Financial Distress Analysis by Using Altman Z-Score Methods: A Case Study of Selected Fertilizer Company in Indonesia Year 2016–2020

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Abstract. This study aims to analyze financial distress conditions in PT XYZ. This private company produces chemicals and fertilizers in Indonesia and sells them in Indonesia and globally. PT XYZ is chosen because it is Indonesia's biggest and most complete fertilizer industry. This study used secondary data taken from the business enterprise's economic statements on the company's official website from 2016 to 2020. The Altman Z-Score model for production non-public corporations is set as the method used. The study used many ratios to calculate financial distress, working capital ratio (ratio between working/operational capital and total/overall assets), retained earnings ratio (retained earnings divided by total assets), EBIT (ratio between earnings before interest and tax and total assets), and also ratio between the book value of the equity and total liabilities.

Keywords: Financial distress · Altman Z-Score · Bankruptcy · Fertilizer

1 Introduction

Bankruptcy may be due to internal or external factors. Examples of internal factors that cause bankruptcy are a company that loses control over its finances and is unable to operate. Examples of external factors that cause bankruptcy are severe competition with competitors, economic crisis, bad political situations, and others. Internal and external factors can be used to determine whether a business will survive.

To avoid financial disaster, the organization should recognize the quantity of its financial ruin or bankruptcy from year to year to keep or enhance its overall performance. An assessment of financial distress must be used to determine the extent of financial disaster. Financial disaster is a serious problem that companies must be aware of since if a corporation is in economic or financial distress, it is almost certainly suffering business failure. As a result, the company should carry out various analyses as soon as possible, particularly those involving corporate bankruptcy.

One of the several benefits of financial statement analysis is the ability to predict the company's existence. The definition of bankruptcy or financial crisis forecasting is an analysis that assists a business enterprise in predicting the likelihood that the business enterprise would suffer financial ruin or bankruptcy because of a financial problem. In

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this study, bankruptcy was assessed using the Z-score (Altman) methodology. The score was calculated using a general count of times based on financial ratios that expect the possibility of a company facing bankruptcy [1].

1.1 Bankruptcy

According to Febriani [2], A company's inability to manage its activities to create profit is referred to as bankruptcy. Furthermore, according to Onakoya & Olotu [3], financial disaster or bankruptcy occurs when a corporation cannot generate sufficient revenue or sales to cover its costs. In this scenario, the company is stated to have a manifestly negative monetary worth. Meanwhile, according to Venkataramana et al. [4], bankruptcy or financial disaster is a situation in which a corporation's liabilities exceed its assets; it commonly happens because of a loss of capital, a failure to retain sufficient cash, ineffective resource management, inefficient activity control, income decline, and the marketplace situation deteriorates.

An enterprise's bankruptcy is frequently marked by persistent financial pressures in financing running activities and issues acquiring loans from lenders and creditors. Financial distress is when cash flow (operating cash flow) is inadequate to pay current obligations or responsibilities such as corporate debt or interest, forcing the corporation to undertake corrective actions. According to Setiadi [5], bankruptcy may be divided into two (2) categories: (1) Monetary failure (financial distress) is a situation in which a corporation has misplaced money to cover its expenses. This signifies that the company's income rate is lower than its capital cost, and its cash flow present value is decreased than its liabilities. (2) A monetary failure (financial distress) is described as insolvency that distinguishes between cash (cash flow) and share (share price). On the excuse of cash flows, there are two (2) types of insolvency: (a) Technical insolvency occurs when a corporation cannot fulfill its obligations when they are due. However, its total assets exceed its entire liabilities. (b) Insolvency in the context of a bankruptcy when the present value of predicted cash (cash flow) is less than the liabilities.

Setiadi [5] identified two variables that might cause bankruptcy: (1) internal factors, when company management fails to operate the business properly and is unable to fulfill the obligations. There may be a waste and an imbalance in the quantity of capital held by the whole amount of debt due and the number of debts that bring in a significant amount of interest, diminishing the organization's profit. Controlled fraud has the potential to send a company into bankruptcy. (2) external factors, which include unanticipated changes in consumer preferences, suppliers who fail to fulfil raw material specifications, large quantities of receivables, increased business competition, and the global economic situation, all of which should be considered.

1.2 Prediction Methods of Bankruptcy

The first generation to develop a method for reading an organization's bankruptcy was Altman [6], Ohlson [7], and Beaver [8]. The aid of predicting financial ruin or bankruptcy continues to expand with time, owing to the importance of predicting bankruptcy risk to the corporate code of conduct or governance [9]. Experts have advanced many models for analyzing and predicting the bankruptcy of organizations, with its strengths and

weaknesses and its miles proving challenging to select which techniques to use empirically [10]. Agarwal & Tafler [11], Das et al. [12], and Bauer and Agarwal [13] have all verified the validity of prediction models, which can be completely based on accounting, market share, and risk (or dangers). Profitability ratios [14–17] and liquidity ratios [15, 18] have been recognized based on the accounting side as accounting indicators that can affect financial distress.

