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Study of Potential Insolvency Among Cement Sector Firms Listed on the Indonesian Stock Exchange

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ABSTRACT. This research endeavors to evaluate the likelihood of insolvency for cement manufacturing businesses registered on the Indonesian stock exchange. The unpredictability of the business climate has an effect on the performance of manufacturing firms. This can have repercussions for the possibility of cement sub-sector manufacturing companies going bankrupt. In order to anticipate the potential bankruptcy of a company, financial ratio information can provide signals to investors, analysts, creditors, and company management. For this study, secondary data were obtained by downloading them from the website of the Indonesian stock market. For the purpose of determining whether or not cement subsector manufacturing companies are at risk of going bankrupt, the Almant Z-score statistical method is utilized. Based on the findings, it was determined that PT Indocement Tunggal Perkasa Tbk and PT Semen Batu raja Tbk were among the companies that were classified as being in a stable zone. There was a vulnerable zone or a gray region in which PT Semen Indonesia (Persero) Tbk was operating. The remaining companies, namely PT Solusi Bangun Indonesia Tbk, PT Waskita Beton Precast Tbk, PT Waskita Karya (Persero) Tbk, and PT Wijaya Karya Beton Tbk, are on the verge of defaulting on their financial obligations. This research contributes to strengthening signaling theory and previous research and provides useful information to investors, creditors, analysts, government, company management regarding the threat of potential bankruptcy of manufacturing companies. So that interested parties can take strategic steps in providing warnings for manufacturing companies that are facing financial problems on the Indonesia Stock Exchange.

1. Introduction

The covid-19 pandemic has had a substantial impact on the global economy and on society. The implications of Covid-19 not only cause a large number of casualties, but also slow down global economic activity [1]. The occurrence of large-scale social restrictions has a direct impact on the interaction of company employees in the manufacturing business sector. This has the effect

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of disrupting production activities, product and service supply chains, scarcity of raw material supplies, and decreased demand for products and services on a global scale. Some of these aspects can pose a risk to the bankruptcy of manufacturing companies. Information sourced from the website, Ministry of Law and Human Rights of the Republic of Indonesia, said that the number of companies that experienced bankruptcy in 2020 was 3,877 cases. Including the manufacturing sector, there were 1,329 bankruptcy cases.

Financial distress is a condition that refers to a situation in which the company has difficulty meeting daily operating costs because the company's cash inflows are not sufficient [2]. Symptoms of financial distress will lead to bankruptcy if the company is unable to pay its creditors [3]. In the long run, financial difficulty and the possibility of bankruptcy for manufacturing businesses will reduce the company's economic capacity, which will, in turn, affect the company's ability to give financial rights to its employees, shareholders, and the national economy [4]. Some of the negative consequences that can occur include a decrease in market value, suppliers of goods and services tend to impose cash payment mechanisms at the time of delivery, and customers may cancel their orders [5].

Predicting the company's financial difficulties plays an important role in managing the organization [6] and helps the business community, especially investors and management, to identify the risk of bankruptcy [7]. This is aimed at taking strategic steps in anticipating and finding solutions to overcome financial crises, improving operational efficiency, planning finances better by formulating backup strategies, and allocating resources wisely, and preparing alternative scenarios if risks occur.

Bankruptcy of manufacturing companies in Indonesia often arises as a result of company management being insensitive to changes in the business environment, both due to regulatory changes and other external and internal factors. Early warning system is a research model that can be used to detect early potential bankruptcy of a company [8]. This model can serve to predict the possibility of bankruptcy so that management can make steps or strategies to prevent or improve before a company actually faces a bankruptcy situation. Various prediction models have been developed to assist stakeholders in making decisions related to critical situations, such as bankruptcy. The most popular models used are Altman (1968).

The Altman Z-Score model is a well-known financial analysis technique that was developed by Edward I. Altman in 1968 [9]. Its purpose is to forecast the likelihood that a company may declare bankruptcy in the future. There are five financial parameters that are considered to be essential indications of a company's financial stability. These ratios include comparison of working capital to total assets, comparison of equity to total assets, comparison of operating profit to total assets, comparison of market value of equity to debt, comparison of net income to total assets. Each ratio has a certain weight that reflects its contribution to bankruptcy risk. The

calculation process begins by calculating the individual score of each ratio based on a predetermined formula. The end result of the Altman Z-Score model is a Z score that indicates the level of bankruptcy risk of the company. When the Z score of a company is high, it suggests that the company is not at risk of going bankrupt, however when the Z score is low, it shows that the company is at risk of going bankrupt. The Altman Z-Score model is a useful tool for predicting a company's potential bankruptcy, but should not be used as the only factor in decision-making. Other factors such as economic conditions, industry, and company management also need to be considered.

