et al*., 2015; Chen *et al*., 2017; Brahmasrene & Lee, 2017, Antoci *et al*., 2018).

In dealing with environmental issues caused by rapid or uncontrolled industrialisation, the government and green activists have pushed for green industry. The fundamental rationale is that the green industry can contribute to future sustainable economic development (Chen *et al*., 2017). The green industry prioritises efforts to efficiently and effectively use resources sustainably to align industrial development with the preservation of environmental functions that also benefit the community (Grillitsch & Hansen, 2019). Green industry requires a commitment towards reducing the environmental impact of the production process (Nunes & Bennett, 2010). In addition, an allocation financial and capital resources to low emission industries and a concentration on green financial products is essential for a green financial environment, so that the economic and environmental benefits of sustainability can be achieved (Wang & Zhi, 2016; Zhu *et al*., 2018; He *et al*., 2019; Fu *et al*., 2022).

The green industry is an approach that is oriented towards increasing efficiency in the use of materials, water and energy, alternative energy, materials that are safe for humans and the environment through economic measures, and low-carbon technology that improve productivity while minimising waste

(Chen *et al*., 2017). Green industry aims to build commerce that intertwines economic, environmental and social considerations (Hall & Dickson, 2011). In a broader sense, the green industry sustainably uses inputs, where the production process requires less water, energy, and materials, reuses and recycles solid waste, reduces any harmful gas emission, and aims to have production processes that are free of toxins that are harmful to human beings . The green industry approach towards any form of growth is to reduce its impact on the environment and the ecosystems of the world (Guo *et al*., 2015; Cortes *et al*., 2016).

In Indonesia, the industrial sector plays a crucial role in national development and economic growth by creating job opportunities (Abdullah & Wasil, 2018; Badriah *et al*., 2019). However, this national economic growth was accompanied by a corresponding increase in the consumption of natural resources. Consequently, the industrial regions have a lower environmental quality index (EQI) when compared with non-industrial areas. For this reason, the use of natural resources in all sectors, including in the industrial sector, needs to be managed wisely. To encourage this, it is necessary for the Indonesian manufacturing industry to switch from the business as usual (BAU) model to a green industry model (Sumargo *et al*., 2018). The Indonesian government has attempted to encourage the development of a green industries by giving incentives such as the green industry awards (Alrasyid, 2016).

However, the transition from a BAU model to a green industry one can be done by making the transition to low-carbon technology, waste minimisation, and use of environmentally friendly waste treatment processes. Meanwhile, Lipsey *et al*. (2008) remarked that changes in technology as a factor of production require a long time to occur. This is because technological changes in a company are generally high cost. In other words, the companies that want to switch from a business as usual to green model must have significant capital to spend due to the high costs involved in a technology transfer. The high cost of a technology transfer mean that a company's liquidity ratio is likely to be severely impacted, even if it is not likely to face bankruptcy, at this stage the company is financially distressed. Financial distress is a stage of decline in corporate financial conditions that occurs before the onset of bankruptcy (Hanzaee, 2010; Altman *et al*., 2019; Khoja *et al*., 2019;).

There is a growing body of literature on how to deal with the environmental issues that affect an industry and companies in financial distress following a switch to a green industry model. For instance, Firdausim and Wessiani (2012) conducted a comparative study and cluster analysis using k-means and fuzzy c-means methods to conduct financial distress analysis on the go-public manufacturing industry in Indonesia. The results of the k-means clustering using the financial ratios approach indicated that the first cluster was a cluster of companies that were not financially distressed. In contrast, second cluster was a cluster of manufacturing companies that were experiencing financial distress. Another study by Pane and Topowijono (2015) showed that the dominant variables that form the discriminant function were net working capital, current ratio, quick ratio and returns on assets.

In addition, Alifiah (2014) mentioned that the independent variables that could be used to predict financially distressed companies in the trading and services sector in Malaysia were debt ratio, total assets turnover ratio, working capital ratio, net income to total assets ratio and base lending rate. Financial distress is often thought of as having a poor financial structure and engaging in financially risky behaviours by firms (Inekwe *et al*., 2018). Therefore, companies receiving green industry awards from the Indonesian Industry Ministry are expected to be healthy companies or those that are not in financial distress. However, there is a lack of available literature that provides a green industry criteria for financially distressed companies. Therefore, further analysis is needed to since the existing criteria does not elaborate

on the financial criteria required of green industry companies.

This present study applies a discriminant analysis to investigate 14 companies that received green industry awards. This study aims to consider the financial aspects that were missing in prior studies, especially in the Indonesian context. The purpose of this study is threefold. First, this study aims to find out the general financial condition of companies that have received green industry awards in Indonesia. This analysis will be based on financial ratios that are under-examined in existing studies. Second, this research intends to analyse the dominant financial ratios that reflect companies in distress that acquire green industry awards in Indonesia. Lastly, this study aims to evaluate how precise the discriminant function is in classifying companies that have won green industry awards in Indonesia.

