

# **Does COVID-19 Impact on Financial Healthiness of Food and Beverages Companies in Indonesia?**

## **An Application of Altman Z-Score Model and Geographical Information System**

**Siti Rochmah Ika<sup>1\*</sup>, Triyani<sup>1</sup>, Rinda Ayu Arista<sup>1</sup>, Melinda Puspita Sari<sup>1</sup>,  
Ririn Iswantiningsih<sup>1</sup>, and Nur Fikhriah Takril<sup>2</sup>**

<sup>1</sup>Department of Accounting, Janabadra University, Yogyakarta, Indonesia

<sup>2</sup>Kolej Universiti Islam Antarabangsa Selangor, Malaysia

\*Corresponding author: [ika@janabadra.ac.id](mailto:ika@janabadra.ac.id)

### **ABSTRACT**

This article aims to examine whether there is any difference in the financial performance of the food and beverage industry before and during COVID-19 in companies listed on the Indonesia Stock Exchange. This study observes the financial statements of 22 companies in the industry in the period 2019–2021 using the Altman Z-Score bankruptcy prediction model, where 2020 onward represents the period during COVID-19. The descriptive statistics indicate that the Z-Score during COVID-19 on average decreased compared to the period before COVID-19. However, the results of the Wilcoxon signed rank-test showed that the performance of sample companies before and during COVID-19 did not show a significant difference. This study may give insight into the impact of COVID-19 on the financial performance of the food and beverage industry. The results suggest that the performance of the food and beverage industry remains stable despite the pandemic turbulence. A plausible explanation is that the sector was included as an essential industry to fulfill the basic need during the pandemic, so that the industry must maintain its operation during large-scale restrictions. However, the findings are restricted to the industry and national contexts. This study contributes to the literature by creating maps of the financial performance of food and beverage companies in the period before and during the COVID-19 pandemic.

*Keywords: Financial performance, Z-score Altman, food and beverages industry, COVID-19*

## **1. INTRODUCTION**

In a statement released on March 11, 2020, the World Health Organization (WHO) confirmed that the coronavirus has become a pandemic, which is defined as an epidemic that has spread to and had an impact on a number of countries. In a short amount of time, the coronavirus disease (COVID-19) spread throughout a region or the entire planet, resulting in a large number of cases and fatalities (Yilmaz & Şahin, 2021). Approximately 7 million people have died from complications related to coronavirus infection, out of an estimated 700 million total cases worldwide (World Health Organization, 2021). As a result, many aspects of society, including healthcare, economics, politics, and transportation, will undergo profound shifts in the near future.

In 2020, on March 2nd, the Indonesian government reported the first incidence of COVID-19. Following the announcement, the number of confirmed cases of COVID-19 also rose substantially, reaching nearly 1.3 as of February 17, 2021. With this statistic, Indonesia has more confirmed cases of COVID-19 than any other Southeast Asian country (Siregar et al., 2021). The pandemic has significantly impacted various facets of Indonesia, particularly the country's national economy. The period from July to September 2020 witnessed a notable decline in economic growth, with a recorded value of -3.49 percent (Astuti & Mahardhika, 2020). In anticipation of a more severe impact, the Indonesian government implemented a range of initiatives aimed at assisting the populace during these challenging circumstances.

One of the initiatives was large-scale social restriction (PSBB), intended to reduce virus transmission.

The PSBB scenario leads to a decline in individuals' spending and expenditures. The COVID-19 epidemic has had an impact on the consumer goods industry sector, including food and beverages industry. According to a report from PT Moka Teknologi Indonesia (as cited in the Jakarta Post, 2020), a domestic start-up offering digital cashier services to over 30,000 merchants in Indonesia, a notable decline in daily revenues was noticed in the food and beverage sector in 13 out of the 17 cities surveyed. Consequently, prominent restaurant chains, who collectively employ a substantial workforce, have made the decision to temporarily suspend their operations. Included in the list of notable entities are Ismaya Group, boasting a portfolio of over 20 distinct restaurant brands and a widespread presence of over 60 locations across the nation. Additionally, the Boga Group stands out with its extensive operation of more than 150 restaurants, providing employment opportunities to a workforce exceeding 5,000 individuals.