The objective of this investigation is to forecast the insolvency of cement manufacturing enterprises that are listed on the Indonesia Stock Exchange. Potential bankruptcy in manufacturing companies, including cement sub-sector manufacturing companies, can be caused by slowing economic growth due to Covid-19, intense cement market competition, declining construction activity, high raw material costs, demand fluctuations, changes in environmental regulations, less adoption of new technology and low innovation. It is possible that the profitability of manufacturing enterprises operating in the cement sub-sector could be impacted by some of these factors. By knowing early the potential bankruptcy of cement sub-sector enterprises will be able to provide important information for business people to make economic decisions.

1.1 Stakeholder Theory, Signalling Theory and Financial Distress

Stakeholder theory pioneered by Freeman is based on the argument that there are other groups that are responsible for companies other than shareholders, which groups also have an interest in every action taken by the company [10]. According to this theory, companies must not only work to maximize profits but also the interests of other stakeholders (internal and external) must be equally protected [11]. These groups include employees, customers, suppliers, lenders, and society. The argument implies that managers' responsibilities are not only to shareholders but also to all communities of interest to the company. Furthermore, Harrison & Wicks (2013) explained that the manager's responsibility is not only to focus on economic performance indicators but to develop stakeholder-based performance indicators [12]. This can provide motivation and challenge for managers to develop and examine the values that can be created by the company from the perspective of stakeholders. Managers also need to engage stakeholders and improve managerial capabilities to create more value.

This study places the stakeholder theory perspective in the study of financial distress (potential bankruptcy) by assuming that financial distress is the responsibility of management that should be anticipated and does not interfere with company operations to achieve company goals. In the perspective of stakeholder theory, the company's goal is to create value for the benefit

of its stakeholders [13]. Therefore, the performance of private sector corporations is very important, because inadequate performance and financial difficulties can cause significant losses for many stakeholders [14]. The main focus of all stakeholders is to predict the future success or failure of the company [15].

Signaling theory was pioneered by Spence (1973) explains that a "signal" is an observable characteristic or attribute attached to an object that can be manipulated. The market is a place where signaling occurs and where the main signaler is. The signaler has a large amount of internal information that is not known to the public or has not reached the recipient with the same important signal quality [16].

The relevance of the signaling theory perspective in the study of financial distress is to explain that financial distress as an implication of ineffective management of company resources should be detected early as a signal for stakeholders in making business decisions. Signals are actions taken by the company to provide clues to investors about how management views the company's prospects, including what management has done to fulfill the owner's wishes [17].

Financial distress is a corporate finance topic that examines the situation when the company's operating cash flow is insufficient to cover current debt and the company is forced to take corrective action [18]. Financial distress can have a significant impact where the company's unstable position results in aggressive actions by competitors in seizing opportunities to increase market share [19]. In addition, financial distress can also result in company losses, CEO resignations, dividend reductions, plant closures, layoffs, and plummeting stock prices [18]. Companies that are experiencing financial distress have the potential to experience bankruptcy if the company is unable to pay its creditors [3]. In line with Nuzul & Lautania (2015), financial distress indicates a measurement that indicates difficulty in repaying debt to creditors, or can be referred to as a measure of corporate bankruptcy [20].

Financial distress prediction is a subject that is widely discussed in the literature, continuing to provide new perspectives and contributions, which are particularly relevant to a wide range of stakeholders [14]. Therefore, it is important to develop bankruptcy prediction models that can forecast business failure and its implications at the micro- and macroeconomic level [15]. One of the prediction models that can be used and developed is financial ratios.

Financial ratios have been found significant in at least ten previous studies on the prediction of companies experiencing financial difficulties while macroeconomic variables are selected if they are found significant in at least one previous study [6]. The Altman Z-score is one of the financial distress (potential bankruptcy) assessments that uses a financial ratios approach. The absolute value of the Altman Z-score is taken as an indicator of financial distress (potential bankruptcy) assessment. The higher the Altman Z-score value, the lower the risk of financial distress [21]. Altman's Z-score is useful for investors in assessing the company's financial health

and deciding whether to buy or sell shares of a particular company based on financial strength [22].