The deterioration of the Indonesian economic system in early 1997 began with the beginning of bankruptcy. Almost all Indonesian banks have been impacted by high-interest rates, debt swelling, rushes, low consumer deposits, and high-risk loans. However, this is not the critical factor leading to bank bankruptcy, as seen by the fact that some banks have survived today. According to Munawir [19], general variables, internal and external factors contribute to an organization's bankruptcy. General causes include: (1) the economic or financial sector, the impact of the economy on financial disaster or bankruptcy resulting from indications and signs of inflation and price deviations in products and services, interest rates, government monetary policy, and valuta depreciation or revaluation. (2) Social area, the impact of the social region is primarily based totally on adjustments in human life that affect the demand for services and items, or services associated with personnel. (3) The technology region, the effect of the technology region as a result of using technology, calls for organizational costs, specifically for installation and maintenance. (4) The authority's region, the impact of regulatory governance in the authority's region, the abolition of subsidies to corporations and industry, the imposition of import and export taxes on modified items, and the scope of the latest legal guidelines for banks or exertions and others.

External factors: (1) The client or consumer sector. In order to prevent dropping financial institution customers, it is necessary to identify consumer or customer traits and provide possibilities to discover new clients. (2) The creditor region is in which the strength is in lending and establishing a payback time for accounts payable, which is based on the creditor's confidence in a bank's liquidity. (3) Other competitors or financial institution factors should be nicely considered, considering that they contain variances in customer support delivery.

Internal factors: (1) Customers are granted an excessive amount of credit, resulting in payment arrears and eventually inability to pay. (2) Ineffective management due to management's loss of ability, experience, performance skills, adaptability, and initiative. (3) Abuse of authority power and fraud, which employees frequently perpetrate, even senior managers, is extremely harmful, particularly in corporate finance.

1.2.1 Altman Z-Scores Methodology

According to Burhanuddin [20], Altman [6] studied financial distress after Beaver [8] pioneered it in 1966. Altman [6] carried out the multivariate analysis that Beaver [8] advised at the end of his paper. Altman's method eventually became the most generally used tool for predicting economic or financial distress [6]. The Z-Score is the name of the method. In his study, Altman used the step-sensible multivariate discriminant analysis (MDA) methodology.

This statistical methodology, like logistic regression, is commonly used to make methods using a qualitative dependent variable. The MDA methodology produces linear equation's that might distinguish between two dependent variable states. Altman's study sample consisted of 66 companies over 20 years (1946–1965). The sample was grouped into two categories: 33 companies considered bankruptcy and 33 not considered bankruptcy. Companies filed for financial disaster or bankruptcy below Chapter X of the National Bankruptcy Act are considered bankrupt. Altman's enterprise was exclusive withinside the manufacturing enterprise. The motive for this, as Beaver's [8] stated, is that the only statistics to be had is from Moody's Industrial Manual, which most effectively presents statistics concerning manufacturing companies. Altman applied matched-paid methods within the choice of samples, as determined by the recent samples. Like Beaver's [8], Altman's [6] matched-pair method uses criteria: enterprise and corporation size (overall assets). However, unlike Beaver, who compared the whole assets of the 2 sample corporations one by one, Altman simply looked at the common distinction between the two organizations.

Initially, Altman's [6] studies accrued 22 corporation ratios that can be useful in predicting economic or financial distress. Tests were carried out on those 22 ratios to decide which ratios could be applied in the model. The statistical importance of the ratio, the correlation among ratios, the accuracy to expect ratios, and the researchers' judgment are all used in the testing. The results of the ratio test determined which 5 ratios need to be applied as variables inside the technique. An examination of the technique used to expect the likelihood of financial distress in Indonesian companies. The formulation for calculating the Altman Z-Score for a non-public organization is as follows:

$$Z = 0{,}717\,X1 + 0{,}847\,X2 + 3{,}107\,X3 + 0{,}420\,X4 + 0{,}998\,X5 \quad (1)$$

X1 = Operating capital/Overall assets
X2 = Retained profits/Overall assets
X3 = Profits earlier than interest and taxes/Overall assets
X4 = Book cost equity/Total Liabilities
X5 = Sales/Total assets

Companies with a Z-score of more than 2.90 ($Z > 2.90$) are categorized as safe zone (healthy organizations), whereas companies with a Z-score less than 1.13 ($Z < 1.13$) are classified as potential bankrupt possibilities. Companies located in the gray zone have a score between 1.13 and 2.90.

