



# Financial Distress Prediction Models: Altman Z-Score Approach

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**Abstract.** The purpose of this study is to find out whether the Altman method can predict financial distress in packaging and plastic companies listed on the Indonesia Stock Exchange for the 2016–2019 period. This research method uses quantitative with secondary data sources. The population in this study are packaging and plastic companies listed on the Indonesia Stock Exchange for the 2016–2019 period. The sampling technique used purposive sampling with a total sample of 9 companies. Data analysis technique using descriptive with Excel. Based on the results of the study, it was shown that overall, the calculation of the Z-score using the Altman method or formula stated that during the study period of the 9 (nine) manufacturing companies in the packaging and plastics industry, not all companies were in good health, there were several companies that experienced declines and increases. Quite significantly, there are also companies that have consistently been able to survive the economic turmoil in the plastics industry. The positive impact of this research is that we can find out about the health of the company so that when we are going to invest we won't have any difficulties.

**Keywords:** Financial Distress · Altman Z-Score · Packaging and Plastic Company

## 1 Introduction

### 1.1 Background Behind

Appearance globalization the economy which is an activity process economy where written off limitation between countries, cause competition between company will the more tight. So the perpetrators business demanded for can maintain his efforts from competitors. Success company in Competitiveness is largely determined by performance company. Companies that don't capable compete for maintain performance his company slow gradually will evicted from environment the industry and will experience bankruptcy. Because it is for continuity life company permanent awake, then party management must could maintain or especially again could spur performance. Kindly general performance company could seen from report published financials [1].

Investors and creditors as existing party outside company demanded knowing existing developments in company for secure investment that has done. Inability for read

signals difficulty effort will resulted loss in that investment has done. For resolve Thing that investors should can detect possibility difficulty finance which is signal from in company form indicator difficulty finance [2]. According to [3] if reviewed from condition finance there is three circumstances that cause financial distress namely factor insufficient capital or lack of capital, magnitude debt and interest charges as well as suffer loss. Third aspect the each other related. Because that must guarded balance in order for the company spared from leading to financial distress conditions to bankruptcy.

The condition of financial distress is Step decline condition finance happened company before happening bankruptcy or liquidation. Estimation condition finance companies that are linked to bankruptcy, can made instruction for the holders interest about condition finance company is for period time forward have potency bankruptcy. Party external conscious and capturing company distress symptoms that occur at the company for example such as: exists delayed delivery, quality increasingly products down, trust starting customers disappeared, accumulated debts that have been maturity from banks and creditors, and so on, p the mark there is potential financial distress.

Vulnerable condition \_ the has approach bankruptcy where stakeholder trust will follow is lost if not yet find the solution. Financial distress is something condition where company currently face problem difficulty finance [4]. Condition the could could look at the composition balance sheet, comparison of total assets and. Liabilities, negative working capital indicate happening capital imbalance with debt receivables have impact on activities fee company operational no could paid off, for example cost ingredient raw, cost power work, overhead costs, debts that have maturity and cost others described in the report profit make a loss if company Keep going experience losses, and cash outflows more big compared with cash inflows shown on the report cash flow.

Importance knowing prediction of deep financial distress study this is one for the company could alert in respond a number of probability of survival life company for period time forward. Management actions needed in taking decision when company identified in financial distress condition.

A number of party external interested \_ need information this financial distress among others, such as (1) Creditors in decision for give loans, (2) Investors in decision for invest, (3) Regulatory body as observer in payment debt and stability company, (4) Government in make policy (5) Auditor as ingredient for give opinion. On research previously carried out by [5] researching about comparison Altman, Springate, Fulmer, Ohlson, CA-Score and Zmijewski methods in predicting financial distress in Food and Beverages companies. From analysis regression, results study this reveal that the CA-Score method doesn't could used in predict finances distress. Whereas Ohlson's method is the most appropriate method with score coefficient determination and value highest F significance compared other methods [5]. And in research others also use analysis regression carried out by [6] on the title his research investigates the ability of bankruptcy prediction models of altman and springate and Zmijewski and grover in tehran stock exchange. Research results show method Altman by 92% which is slightly different from method grover by 98%.

Difference with study before, on research this done in industry packaging and plastic listed on the IDX for the 2016–2019 period with use analysis one way anova / kruskal wallis where conducted analysis comparison Among financial distress method. Whereas

equality in study previously contained in the financial distress method which previously has researched however with amount samples and objects different research. Method used in study this including Altman, Zmijewski, Fulmer, and Ohlson methods.

Study this special researching industry packaging and plastic listed on the Indonesia Stock Exchange, where report his finances could is known in a manner open. A number of year this industry this experience enough obstacles significant consequences shake prospect company. Previously in 2016, industry plastic is known have sufficient growth good with average growth by 7% each year and it worked absorb more from 30 thousand power work. Industry this rated enough potential for developed by the Ministry of Industry (Kemenperin). However a number of issue before enter 2017 is worrying industry this including exists increase duty excise ingredient raw plastic.