Literature Review

The interaction between the green industry, green innovation and financial distress has been debated by policy researchers and scholars (Zhang *et al*., 2019; Xie *et al*., 2022; Fu *et al*., 2022). Financial distress occurs before the company experiences bankruptcy; when a company is unable to meet its financial obligations, it is declared as being financially distressed (Dalwai *et al*., 2021). Therefore, the company is required to anticipate the existence of financial issues that could impact ir ability to meet its financial obligations in order to remain standing and compete in the global market. The issue of financial distress involves various aspects and has been analysed from a political theory, legal theory, management, economic, accounting and finance standpoint (Salehi *et al*., 2016). Recent studies have attempted to link green innovation through corporate social responsibilities and provide a criteria for the green industry to follow, or aspire to (Wu *et al*., 2020; Handayati *et al*., 2022).

There is extensive literature that mentions that the green industry can help reduce costs, fight climate change, rethink long-held business practices and open doors to a myriad new opportunities (Lee & Kim, 2016; Never & Betz, 2014; Das & Green, 2010). Some scholars say there is a robust link between green innovation and the value of a firm. For instance, recent research by Xie *et al.* (2022) noted that firms in China can raise their value by implementing green innovations. Indeed, Irfan *et al.* (2022) revealed that government policy intervention is needed to enlarge the green industry as its beneficial to the environment and the value of a company. In the Indonesian context, a study on the mining sector by Handayati *et al.* (2022) pointed out the positive relationship between the corporate social responsibility disclosures of a company and its value.

As far as literature on the relationship between green innovation and financial distress goes, there is very limited research on the criteria that the green industry is required to meet. Existing studies on financial distress and bankruptcy risk have been more focused on the role of corporate social responsibility (Wu *et al*., 2020). To deal with this, a study by Fu *et al*. (2022) suggested the emergence of a green financial environment that is beneficial to companies and policymakers. In addition, the disclosure of information will be advantageous to many parties, including investors, governments and stakeholders, linked to cost reductions, which in turn affects a company's performance (Salehi *et al*., 2017). The significance of this research is that it provides new criteria for the green industry in Indonesia from a financial distress aspect .

Materials and Methods

This study engaged 14 companies that received green industry awards in Indonesia in 2017 and have complete financial statements and data. Secondary data used in this study was also gathered from the Indonesia Stock Exchange and other companies in the same industry. The data collected was from the companies' financial statements, which were then used to calculate the value of variables or financial ratios to be

used to test the research hypothesis in this study. The financial ratios used included the working capital to total assets ratio, earnings before interest and taxes (EBIT) to total assets, sales to total assets, financial leverage, inventory turnover, accounts receivable turnover, working capital turnover, gross profit margins and returns on equity (ROE). Additionally, a cluster analysis was used to divide the companies into two groups, the financial distressed and non-financially distressed categories using the working capital to total assets ratio, EBIT to total assets and sales to total assets ratio. The results of the cluster analysis was used as the dependent variable in the discriminant analysis.

The discriminant analysis also aimed to determine and analyse the dominant financial ratios that indicate the financial condition of the company and to determine the accuracy of the discriminant function to properly classify green industry companies using leverage financial ratios, inventory turnover, account receivable turnover, working capital turnover, gross profit margins and the returns on equity (ROE) ratio as distinguishing variables. In more detail, the several stages of The discriminant analysis was applied at several stages to give the research more depth and make it more detailed. First, discriminant analysis was used against the normal multivariates to test the assumption and the similarity of the diversity matrix (homoscedasticity). Second, the significantly distinguishing variables were selected using a stepwise forward method in the Wilks' Lambda test. Third, the discriminant functions were established. The following are examples of discriminant functions, according to Johnson and Wichern (2007).

$$Z_{jk} = a + W_1X_{1k} + W_2X_{2k} + \cdots + W_pX_{pk} \quad (1)$$

Information:

Z_{jk} = discriminant score of the j-discriminant function for the k-th object

a = intercept

W_i = discriminant weight for the i-th independent variable

X_{ik} = i-th independent variable k-th object.