On the other hand, according to the Ministry of National Development Planning Agency abbreviated as Bappenas (2021), in 2020, the food and beverage industry was one of the main sectors, growing by 1.66 percent. Meanwhile, its contribution to the gross domestic product (GDP) of the non-oil and gas processing industry reached 38.29 percent and to the national GDP at 6.85 percent. Hence, the food and beverage industry is a priority industry to be developed.

This article aims to determine if there is a difference in the financial health of food and beverage companies listed on the Indonesia Stock Exchange (IDX) prior to and during COVID-19. Unlike previous studies that use financial ratios individually to assess financial performance (Adi & Daryanto, 2021; Dananti et al., 2022; Paranita & Siska MY, 2022; Wijayanto & Seno, 2022), this study utilizes Altman Z-score bankruptcy prediction model (Altman, 1968) to examine the financial healthiness of a company. The Z-score allows the user of financial information to appraise whether a company is in good financial health, in cautious condition, or in distress (Goh et al., 2022; Ika et al., 2021). Furthermore, the Z-score on the Altman model can be used to map the financial performance of the food and beverage industry sector at IDX using the Geographical Information System (GIS). The creation of a map that integrates the Z-score and GIS is the contribution of the study to the literature. To the best of the author's knowledge, this research is the first to map the financial performance of food and beverage companies listed on the IDX. Performance measurement and mapping provide essential information that allows management to effectively monitor several aspects of organizational performance, including progress, enthusiasm, interaction, and issue identification.

The arrangement of this study is as follows: The current literature is reviewed, and hypotheses are proposed in the paper's second section. In the third segment, this study goes into greater depth regarding the methodology. The findings and discussion are reported in Section 4. Finally, final conclusions are drawn, and further research directions are suggested.

## **2. LITERATURE REVIEW**

Research that specifically examines the financial performance of corporations in the period pre- and post-COVID-19 is abundant. In the international arena, the study conducted by Atayah et al. (2022) examines the effects of the COVID-19 pandemic on the financial performance of logistic enterprises in G-20 countries. The findings indicate a notable increase in the financial health of logistics companies in 2020. In general, the data from different nations supports the primary conclusions, indicating that the financial health of logistic enterprises in 14 out of the 20 countries analyzed had a significant increase during the pandemic period. Nevertheless, this study has identified a detrimental financial performance exhibited by logistics companies

across six nations, i.e., among others, the United Kingdom, Russia, Germany, Korea, and Saudi Arabia, during the COVID-19 era.

Alsamhi et al. (2022) analyze the financial health of Indian companies in the construction, hospitality, and food and consumer goods industries that are traded on the Bombay Stock Exchange. The results showed that the tourism, hotel, and consumer industries' financial indicators such as overall income, sales, net profit, and earnings per share, after the pandemic were significantly lower than before the pandemic.

Kubiczek looked into how the epidemic affected 40 different industries in Poland. The research included the years 2017 through 2021, and each year was broken down into four sections. The study found that different sectors were highly sensitive to the problem brought on by the COVID-19 pandemic. While the vast majority of businesses saw a decrease in income, there were several sectors that actually saw a rise in revenue.

Other studies used a literature review method to explain the effect of COVID-19 on tourism industry. These studies conclude that COVID-19 provides severe detrimental impact to the hospitality and tourism sector in Turkey (Ozbay et al., 2022) and in Malaysia (Abhari et al., 2022). The studies then proposed a framework to minimize the impact on tourism sector. Another study observed the agility of the manufacturing food and beverage sector in South Africa in facing the new virus (Telukdarie et al., 2020). The findings demonstrate a robust association between the South African food and beverage manufacturing sector and many critical reactions and mitigations, aligning with international best practices. The mitigation steps have been prioritized based on the specific needs and circumstances of the South African context. There are four key areas that require attention: (1) the modification of marketing tactics; (2) the enhancement of staff skills through upskilling initiatives; (3) the establishment of response groups for emergencies; and (4) the implementation of new safety and health protocols.