However industry plastic for packaging eat and drink little getting better in the middle 2018. Election event head area simultaneously in 2018 boost consumption food drink. Because of the ingredients plastic packaging many used in campaign for example just drinking water in packaging. The impact Request plastic packaging too increase, p the will have a good moment for industry packaging and plastic. And in 2019, growth industry plastic stated getting better with succeed record 6.92% growth in comparison year previously only 2.47%. In response to ups and downs prospect industry packaging and plastic that, researcher interested want to knowing Financial Distress ratio in the industry packaging and plastic in a number of year final as well as knowing which method is most appropriate for predict financial distress. Researcher decide for take title “ Analysis comparison Altman Z Method - Deep Score predict Financial Distress (Industry Studies Packaging and Plastic Listed on the Indonesia Stock Exchange Period 2016–2019).

## 2 Methodology

Approach in study this use study quantitative [7]. The variables in this study are the *financial distress method*, namely the *Altman* method [8]. The results of the calculation of the *financial distress method* are as follows will in inputs to *SPSS* for could is known about exists difference from to- four variable and variable which which most significant. Indicator variable on study this use nominal scale for classification each respectively method *financial distress* which compared use *SPSS 18*. Method *Altman* have criteria as following [9]:

- If score index  $Z'' < 1,1$  so company predicted broke.
- If score index  $1,1 < Z'' < 2,6$  so including grey area.
- If score index  $Z'' > 2,6$  so including company which no broke.

The population in this study is a manufacturing company who are actively registered on the Indonesia Stock Exchange. While the sample is part of the selected population elements. Sampling technique on this study used a *purposive sampling method*. *Purposive sampling* is method taking sampling which based on consideration- consideration certain [10]. In study this sample taken based on a number of indicator Among other:

- Industry manufacture packaging and plastic that has been listed on the Stock Exchange Indonesia (IDX) in category company *go public* which publish report financial (*annual report*) on a regular basis consecutive During period 2016–2019.
- Sample company have all the data needed in a manner complete in period observation.
- Sample company publish report finance in form currency \_ rupiah.

Following data finance which need collected in report finance company sample period 2016–2019:

- 1) Capital Work (*Working Capital*)
- 2) Total Asset (*Total assets*)
- 3) Profit detained ( *Retained earning*)
- 4) Profit Before Flower and Tax ( *Earnings before Interest and tax*)
- 5) Score Book Equity (*Market Value Of equity*)
- 6) Profit clean (*Earning After taxes*)
- 7) Total Obligation (*Total Liabilities*)
- 8) Asset Fluent (*Current assets*)
- 9) Obligation Fluent (*Current Liabilities*)
- 10) Sale (*Sales*)
- 11) Profit Before Tax (*Earning before interest*)
- 12) Cash Flow from Activity Operations (*Cash Flow from Operating Activities*)
- 13) Asset Tangible (*Tangibles assets*)
- 14) Burden Flower (*Interest Expenses*)
- 15) Index Level Price (GNP)

The following are the stages of data analysis in study this:

1. Gather data
2. Count ratio finance
3. Count ratio *financial distress*

Stage next that is with To do calculation prediction *financial distress* after count score from ratio finance. Calculation prediction the *financial distress* use method *Altman Z-Score Modification* [6]. Limit evaluation company on each method have score criteria alone for differentiate which experience *Financial Distress* or non *Financial Distress*.

#### 1) Method *Altman* Modification

Following formula *Z-Scores* model *Altman III* for various type company, as following:

$$Z'' = 6.56X1 + 3.26X2 + 6.72X3 + 1.05X4$$

Where:

X1 = Capital Work to Total Asset X2 = Profit Detained to Total Asset

X3 = Profit Before Flower and . Tax . to Total

X4 = Score Book Equity to Score Book Total Debt

Criteria company which healthy and bankrupt based on score *Z score* model *Altman* Modification that is:

- a. If score index  $Z'' < 1,1$  so company predicted broke.
- b. If score index  $1.1 < Z'' < 2,6$  so including *grey area* ( company predicted experience problem finance and potentially will bankrupt).
- c. If score index  $Z'' > 2,6$  so including company which no broke.
- d. Analysis data use *SPSS 18*
- e. Interesting conclusion

Conclusion from study this pulled with use provision:

- a. Knowing results ratio *financial distress* from method *Altman*
- b. Knowing results calculation analysis comparison *one way anova / kruskal wallis* which conducted on program *SPSS*

### 3 Results and Discussion

#### 3.1 Results

##### Calculating the *Financial Distress Ratio*

*Altman (Z-Score)* method (III) uses the following formula:

$$Z'' = 6.56X1 + 3.26X2 + 6.72X3 + 1.05X4.$$

Where:

Z = Overall Index.