1.2.2 Springate Method

According to Burhanuddin [20], Springate created the financial distress or economic misery prediction model in 1978. Springate used the equal Multiple Discriminant Analysis (MDA) method as Altman [6]. Springate [21] began by collecting common financial/economic ratios that may be used to indicate economic/financial distress, similar to Beaver [8] and Altman [6]. After going thru the same check as Altman, Springate selected four ratios to distinguish between corporations in misery and those that have been not. Springate selected 40 companies from all over Canada as samples.

The Springate Method's formulates:

$$S = 1{,}03X1 + 3{,}07X2 + 0{,}66X3 + 0{,}4X4 \quad (2)$$

X1 = Operating Capital/Overall Assets
X2 = Net Earnings earlier than interest and taxes/Overall Assets
X3 = Net earnings earlier than taxes/Current Liability
X4 = Sales/Total assets

The cut-off value for this model, according to Springate, is 0.862. If the S value is less than 0.862, the company is expected to go bankrupt. In Springate's tests, this method was shown to be 92.5% accurate.

1.2.3 Zmijewski's Method

According to Sari [22], Zmijewski's prediction technique from 1983 was based on a 20-yr observation that has been repeated. Zmijewski [23] measured a company's performance using liquidity ratio analysis and leverage. Using a sample of seventy-five bankrupt corporations and seventy-three healthful corporations from 1972 to 1978, Zmijewski [23] found considerable variations among healthful and bad corporations in the usage of the F-Test indicator of the institution ratio of the rate of return, liquidity, return on return, fixed price coverage, trends, corporation size, and inventory return volatility.

The higher the value of X in the assessment criteria, the greater the possibility of the organization going bankrupt.

$$X = -4{,}3 - 4{,}5X1 + 5{,}7X2 - 0{,}004X3 \tag{3}$$

X1 = net incomes after tax/overall assets
X2 = overall debt/overall assets
X3 = recently assets/current liabilities

In this model, the cut-off cost is set at zero. This signifies that companies with an X value larger than or identical to zero are much more likely to financial ruin or bankruptcy. Companies with a value of much less than zero, on the other hand, are not going to head bankrupt. With accuracy values, Zmijewski has measured the correctness of his model.

2 Research Methods

The study is descriptive with quantitative techniques in other words, the hassle is defined descriptively, and statistics are accumulated quantitatively. The collected statistics were from secondary information of PT XYZ's yearly financial statements downloaded from the company's official internet site between 2016 and 2020. The sampling technique used in this observation was purposive sampling. The research was conducted on manufacturing enterprises in PT XYZ for five years. This study used discriminants in the processing methods and data analysis. Altman's Z-score analysis is the discriminant evaluation used in this methodology. The 5 variables that have been used in this research are: (1)Net working capital to total assets (X1), (2), retained earning to total assets (X2), (3) Earning before interest and tax to total assets (X3), (4) Book value of equity to Total Liabilities (X4), (5) sales/total assets (X5).

Altman Z-Score (Z) equation is:

$$Z = 0{,}717X1 + 0{,}847X2 + 3{,}107X3 + 0{,}420X4 + 0{,}998X5 \tag{4}$$

Table 1. Z-Score Score Criteria

Value of Z-Score	Information
Z < 1,13	Indicating indications that company is facing a threat of serious bankruptcy (distress zone), this needs to be followed up by the company's management to avoid bankruptcy.
1,13 ≤ Z ≤ 2,90	Indicates that the company is in grey area, a vulnerable condition. In this condition, management must be careful in managing company assets so that there is no bankruptcy (Gray zone)
Z > 2,90	Shows the company in healthy financial condition and has no problems with the financial (Safe Zone).

Table 2. Working Capital (WC) to Total Assets Ratio Value (X1) from 2016–2020

Year	WC to Total Assets ratio
2016	0,0303
2017	0,0329
2018	0,2431
2019	−0,1854
2020	−0,0872

Determine the situation of every organization primarily based totally on the subsequent criteria after receiving the results of the Altman model calculation (Table 1).

3 Research Results and Discussion

3.1 Working Capital to Total Assets Ratio

The corporation's working capital to overall assets ratio became positive for three years, from 2016 to 2018, before becoming negative in 2019 and 2020 (Table 2). The company's current liabilities are more than its current assets in the previous two years, signifying that its current and short-term liabilities are unsustainable.

According to Riyanto, B [24], the higher value of this ratio, the more the company's working capital relative to overall assets. The value of this ratio, on the other hand, is low, indicating that the company's working capital is less than its overall assets. Because the money gained by the company comes from debt, some of the value of working capital to general assets is negative, implying that working capital has dropped for the duration of the research year.

3.2 Retained Earnings to Total Assets Ratio

The term "retained profits" refers to the portion of a company's income that is not distributed to shareholders in dividends. Low retained earnings may hamper the company's capacity to control dividend payments. The retained profits to total assets ratio have been positive for the past five years (Table 3). This demonstrates that its finances were based on profit rather than debt during its five-year operation.