In the Indonesian environment, some studies have compared the financial performance of businesses in the pre- and post-COVID-19 eras. These studies observed companies that were included in the LQ-45 index (Paranita & Siska MY, 2022), in the consumer goods industry (Wijayanto & Seno, 2022), in food and beverage companies (Adi & Daryanto, 2021; Dananti et al., 2022), in micro and small medium enterprises (Nosih & Aziz, 2021), and in some industry sectors, i.e., consumer goods, pharmaceuticals, and telecommunication companies (Fajriyanti & Wiyarni, 2022). All of the studies mentioned above utilize some financial ratios individually such as liquidity (cash and quick ratio), profitability (return on assets, return on equity, gross profit margin), solvability (leverage, and debt to equity ratio), and activity ratios (total assets turnover). All of the studies mentioned above utilize some financial ratios individually, such as liquidity (cash and quick ratio), profitability (return on assets, return on equity, gross profit margin), solvability (leverage and debt to equity ratio), and activity ratios (total asset turnover). In the Indonesian environment, some studies have compared the financial performance of businesses in the pre- and post-COVID-19 eras. These studies observed companies that were included in the LQ-45 index (Paranita & Siska MY, 2022), in the consumer goods industry (Wijayanto & Seno, 2022), in food and beverage companies (Adi & Daryanto, 2021; Kristyana Dananti et al., 2022), in micro and small medium enterprises (Nosih & Aziz, 2021), and in a single company of each sector, i.e., consumer goods, pharmaceuticals, and telecommunications companies (Fajriyanti & Wiyarni, 2022). All of the studies mentioned above utilize some financial ratios individually, such as liquidity (cash and quick ratio), profitability (return on assets, return on equity, gross profit margin), solvability (leverage and debt-to-equity ratio), and activity ratios (total asset turnover).

The data analysis reveals that the financial performance of the Indonesian corporations included in blue chip index (LQ 45) has been negatively impacted by the COVID-19 epidemic. The exacerbation of adverse conditions has led to an increase in the leverage ratio, while the

profitability and activity ratio have witnessed a fall, as observed in multiple emerging economies (Paranita & Siska MY, 2022). For research that takes food and beverage industry as the sample, the results demonstrate a reduction in the firm's profitability, activity, and solvability ratios. In contrast, post-pandemic analysis reveals an improvement in liquidity measures including the cash-to-current ratio. Although there was a slight change from before the pandemic to after, it was not statistically significant (Adi & Daryanto, 2021).

As stated in the introduction, this research analyzes a business's financial health using the Altman Z-score distress estimation model (Altman, 1968), which distinguishes this research from the previous research. Z-scores have been shown to be useful in assessing if a company is doing well financially, should exercise caution, or is struggling (Goh et al., 2022; Ika et al., 2021). Based on the results of previous studies showing that, in general, companies face a decline in performance, this study posits that the food and beverage industry experiences a decrease in Z-scores and that the difference in periods pre- and post-pandemic is statistically significant. Hence the hypothesis is stated as follow.

H1: The Z-scores of food and beverage companies are different in periods pre- and post-COVID-19.

### **3. METHODOLOGY**

#### **3.1 Sampling and data**

The research population includes 46 food and beverage companies listed on the IDX as of 31<sup>st</sup> December 2021. This study used purposive sampling to select samples based on the following criteria: (1) the company publishes an annual report for the 2019–2021 period, and the report is available; (2) the report contains complete data related to research.

There are 22 companies that fit the above criteria. The number of sample in the food and beverage companies is consistent with previous study (Wijayanto & Seno, 2021). The data is acquired from the annual reports of companies or audited annual financial reports, which can be accessed on the IDX website, corporate website, or IDN financials website ([www.idnfinancials.com](http://www.idnfinancials.com)).

#### **3.2 Variable**

The Altman Z-score model (Altman, 1968) is a quantitative method used to anticipate financial company distress; although it was originally developed for manufacturing organizations, it has since been adapted so that it can be used for both types of businesses (MacCarthy, 2017). The model has been successfully used in numerous studies of financial difficulty and insolvency (Horváthová & Mokrišová, 2018). If the Z-score is greater than 2.99, a company is in the secure zone; if it is less than 1.81, a company is in the distress zone, which suggests a significant risk of distress during a specific period of time (Altman, 1968). Meanwhile, if the Z-score is 1.81 to 2.99, a company is in the cautious zone or gray area. Using multiple discriminant analysis (MDA), Altman created the first very accurate prediction model (Vavrek et al., 2021).