Altman (1968) established the original Z-score function for publicly listed manufacturing companies based on statistical significance, variable correlation, and predictive accuracy, namely:

$$Z = 0.012X_1 + 0.014X_2 + 0.033X_3 + 0.006X_4 + 0.999X_5$$

The original Z-score model required absolute percentage values for variables X1 through X4, so Altman introduced a slightly modified version for more practical use [23]:

$$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1X_5$$

2. Method

This study employs a descriptive research design utilizing a quantitative methodology. Secondary data used in this study was gathered from www.idx.co.id, the Indonesia Stock Exchange's official website. The research investigated seven manufacturing companies that are listed on the Indonesia Stock Exchange and operate in the cement sub-sector.

The analytical approach utilized to assess potential bankruptcy is a modified first variant of the Altman Z-Score. Altman categorized financial parameters into five groups that can be used to distinguish between bankrupt and non-bankrupt firms. The Altman Z-Score for manufacturing companies that have gone public is determined using the following formula [9], [23]:

$$Z = 1.2(X1) + 1.4(X2) + 3.3(X3) + 0.6(X4) + 1(X5)$$

The statistical analysis process performed by Altman to produce the Altman Z-Score formula involves the discriminant method, which is a statistical approach used to distinguish or discriminate between two or more groups based on a number of variables. In this case, Altman wanted to differentiate between bankrupt companies (bankrupt group) and companies that were still operating and not bankrupt (non-bankrupt group) based on a number of financial ratios.

The main steps in Altman's statistical analysis are First Altman collects financial data from a number of companies that have gone bankrupt (bankrupt group) and those that are still operating and not bankrupt (non-bankrupt group). This data includes the values of the selected financial ratios that will be used in the analysis. Once the data is collected, Altman normalizes the data to avoid bias that may arise due to scale differences between variables. Normalization is important because financial ratios usually have different scales. Altman then uses discriminant analysis, a statistical technique, to identify which financial ratios are most significantly different between the bankrupt and non-bankrupt groups. This analysis helps determine the most relevant variables in predicting bankruptcy. Once the most relevant variables have been identified, Altman conducts

a regression analysis to find the optimal coefficients for each variable. These coefficients are weights that indicate the relative contribution of each financial ratio in predicting bankruptcy. Finally, Altman combines the optimal coefficients with each normalized financial ratio to form the Altman Z-Score formula. This formula is the result of a statistical analysis that shows the relative role of each financial ratio in distinguishing between companies that are at risk of bankruptcy and those that are not.

The end result of the statistical analysis process is the Altman Z-Score formula as explained earlier:

$$Z\text{ - }Score = 1.2(X1) + 1.4(X2) + 3.3(X3) + 0.6(X4) + 1(X5)$$

This computation can be used to assess the potential bankruptcy of a company based on the value of each financial ratio that has been normalized using a coefficient that has been determined through statistical analysis.

Where:

Z = Financial Distress Index (Overall Index)

X1= Working Capital / Total Assets

X2= Retained Earnings / Total Assets

X3= Earnings Before Interest & Taxes / Total Assets

X4= Market Value of Equity / Total Liabilities

X5= Sales / Total Assets

3. Result and Discussion

3.1 Result

The following is a table to summarize all the results of the Z-Score calculation for all cement subsector manufacturing companies in the research sample:

Table 1. Z-Score Results of Manufacturing Companies Cement Subsector

Cement Subsector	Year				
	2018	**2019**	**2020**	**2021**	**2022**
PT Indocement Tunggal Prakarsa Tbk	10,91	11,22	8,24	6,78	5,48
PT Semen Baturaja Tbk	6,03	2,20	3,50	2,48	1,96
PT Solusi Bangun Indonesia Tbk	0,83	0,84	1,22	1,84	1,79
PT Semen Indonesia (Persero) Tbk	4,11	2,33	2,42	2,03	2,09
PT Waskita Beton Precast Tbk	2,10	1,77	-1,69	-3,00	-1,63
PT Waskita Karya (Persero) Tbk	1,00	0,70	-0,04	0,61	0,34
PT Wijaya Karya Beton Tbk	1,68	1,62	1,35	1,07	1,28