X1 = Working Capital to Total Assets X2 = Retained Earnings to Total Assets.

X3 = Profit Before Interest and Tax to Total.

X4 = Book Value of Equity to Book Value of Total Debt.

The criteria for healthy and bankrupt companies are based on the *Z Score* Modified *Altman* models namely:

- a. If the Z index value is  $< 1.1$ , the company is predicted to go bankrupt.
- b. If the index value is  $1.1 < Z'' < 2.6$  then it is included in the *gray area* (the company is predicted to experience financial problems and has the potential to go bankrupt).
- c. If the index value  $Z'' > 2.6$ , it is a company that is not bankrupt.

Below is the implementation of the variable value in the method formula *Altman (Z-Score)* and the results of calculating the value of Z in each company. The results can be seen in Table 1.

Based on the calculation process that was carried out in 2016, *the Z-Score was generated from the Altman* formula as shown in Table 4.11 above. It is known that in 2016 the *Z-Score value* of the 9 (nine) companies, there are 6 (six) companies that have a value above the criterion limit ( *non-financial distress*), namely  $Z > 2.6$  and 3 (three) companies are in the gray zone -*gray area*, namely  $1.1 < Z'' < 2.6$ , so that overall there are 66% of companies that entering the safe zone is categorized as healthy (safe zone)

**Table 1.** Altman Variable Value Calculation Results (*Z-Score*) 2016 year

No.	Code Company	(X1)	(X2)	(X3)	(X4)	Z-SCORE	RESULTS
1	AKPI	0.0379	0.1281	0.0515	0.7487	1.7989	Grey
2	APLI	0.0749	0.2386	0.1114	3.6268	5.8259	NFD
3	BRNA	0.1039	0.1132	0.0534	0.9698	2.4278	Grey
4	IGAR	0.6807	0.4327	0.2197	5.6873	13.3244	NFD
5	IMPC	0.2208	0.3115	0.0922	1.1669	4.3085	NFD
6	TALF	0.2429	0.2723	0.0468	5.7937	8.8789	NFD
7	TRST	0.0821	0.4776	0.0181	1.4227	3.7111	NFD
8	YPAS	(0.0114)	0.1682	(0.0011)	1.0271	1.5445	Grey
9	PBID	0.1618	0.1174	0.1733	1.4087	4.0877	NFD

**Table 2.** Altman Variable Value Calculation Results (*Z-Score*) 2017 year

No.	Code Company	(X1)	(X2)	(X3)	(X4)	Z-SCORE	RESULTS
1	AKPI	0.0152	0.1243	0.0341	0.6960	1.4650	Grey
2	APLI	0.1323	0.2193	0.0134	1.3246	3.0638	NFD
3	BRNA	0.0329	0.0491	(0.0745)	0.7672	0.6811	FD
4	IGAR	0.6338	0.4645	0.1883	6.2180	13.4666	NFD
5	IMPC	0.3781	0.3331	0.0819	1.2818	5.4627	NFD
6	TALF	0.2427	0.2761	0.0375	4.9406	7.9318	NFD
7	TRST	0.0664	0.4845	0.0120	1.4555	3.6241	NFD
8	YPAS	(0.0577)	0.1062	(0.0092)	0.7203	0.6621	FD
9	PBID	0.4042	0.2126	0.1794	2.6452	7.3278	NFD

and others are included in the gray zone. The lowest *Z-Score value* is owned by PT Yana Prima Hasta Persada Tbk (YPAS) with a value of 1.5445. On the other hand, PT Champion Pacific Indonesia Tbk (IGAR) has the highest *Z-Score* score of 13.3244. The results can be seen in Table 2.

Based on the calculation process that has been done, *the Z-Score is generated from the Altman formula* as shown in Table 4.4 above. It is known that in 2017 the *Z-Score values* of the 9 (nine) companies, there are 6 companies that have values above the criteria limit (*non-financial distress*), namely  $Z > 2.6$ , 1 (one) company is included in the gray zone (*gray area*), namely  $1.1 < Z' < 2.6$ , and 2 (two) companies have a value below the criteria (*financial distress*), namely  $Z' < 1.1$ , so that overall 66% of companies are included in the healthy category (safe zone) and others are included in the gray zone