The model employs the following formula to predict financial difficulties based on the relative importance of the variables X1, X2, X3, X4, and X5.

	$Z - score = 1.2X1 + 1.4X2 + 3.3X3 + 0.4X4 + 1.0X5$	(1)
where,		

	$X1 = \frac{\text{Net working capital}}{\text{Total assets}}$	(2)
	$X2 = \frac{\text{Retained earnings}}{\text{Total assets}}$	(3)
	$X3 = \frac{\text{Earnings before interest and tax}}{\text{Total assets}}$	(4)
	$X4 = \frac{\text{Market value of equity}}{\text{Book value of debt}}$	(5)
	$X5 = \frac{\text{Sales}}{\text{Total assets}}$	(6)

### 3.3 Data analysis

To test whether there are any differences in the Z-score in the period prior to and preceding COVID-19, this study deploys a paired sample t-test or Wilcoxon sign rank test, depending upon the normality of the data. If the data is normally distributed, the paired sample t-test is applied, and otherwise, the Wilcoxon sign rank test. The Z-score is tabulated and compared between the two groups of the period. 2020 and 2021 mark the time after the coronavirus spread, while 2019 exhibits the time before.

As stated earlier, this study utilizes a GIS application to create maps based on financial performance as measured by the Z-score. GIS software facilitates the generation of maps and various geographic visualizations for the purpose of analyzing and presenting information. The visual representations commonly encompass elements such as points, lines, regions, or raster pictures, which may originate from photographs or scanned images (Elmhurst University, 2020). This study employs the ArcGIS tools, developed by Esri, which serve as the primary software solution and are extensively utilized in the field of GIS mapping. The generation of the map is based on the head office address as stated in the annual report of each sample company.

## 4. EMPIRICAL RESULTS

The outline of empirical results is broken down into three sections: descriptive statistics, GIS mapping, and the comparison test.

### 4.1 Descriptive statistic

Table 1 presents the calculation of the Z-score of the sample company from 2019 to 2021. As shown in the table, the three-year trend of the mean score continues to decline from 6.17 in 2019 to 5.15 and 4.98 in 2020 and 2021, respectively. The mean score of the three-year period shows that the companies are in good financial condition, as the Z-scores are all above 2.99. It indicates that despite the economic downturn due to COVID-19, the food and beverage listed companies maintain their financial healthiness.

The highest Z-score in 2019 is 19.1, acquired by PT Delta Djakarta, Tbk (DLTA), a beverage producer in Indonesia. The lowest Z-score is 0.65, obtained by PT Tri Banyan Tirta, Tbk (ALTO), a mineral water producer. In 2020 and 2021, after the COVID-19 spread, the minimum value of the Z-score will be 0.47 and 0.50, respectively, acquired consistently by

ALTO. The maximum value of the Z-score in 2020 is 13.22, also acquired by DLTA. Meanwhile, the highest value of the Z-score in 2021 was obtained by PT Siantar Top, Tbk (STTP), a prominent snack producer in the country.

**Table 1: Statistic descriptive of Z-score from 2019 to 2021**

No	Code	2019	2020	2021	Mean 2020-2021
1	MLBI	14.90	9.86	7.98	8.92
2	ULTJ	3.21	2.61	3.43	3.02
3	STTP	8.06	12.89	12.90	12.89
4	DLTA	19.01	13.22	9.03	11.13
5	PSGO	0.98	0.74	1.73	1.24
6	CEKA	6.82	6.53	7.73	7.13
7	COCO	3.34	2.45	1.86	2.16
8	MYOR	6.09	7.38	6.28	6.83
9	GOOD	5.89	3.63	5.53	4.58
10	NASI	3.77	2.84	2.09	2.47
11	FOOD	2.93	1.42	1.39	1.41
12	SKLT	5.16	5.37	6.56	5.97
13	IIKP	1.48	0.95	0.93	0.94
14	ICBP	13.25	3.35	2.86	3.11
15	INDF	3.40	1.97	1.94	1.96
16	ROTI	6.84	8.74	8.22	8.48
17	ADES	4.22	5.04	7.80	6.42
18	HOKI	13.97	12.30	8.92	10.61
19	CLEO	5.52	5.15	5.32	5.24
20	CAMP	3.79	3.46	3.5	3.48
21	SKBM	2.26	2.84	3.01	2.93
22	ALTO	0.65	0.47	0.5	0.49
	Mean	6.17	5.15	4.98	5.06
	Min	0.65	0.47	0.50	0.49
	Max	19.01	13.22	12.90	12.89
	SD	4.89	3.99	3.34	3.62