Source: data processed in 2023

The following are the assessment criteria for predicting bankruptcy according to the first Altman model:

Table 2. Initial cutoff point criterion for the Z-Score Model

Guidelines/Criteria	Z value
Safe Zone/Low Risk if Z >	2,99
Vulnerable Zone (*Gray Area*)	1,81-2,99
Hazard/High Risk Zone if Z <	1,81

Source: Altman, E.I. (1968)

Table 3. Z-Score Results of Cement Subsector Manufacturing

Companies	Year				
	2018	2019	2020	2021	2022
PT Indocement Tunggal Prakarsa Tbk	LR	LR	LR	LR	LR
PT Semen Baturaja Tbk	LR	GA	LR	GA	GA
PT Solusi Bangun Indonesia Tbk	HR	HR	HR	GA	HR
PT Semen Indonesia (Persero) Tbk	LR	GA	GA	GA	GA
PT Waskita Beton Precast Tbk	GA	HR	HR	HR	HR
PT Waskita Karya (Persero) Tbk	HR	HR	HR	HR	HR
PT Wijaya Karya Beton Tbk	HR	HR	HR	HR	HR

Source: data processed in 2023

The interpretation / description of Z-Score results is generally safe / low risk (LR): the company tends to be safe from the risk of bankruptcy. Gray Area (GA): the company is in a gray/vulnerable area that requires further monitoring. And danger/high risk (HR): the company has a high risk of bankruptcy.

Table 4. Average Z-Score of Manufacturing Companies Cement Subsector 2018-2022

Company Name	Average	
	Z-Score	Classification
PT Indocement Tunggal Prakarsa Tbk	8.52	Not Bankrupt
PT Semen Baturaja Tbk	3.23	Not Bankrupt
PT Solusi Bangun Indonesia Tbk	1.30	Bankrupt
PT Semen Indonesia (Persero) Tbk	2.59	Gray
PT Waskita Beton Precast Tbk	-0.49	Bankrupt
PT Waskita Karya (Persero) Tbk	0.52	Bankrupt
PT Wijaya Karya Beton Tbk	1.40	Bankrupt

Source: data processed in 2023

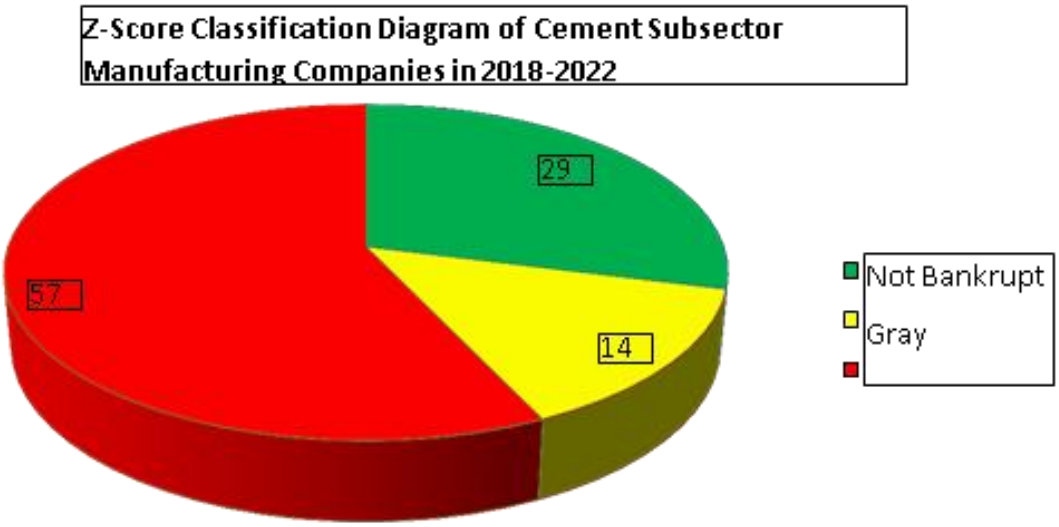

Figure 1.