Fourth, the discriminant functions were evaluated in distinguishing groups using canonical correlations. Fifth, the observations were classified using a comparison of discriminant scores with cutting score values. The cutting scores were calculated using the following formula.

$$\frac{n_1\overline{Z_1} + n_2\overline{Z_2}}{n_1 + n_2} \quad (2)$$

Information:

$\overline{Z_1}$ = average discriminant score in group 1

$\overline{Z_2}$ = average discriminant score in group 2

n_1 = many observations in group 1

n_2 = lots of observations in group 2

Lastly, the accuracy of the discriminant function was evaluated in this research paper using a hit ratio. The hit ratio can be calculated using the following formula.

$$Hit\ ratio = \frac{n_{1c}+n_{2c}}{n_1+n_2} x\ 100\% \quad (3)$$

Information:

n_{1c} = number of objects $\pi 1$ correctly classified as $\pi 1$

n_{2c} = number of objects $\pi 2$ correctly classified as $\pi 2$

n_1 = number of objects $\pi 1$

n_2 = number of objects $\pi 2$

Results and Discussion

The results of this study showed that approximately 93 percent or 13 green industry companies were profitable while the remaining companies suffered losses, loss making companies included Krakatau Steel, a company focusing on steel business. It lost about US$86,097,000 due to the uncertainty of global and domestic economic conditions, which caused the world steel market prices and raw materials to fluctuate that adversely affected domestic steel prices. is The steelmaker found it challenging to maintain its market share, resulting in it not achieving its sales volume target. The company could only achieve 66.35 percent of the target steel sale and 72.58 percent of its target revenue.

Table 1 provides the financial leverage for both non-financially distressed and financially distressed groups with scores of 0.8259 and 0.9537, respectively. The non-financially distressed group have an average debt of 0.83 times of their total capital. Every single unit of debt currency is guaranteed at 1.21 units of currency by capital. Meanwhile, in the financially distressed group, companies have a debt of 0.95 times of the total capital. These findings suggest that the ratio of debt to company capital in not financially distressed group is better than that of the financially distressed group.

Table 1 shows that the average value inventory turnover ratio both from the non-financially distressed and financially distressed groups is positive with the score of 5.5504 and 4.3202. This result means that the velocity of funds embedded in inventory will rotate in one limited period more effectively for non-financially distressed groups. Furthermore, the average accounts receivable turnover for non-financially distressed and financially distressed groups is positive with the score of 7.9153 and 28.3151. This implies that the circulation of funds embedded in accounts receivable will revolve in one period better for the unprofitable group rather than the non-financially distressed group.

The average ratio of working capital turnover of financially sound and financially distressed firms showed a slightly different value, which means that every one unit of current asset currency owned contributes to the creation of 1.24 units of sales currency in the financially healthy group and at 0.96 units of sales currency in the distressed group. The next ratio ,the gross profit margin had marginally different values with scores of 0.2467 and 0.1586, respectively. The cost of goods sold was 75.33 percent of total net sales. This means that each unit of net sales currency contains 0.7533 units of cost of goods sold and contributes to creating 0.2467 units of gross profit currency in profitable companies. These results indicate that every unit of net currency sales, contains 0.8414 units of cost of goods sold and contributed to creating 0.1586 units of gross profit currency. In other word, companies in the financially viable group were doing better than those in the loss-making group.

The average return on equity (ROE) ratio between for profitable and loss-making groups is positive with a value of 0.1065 and 0.0029, respectively. This means that every unit of currency invested in the total equity will generate a net profit of 0.1065 units of currency for the non-financial distress group and 0.0029 units of currency for the financial distress group. In other word, companies in the non-financial distress group have better ROE compared to that those in the financial distress group.

Judging from the financial condition of companies studied or the ratio between EBIT and total assets, it can be understood that there were ten companies included in the first

Table 1: Average financial ratios of sample green industry companies

Finance Ratio	Average	
	Non-financial Distress Groups	Financial Distress Groups
(1)	(2)	(3)
Financial Leverage	0.8259	0.9537
Inventory Turn Over	5.5504	4.3202
Account Receivable Turn Over	7.9153	28.3151
Working Capital Turn Over	1.2449	0.9858
Gross Profit Margin	0.2467	0.1586
ROE	0.1065	0.0029

cluster, namely Arwana Citramulia, Chandra Asri Petrochemical, Fajar Surya Wisesa, Sido Emerging Herbal Medicine and Pharmaceutical Industries, Gresik Petrochemicals, East Kalimantan Fertilizers, Semen Indonesia, Semen Padang, Semen Tonasa, and Timico Fiber Indonesia. The companies that are included in the second cluster are Krakatau Steel, Kujang Fertilizer, Srivijaya Fertilizer, and Toba Pulp Lestari. The results obtained shows that there was no negative EBIT value. However, the second cluster had a ratio between EBIT and total assets which was smaller than the first cluster, the second cluster can be classified as a financial distressed cluster while the first cluster is categorized as a non-financial distressed cluster.

Table 2 shows that a significant difference between the two groups is accounts receivable turn over and ROE. Using the stepwise method to select the financial ratio model that enters the discriminant function produces three financial ratios were used in the preparation of the discriminant function, namely ROE, account receivable turnover, and working capital turn over. The three financial ratios were sufficient representatives of the evaluation of the performance of green industry companies in each group. In addition, it is also sufficient to predict a green industry company's classification in the category of financial distress or non-financial distress. The results of the discriminant function obtained are as follows.