As shown in Table 1, some companies experienced better financial performance after the pandemic era, for example, STTP, PT Mayora Indah, Tbk (MYOR), PT Sekar Laut, Tbk (SKLT), and PT Nippon Indosari Corporindo, Tbk (ROTI). These companies are all in the food sector (snacks and bread). Probably, during work-from-home (WFH) time, household consumption related to snacks increases. For easier analysis, the last column in Table 1 presents the financial performance of the sample company after the COVID-19 spread, i.e., the average Z-score in 2020 and 2021.

**Table 2: Statistic descriptive of Z-score category before and after the pandemic spread**

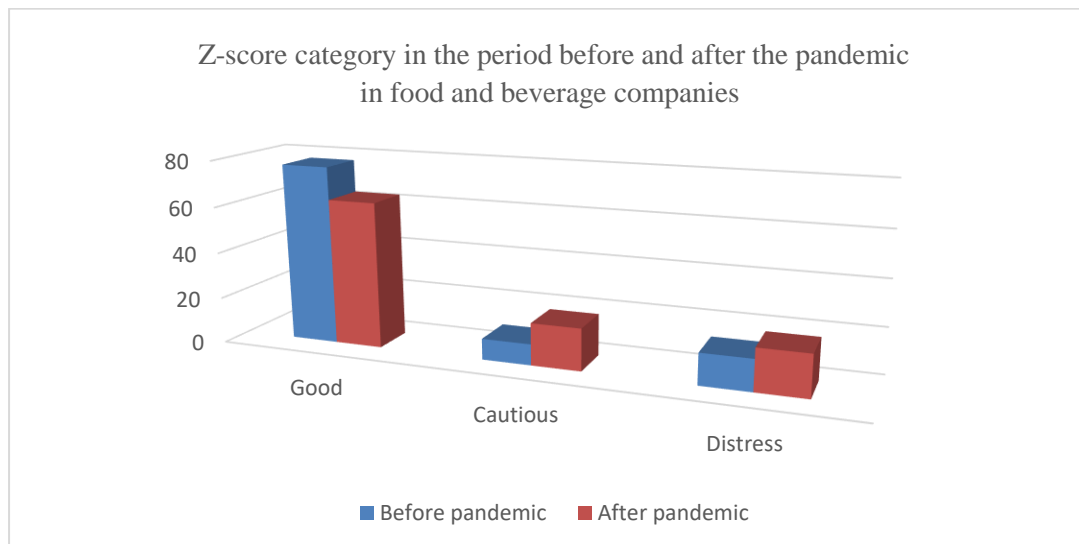
Z-score category	Before pandemic		After pandemic	
	Frequency	Percentage	Frequency	Percentage
<b>Good</b>	17	77.3	14	63.6
<b>Cautious</b>	2	9.1	4	18.2
<b>Distress</b>	3	13.6	4	18.2
<b>Total</b>	22	100	22	100

Table 2 displays the distribution of Z-scores based on the healthiness category. As presented in the table, 17 companies (77.3%) are in good condition as their Z-score was above

2.99 in the period before the pandemic. The good-performing companies, however, declined to 14 (63.3%) in the period after the epidemic spread. The number of cautious companies for which the Z-score is between 2.99 and 1.81 increased from 2 companies (9.1%) to 4 companies (18.2%) in the period after the pandemic. Similarly, the number of distressed companies rose from 3 firms (13.6%) to 4 firms (18.2%) in the period post-pandemic. Despite the decrease in performance in the two categories, however, the majority of food and beverage firms are in good financial shape.