Based on the Z-Score results in Table 3 for manufacturing companies in the Cement subsector from 2018 to 2022, it can be seen that the financial conditions of several companies show different levels of bankruptcy risk. PT Indocement Tunggal Prakarsa Tbk shows consistency with the "Safe/Low Risk" category throughout the 2018-2022 period, indicating high financial stability. PT Semen Baturaja Tbk, although in the "Safe/Low Risk" category in 2018 and 2020, experienced changes to the "Gray Area" in 2019, 2021, and 2022, indicating fluctuations that need attention. PT Solusi Bangun Indonesia Tbk showed a change in status from "Danger/High Risk" in 2018-2020 to "Gray Area" in 2021, then back to "Danger/High Risk" in 2022. PT Semen Indonesia (Persero) Tbk was in the "Safe/Low Risk" category in 2018, but PT Semen Indonesia changed to "Gray Area" in 2019-2022, while PT Waskita Beton Precast Tbk was in the "Gray Area" category in 2018 but moved to the "Danger/High Risk" category in 2019-2022. PT. Waskita Karya (Persero) Tbk and PT. Wijaya Karya Beton Tbk showed a high level of risk throughout the period, being in the "Danger/High Risk" category from 2018 to 2022.

Table 4 provides an overview of the average Z-Score of manufacturing companies in the cement subsector during the 2018-2022 period. The results of this calculation show different results from each company. PT Indocement Tunggal Prakarsa Tbk (INTP) showed very good financial performance with an average Z-Score of 8.52, which classifies it as "Not Bankrupt". This reflects the company's level of financial safety and stability during the period. PT Semen Baturaja Tbk (SMBR) also showed strong performance with an average Z-Score of 3.23 and was classified as a "Not Bankrupt" company. Although not as strong as INTP, SMBR still showed the ability to overcome the risk of bankruptcy. In contrast, PT Solusi Bangun Indonesia Tbk (SMCB) has an average Z-Score of 1.30 and is classified as "Bankrupt." This indicates significant financial risk

and the company is classified as "Not Bankrupt." This indicates a significant financial risk and requires an in-depth evaluation to identify the cause and take the necessary corrective measures.

PT Semen Indonesia (Persero) Tbk (SMGR) has an average Z-Score of 2.59 and is classified as "Gray." This signifies a middle position on the bankruptcy risk spectrum, where the company may have some risk factors that need attention. This signifies a middle position on the bankruptcy risk spectrum, where the company may have some risk factors that need attention. PT. Waskita Beton Precast Tbk (WSBP), PT. Waskita Karya (Persero) Tbk (WSKT) and PT. Wijaya Karya Beton Tbk (WTON) all have an average Z-Score below 1.8, which indicates bankruptcy risk. By being classified as "Bankrupt," these companies need to urgently identify and address underlying financial issues to ensure their operational sustainability.

Overall, these average Z-Score results provide a holistic view of the risk of bankruptcy in the cement subsector. Companies classified as "Bankrupt" require immediate attention and remedial action, while those classified as "Not Bankrupt" demonstrate a good ability to maintain financial stability. Continued evaluation and appropriate actions are required to mitigate risks and strengthen the company's financial position.

3.2 Discussion

Based on the results of research using Altman Z-Score on cement subsector manufacturing companies, it can be seen that PT Indocement Tunggal Prakarsa Tbk, this company is in a healthy zone or low risk of bankruptcy, because the company has a Z value> 2.99 in the 2018-2022 period indicating consistent financial health, stability and security in the company's financial condition. PT Semen Baturaja Tbk, this company is in a healthy zone or low risk of bankruptcy in the 2018 period because it has a Z value> 2.99, but in the 2019-2022 period the company is in the gray zone or gray area because the Z-Score value is between 1.81-2.99. This change can be a warning of potential risk or instability. PT Solusi Bangun Indonesia Tbk, this company in the 2018-2020 period was in the danger zone or high risk of bankruptcy because the Z value was <1.81, but in the 2021-2022 period the company was in the gray zone because the Z-Score value was between 1.81-2.99. Although still at risk, there is a possibility of improvement or change in financial condition. PT. Semen Indonesia (Persero) Tbk, this company is in the healthy zone or low risk of bankruptcy in the 2018 period because it has a Z value > 2.99, but in the 2019-2022 period the company is in the gray zone because the Z-Score is between 1.81-2.99. This can be a warning signal of potential changes in financial condition. PT. Waskita Beton Precast Tbk, this company is in the gray zone in the 2018 period because the Z-Score is between 1.81-2.99, but in the 2019-2022 period the company is in the danger zone because the Z value < 1.81. This shows an increase in risk from 2018 to 2022, starting from the gray area to reach high risk. There is a significant change in financial condition and can be a serious concern. PT. Waskita Karya (Persero) Tbk and

PT. Wijaya Karya Beton Tbk is in the danger zone during the 2018-2022 period because the Z value < 1.81 indicates high risk throughout the 2018-2022 period. This condition indicates significant financial instability and requires special attention.