From the discriminant function, the account receivable turnover coefficient of -0.077 meant that each single increase in accounts receivable turnover in one period, would reduce the discriminant score by 0.077 if the other ratios are fixed. Furthermore, the coefficient of working capital turnover was 2.427 which meant that an increase in working capital turnover 1 time each period would increase the discriminant score by 2.427, assuming that the other ratios are fixed. Finally, the ROE coefficient of 11.148 indicated that an increase in return on equity by a unit would increase the discriminant score by 11.148, when other ratios were fixed. With a confidence level of 95 percent, it can be said that the discriminant function is formed (fit) and suitable to distinguish between the two groups of green industry companies.

Canonical correlations in this study showed the relationship between discriminant scores in the groups. The discriminant function t formed is already good, with a canonical correlation value of 0.853. The canonical correlation value squared is 0.727609, which means that 72.76 percent variance of group differences can be distinguished by variables in the discriminant function. Based on this value, it can be said that the relationship between the discriminant scores and the green industry group is quite high. After the discriminant function was formed, the observations are classified by comparing the results of the cutting score with the discriminant score. This comparison resulted

Table 2: Average vector difference test results of the two groups of green industry companies

Finance Ratio	Average		F	p-value
	Non-Financial Distress	Financial Distress		
(1)	(2)	(3)	(4)	(5)
Financial Leverage	0.8259	09537	0.184	0.675
Inventory Turnover	5.5504	4.3202	1.780	0.207
Account Receivable Turnover	7.9153	28.3151	6.482	0.026*
Working Capital Turnover	1.2449	0.9858	1.547	0.237
Gross Profit Margin	0.2467	0.1586	2.867	0.116
ROE	0.1065	0.0029	9.591	0.009*

in one company, the East Kalimantan Fertilizer, being unclassified as belonging to the financially distressed group.

The East Kalimantan fertilizer company could enter the financial distressed group of 0.591. In addition, the terms of the accounts receivable turnover's financial ratios, this company has a ratio above the average of 19.96, where companies that have a high ratio value tend to be in the financially distressed group. Other financial ratios, namely ROE and working capital turnover are below the average of the non-financially distressed group. In 2017, the East Kalimantan Fertilizer company faced several obstacles related to the company's operations. This resulted in a decrease in the realization of Urea and Ammonia production each by 2.9 million tonnes or 6 percent and 3.1 million tonnes or 5 percent from the previous year. In addition to the decline in production realisation, the company also experienced a decline in its sales realisation.

Based on Table 3, it can be said that the function of determining the category of financial distress of green industry companies is able to classify companies appropriately as many as 9 out of 10 companies (90 percent) belonged to the non-financial distressed group, and only one company t was classified as a financially distressed group. The discriminant function that is formed can appropriately classify four companies (100 percent) in the financial distressed group.

From Table 3, the percentage of accuracy in the classification of green industry companies by the discriminant function (hit ratio) was 92.9 percent. Companies that were misclassified have a financial ratio forming a discriminant function, namely account receivable turnover was above the average in the initial group, working capital turnover was below the initial group average, and ROE is also below average and had serious constraints in operation. This indicates that the discriminant function of determining the category of green industry companies is included in a good category.

Conclusion

This study concludes that there were companies that received the green industry award in 2017 experiencing financial distressed or financial difficulties. It can be concluded that the group of non-financially distressed companies has better financial and corporate performance than the financially distressed green industry group. Based on the financial distress criteria, it can be known that a new variable such as green industry criteria were proposed. The findings of the study also indicated that ten companies were found to be in the financially viable, profitable non=distressed category, while the four companies were included in the financially distressed category. This study proposes that the financial ratio variables namely account receivable turnover, working capital turnover, and return on equity be considered as new criteria for green Industry. Several companies that were predicted as green industry-based companies, are experiencing financial difficulties. The green industry criteria used so far, has not included important indicators of financial distress, so the findings in this study are to recommend improvements to the green industry criteria, namely the need to add important indicators to the green industry criteria, namely financial

Table 3: Accuracy in classification of green industry companies

Companies Green Industry Groups		Predicted Membership		Total
		Non-financial Distress	Financial Distress	
Original	Non-financial Distress	9 (90%)	1 (10%)	10 (100%)
	Financial Distress	0 (0%)	4 (100%)	4 (100%)
Cross Validated	Non-financial Distress	8 (80%)	2 (20%)	10 (100%)
	Financial Distress	0 (0%)	4 (100%)	4 (100%)

ratio variables (receivable turnover, working capital turnover, and return on equity).

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