Based on Table 1 and Table 2, the three companies that consistently suffered distress in the pre- and post-COVID eras are ALTO, PT Palma Serasih Tbk (PSGO), and PT Inti Agri Resources Tbk (IIKP). Then, after the pandemic, one more company faced financial difficulty, namely PT Sentra Food Indonesia Tbk (FOOD). Three companies that were previously in good financial condition but then moved to cautious status due to the pandemic are PT Indofood Sukses Makmur Tbk (INDF), the biggest instant noodle producer in Indonesia; PT Wahana Interfood Nusantara (COCO), a chocolate-related product factory; and PT Wahana Inti Makmur Tbk (NASI), a rice producer and distributor.

Figure 1 presents the chart of Z-score category in the period pre and post COVID-19 in the sample company. The data is derived from Table 2.



**Figure 1: Z-score category in the period before and after the pandemic in the sample company**  
 Source: Extracted and modified from Table 2

## 4.2 GIS mapping

This study attempts to create a map of the financial performance of food and beverage companies in the period prior to and preceding COVID-19 using ArcGIS software. The formation of the map is based on the address of each sample company as stated in the annual report. While Figure 2 displays the map of Z-score performance before the pandemic, Figure 3 shows the map after the pandemic.

As shown in Figure 2 and Figure 3, geographically, the majority of the head offices of food and beverage companies listed on IDX are located in Jakarta, Special Region province; some other companies are in East Java. Both Figure 1 and Figure 2 show that the financial performance of the sample companies is commonly in the green color, i.e., a healthy financial condition. The maps may be utilized by the financial analysts or regulatory body in the capital market or to evaluate the performance of a specific industry listed on the country's stock exchange.