However, based on the average calculation from 2018-2022 shows that PT. Indocement Tunggal Prakarsa Tbk (INTP) has the highest Z-Score of 8.52, which indicates that the company is not at risk of bankruptcy. PT. Semen Baturaja Tbk (SMBR) also shows a good level of stability with a Z-Score of 3.23, obtained from the average calculation which gives it a classification of "Not Bankrupt." On the other hand, PT. Solusi Bangun Indonesia Tbk (SMCB), PT. Waskita Beton Precast Tbk (WSBP), PT. Waskita Karya (Persero) Tbk (WSKT), and PT. Wijaya Karya Beton Tbk (WTON) shows a lower Z-Score, indicating a higher risk of bankruptcy. PT. Waskita Karya (Persero) Tbk (WSKT), PT. Wijaya Karya Beton Tbk (WTON), and PT. Waskita Beton Precast Tbk (WSBP) are classified as "Bankrupt," while PT. Semen Indonesia (Persero) Tbk (SMGR) is in the "Gray" category with a Z-Score of 2.59.

Z-Score is a financial indicator used to evaluate the level of bankruptcy risk of a company. Z-Score is calculated based on several financial ratios, including liquidity, profitability, leverage, activity, and market liquidity ratios. If the Z-Score is in the gray category or indicates potential bankruptcy, it can be explained by several theoretical factors in the cement subsector during 2018-2022. First, the cement industry tends to be influenced by macroeconomic factors such as the construction cycle and economic growth. In the event of an economic slowdown, construction demand may decrease, resulting in a decline in sales and profitability of cement companies. Second, the industry's operational characteristics, including high capital investment and fixed production costs, make it vulnerable to fluctuations in raw material and energy costs. An increase in production costs may put additional pressure on a company's profitability, which may be reflected in the Z-Score value. Related to the COVID-19 pandemic, the cement subsector may also experience significant negative impacts. Restrictions on construction activities and decreased construction demand due to lockdowns and economic uncertainty may worsen the financial condition of cement companies.

Overall, the combination of macroeconomic, operational, and COVID-19 impact factors may explain why the Z-Score values of cement subsector companies tend to be in the gray category or even show potential bankruptcy during the 2018-2022 period. Careful financial evaluation and appropriate risk management strategies may be needed to overcome these challenges. The results of this study are in line with the research of Susilawati, E. (2019) [24], Hikmah and Sri Afridola (2019) [25], Marsha Hanniah Alfiyanti, Cacik Rut Damayant i, Ferina Nurlaily (2020) [26], Branson and Alareeni (2013) [27], which prove that the Altman Z-Score bankruptcy prediction calculation model can be used to predict bankruptcy, which is a condition in which the company is experiencing financial difficulties in running its operating business. By using the Altman Z-Score

method, it can be seen that a company is in a safe condition from bankruptcy, vulnerable, and in danger of bankruptcy in manufacturing companies.

4. Conclusion

Companies listed on the Indonesia Stock Exchange. However, the classification of the cutoff value reveals that PT Indocement Tunggal Prakarsa Tbk (INTP) possesses the highest Z-Score of 8.52, suggesting that the company is not at risk of bankruptcy. PT. Semen Baturaja Tbk (SMBR) demonstrates a stable financial position, evidenced by a Z-Score of 3.23 derived from average calculations, indicating a classification of "Not Bankrupt." Conversely, PT. Solusi Bangun Indonesia Tbk (SMCB), PT. Waskita Beton Precast Tbk (WSBP), PT. Waskita Karya (Persero) Tbk (WSKT), and PT. Wijaya Karya Beton Tbk (WTON) exhibits Z-Scores below 1.8, suggesting an increased risk of bankruptcy. PT. Semen Indonesia (Persero) Tbk (SMGR) is classified in the "Gray" category, exhibiting a Z-Score of 2.59.

The overall Z-Score results provide an overview of the financial condition of companies in the cement subsector. Companies with low risk show stability, while those that fall into the gray area or high risk require further attention to analyze potential risks or existing financial problems.

Conflicts of Interest: The authors declare that there are no conflicts of interest regarding the publication of this paper.

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