3.3 EBIT to Total Assets Ratio

The lower the EBIT ratio to total assets, the lower the company's ability to earn profits before interest and taxes from the assets it uses, and the higher the risk of financial distress [25]. EBIT ratio over total assets is a positive for a company. It demonstrates that the company is making the best use of its assets to produce enough revenue to cover operational expenses. On the other hand, when a company's operating expenses are high-value, similar to or more than total income, operating income might be negative or incur a loss (Table 4).

3.4 Book Value of Equity to Total Liabilities Ratio

Table 7 exhibits that the company has a positive X4 value for the book value to total liabilities ratio during the last five years. It means that the corporation averted the trouble of solvency for five years; however simplest if the corporation's common value all through

Table 3. Retained Earnings to Total Assets Ratio Value (X2) from 2016–2020

Year	Retained Earnings to Total Assets Ratio
2016	0.3707
2017	0.3567
2018	0.0570
2019	0.0746
2020	0.0987

Table 4. EBIT to Total Assets Ratio Value (X3). From 2016 to 2020

Year	EBIT to Total Assets Ratio
2016	0.0816
2017	0.0600
2018	0.0798
2019	0.0807
2020	0.0759

Table 5. Market Value to Total Liabilities Ratio Value (X4) from 2016 to 2020

Year	Book Value of Equity to Total Liability
2016	0.9128
2017	0.9513
2018	0.8710
2019	0.8438
2020	1.0719

Table 6. Sales to Total Assets Ratio Value (X5) from 2012 to 2016

Year	Sales to Total Assets
2016	0.841312
2017	0.746628
2018	0.746169
2019	0.804179
2020	0.831827

those five years became zero. Additionally, it means that the corporation approached the trouble of solvency because its assets have been less than its debts or obligations or that the corporation suffered continuous losses in those five years (Table 5).

3.5 Sales to Total Assets Ratio

The company has an average positive X5 value based on the outcomes of the common value of the sales-to-total-assets ratio over the last five years (Table 6). This illustrates how much the company's funds may rotate in the total assets over a certain period. According to Burhanudin, B., & Widayanti, R. [26], this variable is used to measure management's capabilities to apply assets in producing income and to represent the turnover rate of all company's assets.

3.6 Conclusion

The results were obtained using the Altman's formula for private manufacturing companies, which was based on previously known financial ratios (Table 7). The following is the Z score obtained.

Based on Table 7, it can be concluded that PT XYZ is in a grey situation primarily based totally on the company's results (not in a distress zone). The Z score in the company ranges from 1.17 to 2.90. The Z score statement shows that PT XYZ did not suffer financial distress. Table 7 are the financial ratios' values from 2016 to 2020.

Table 7. Results of the Fifth Z Score of PT XYZ from 2016–2020

Year	X1	X2	X3	X4	X5	Value Z Score	Category Z Score
2016	0,030	0,371	0,082	0,913	0,6436	1,6150	Gray Area
2017	0,033	0,357	0,060	0,951	0,5759	1,4862	Gray Area
2018	0,243	0,057	0,080	0,871	0,5954	1,4306	Gray Area
2019	−0,185	0,075	0,081	0,844	0,6368	1,1711	Gray Area
2020	−0,087	0,099	0,076	1,072	0,6419	1,3478	Gray Area

PT XYZ had a ratio value of operating capital to overall assets negative in 2019 and 2020 but positive from 2017 to 2018.

The company has a completely positive ratio of retained income to overall assets, EBIT to Total Assets Ratio, Book value of equity to overall liability, and income to overall liability.

According to the assumption which that has been analyzed in this study, the researchers suggest as following:

PT XYZ has almost a distress area in 2019, which is shown by a 1.17 Z score (The z score for the distress area is 1.13). PT XYZ has already completed its development project, which needs much funding. PT XYZ should optimize the capacity of the new plant to increase the total sales. On the other hand, PT XYZ should also be selective and careful in carrying out the investments to minimize liabilities.

The problem faced in 2019 and 2020 was the company's working capital. In terms of working capital, the company should increase operating capital from the addition of the corporation's working results, the sale of fixed assets that are not needed, or by intentionally communicating with the government on payable accounts receivable regarding that PT XYZ has to fulfill the fertilizer allocation from government.

PT XYZ may continue its development program in the next year by loan funding to execute the next project in proper portions.

The company can use the research position as a signal for continued development. The research results are alleged to be beneficial to investors as reference material and statistics for investment consideration.

This research project also can be used as a reference for reading about a company's economic or financial distress. Furthermore, for manufacturing corporations, Altman's methodology may be implemented in non-manufacturing corporations to increase the sample population. Grover, Springate, and Zmijewski are three alternative financial distress prediction methods that can be utilized.

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