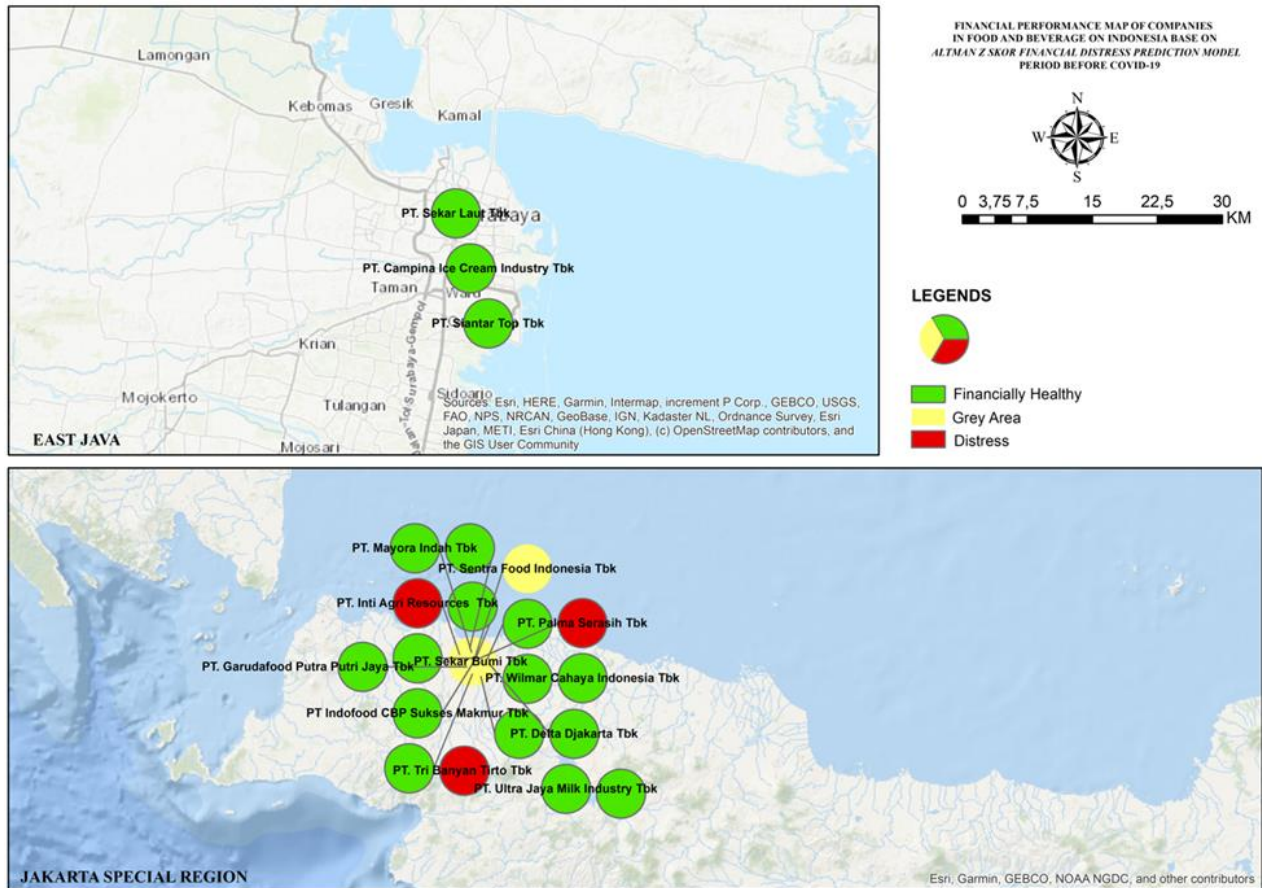


Figure 2: Financial performance map of food and beverage companies listed on IDX based on Z-score category in the period before the pandemic  
 Source: Output of ArcGIS

### 4.3 Test the difference between pre and post COVID-19

Table 3 exhibits the results of the Wilcoxon Sign Rank test to investigate whether the differences in Z-score performance are statistically different. As shown in Table 3, the sig value of all three pairs of the Wilcoxon test is above 0.05. The results indicate that the performance of food and beverage companies did not differ statistically, although there was a slight decline in the period before and after the pandemic. The results are consistent with Adi & Daryanto's study (2021), which used some financial ratios individually, such as return on assets and return on equity, activity ratios, and solvability ratios. It contradicts a previous study that examined the construction company (Daryanto et al., 2021). Therefore, the hypothesis is rejected.

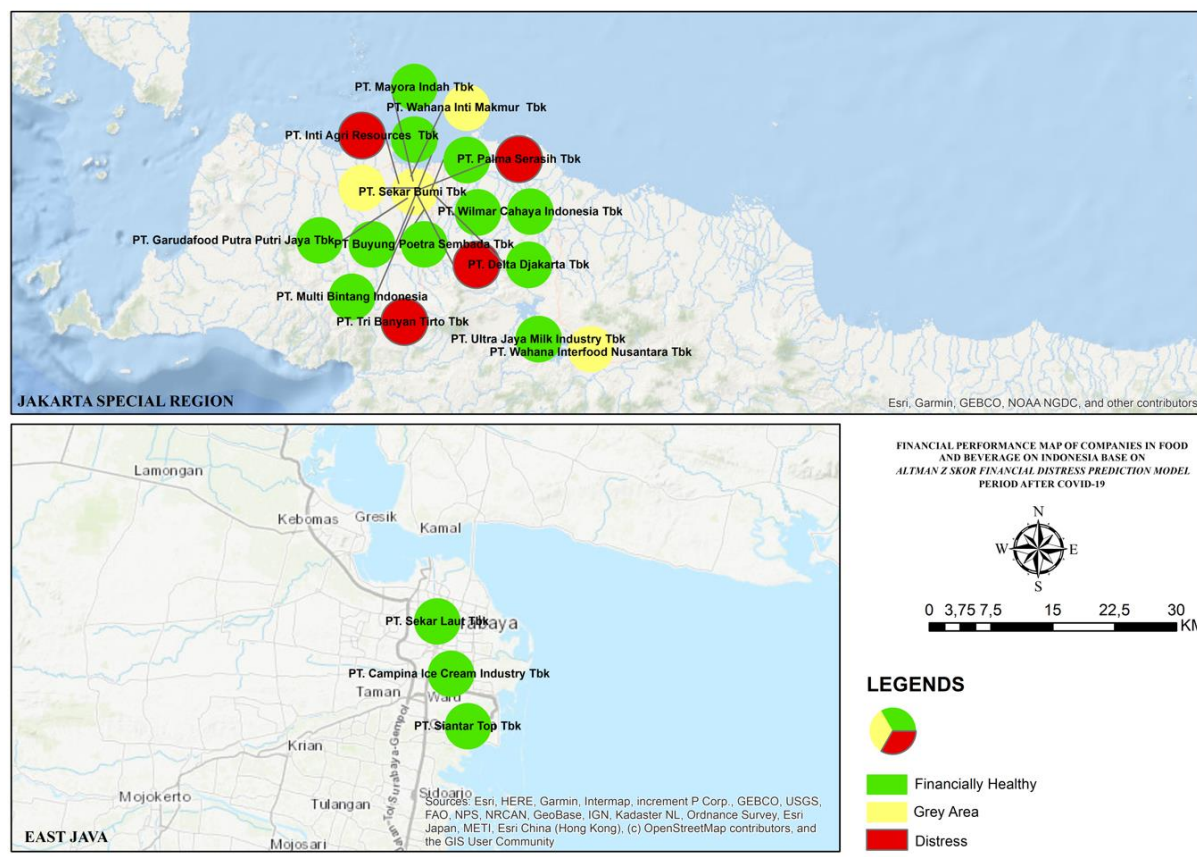
Table 3: Results of the Wilcoxon Sign Rank test of Z-scores

No	Pairs	Mean before	Mean after	Z	Asymp. Sig (2-tailed)
1	Z-score 2019 - Z-score 2020	6.17	5.15	-1,867	0,062
2	Z-score 2019 - Z-score 2021	6.17	4.98	-1,153	0,249
3	Z-score 2019 – Average after COVID-19	6.17	5.06	-1,266	0,205

For the sensitivity analysis, this study also tests the financial performance of the sample company using some financial ratios individually, such as the current ratio, return on assets, leverage, and sales growth. As presented in Table 4, none of the pairs of financial data in the



pre- and post-pandemic periods provided a significant result. All sig. values are above 0.05. Hence, the results presented in Table 4 support the results presented in Table 3, indicating that there was no difference in the performance of the food and beverage industry in the period before and after the outbreak. A plausible explanation for this finding is that food and beverages are closely related to human basic needs. Hence, regardless of the downturn in economics due to COVID-19, the sector maintains its strength.



**Figure 2: Financial performance map of food and beverage companies listed on IDX based on Z-score category in the period after the pandemic**  
Source: Output of ArcGIS

**Table 4: Results of the paired sample t-test of financial ratios**

No	Pairs	Mean before	Mean after	Z	Asymp. Sig (2-tailed)
1	CR 2019 and CR 2020	2.96	7.11	-0,979	0,339
2	CR 2019 and CR 2021	2.96	5.06	-0,894	0,382
3	ROA 2019 and ROA 2020	1.27	1.40	-0,275	0,786
4	ROA 2019 dan ROA 2021	1.27	0.95	0,889	0,384
5	Leverage 2019 and Leverage 2020	0.37	0.37	-0,026	0,980
6	Leverage 2019 and Leverage 2021	0.37	0.36	0,365	0,718
7	Sales Growth 2019 and Sales Growth 2020	497575.55	343956.68	0,885	0,386
8	Sales Growth 2019 and Sales Growth 2021	497575.55	1699386.00	-1,708	0,102

## 5. CONCLUSION

The purpose of this study is to analyze the financial performance of food and beverage companies trading on IDX both before and after COVID-19. Using the Altman Z-Score bankruptcy prediction model, this study analyzes the financial accounts of 22 companies in the industry from 2019 to 2021, with 2020 onwards representing the period during COVID-19. Descriptive statistics show that the Z-Score generally fell during COVID-19 as compared to the pre-COVID-19 time period. The Wilcoxon signed rank test found no statistically significant difference between the pre- and post-COVID-19 performance of the sample companies. The findings imply that the food and beverage business continues to perform well despite global economic uncertainty. One possible justification for the industry's continued operation under widespread challenges is that it was designated as a critical sector to meet fundamental needs during the pandemic. However, the findings are restricted to industry and national contexts. Therefore, further research is urged in the different sectors and country settings.

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