**Table 3.** Results of Calculation of the Altman Variable Value (*Z-Score*) 2018 year

No.	Code Company	(X1)	(X2)	(X3)	(X4)	Z-SCORE	RESULTS
1	AKPI	0.0060	0.1320	0.0519	0.6718	1.5236	Grey
2	APLI	0.0012	0.1272	(0.0528)	0.6829	0.7846	FD
3	BRNA	(0.0054)	0.0439	0.0275	0.8395	1.1737	Grey
4	IGAR	0.6032	0.4704	0.1096	5.5327	12.0365	NFD
5	IMPC	0.3704	0.3488	0.0800	1.3750	5.5482	NFD
6	TALF	0.2586	0.3012	0.0643	4.5874	7.9271	NFD
7	TRST	0.0420	0.4196	0.0187	1.0927	2.9164	NFD
8	YPAS	0.0166	0.0704	0.0134	0.5552	1.0117	FD
9	PBID	0.4276	0.2826	0.1757	2.0545	7.0643	NFD

and red zone which are categorized as potentially bankrupt. It is known that 2 (two) companies that are in the red zone this year in the previous year have entered the gray zone, this means that there is a decline in the performance of the two companies. The lowest *Z-Score value* is owned by PT Yana Prima Hasta Persada Tbk (YPAS) with a value of 0.6621. The highest *Z-Score value* is owned by PT Champion Pacific Indonesia Tbk (IGAR) with a value of 13.4666. The results can be seen in Table 3.

Based on the calculation process that has been carried out, a *Z-Score is produced from the Altman* formula as shown in table above. It is known that in 2018 the *Z-Score value* of the 9 (nine) companies, there are 5 (five) companies that have a value above the criterion limit (*non-financial distress*), namely  $Z > 2.6$ , 2 (two) companies are in the gray zone -gray (*gray area*), namely  $1.1 < Z < 2.6$ , and 2 (two) companies have a value below the criteria (*financial distress*), namely  $Z < 1.1$ , so that overall 55% of companies are included in the healthy category (safe zone) and the other 45% are included in the gray zone ash and red zones which are categorized as potentially bankrupt. The lowest *Z-Score value* is owned by PT Asiaplast Industries Tbk (APLI) with a value of 0.7846. It is regrettable that there has been a significant decrease in the results of APLI's *financial distress ratio*, considering that in the previous year APLI was in the safe zone, on the contrary this year APLI was in the red zone (*financial distress*). And the highest *Z-Score* this year belongs to PT Champion Pacific Indonesia Tbk (IGAR) with a value of 12.0365. The results can be seen in Table 4.

Based on the calculation process that has been carried out, a *Z-Score is produced from the Altman* formula as shown in Table 4. Above. It is known that in 2019 the *Z-Score value* of the 9 (nine) companies, there are 7 (seven) companies that have a value above the criterion limit (*non-financial distress*), namely  $Z > 2.6$ , 1 (one) company is in the gray zone -gray area, namely  $1.1 < Z < 2.6$ , and 1 (one) company has a value below the criteria (*financial distress*), namely  $Z < 1.1$ , so that overall 77% of companies are included in the healthy category (safe zone) and others fall into the gray zone and the red zone which is categorized as bankrupt. The lowest *Z-Score value* is owned by PT

**Table 4.** Altman Variable Value Calculation Results (*Z-Score*) 2019 year

No.	Code Company	(X1)	(X2)	(X3)	(X4)	Z-SCORE	RESULTS
1	AKPI	0.0304	0.1629	0.0538	0.8127	1.9457	Grey
2	APLI	0.0852	0.1756	0.0710	1.0301	2.6898	NFD
3	BRNA	(0.0773)	(0.0022)	(0.0283)	0.7284	0.0601	FD
4	IGAR	0.6294	0.4970	0.1357	6.6559	13.6499	NFD
5	IMPC	0.2781	0.3497	0.0819	1.2886	4.8682	NFD
6	TALF	0.2222	0.2327	0.0362	3.1431	5.7597	NFD
7	TRST	0.0216	0.4005	0.0156	1.0000	2.6024	NFD
8	YPAS	0.1886	0.0952	0.0531	0.7735	2.7164	NFD
9	PBID	0.4085	0.3357	0.1367	2.4873	7.3038	NFD

**Table 5.** Altman Variable Value Calculation Results (*Z-Score*) 2016–2019 year

No.	Code Company	Altman ( Z-SCORE)			
		2016	2017	2018	2019
1	AKPI	1.7989	1.4650	1.5236	1.9457
2	APLI	5.8259	3.0638	0.7846	2.6898
3	BRNA	2.4278	0.6811	1.1737	0.0601
4	IGAR	13.3244	13.4666	12.0365	13.6499
5	IMPC	4.3085	5.4627	5.5482	4.8682
7	TALF	8.8789	7.9318	7.9271	5.7597
8	TRST	3.7111	3.6241	2.9164	2.6024
9	YPAS	1.5445	0.6621	1.0117	2.7164
10	PBID	4.0877	7.3278	7.0643	7.3038

Berlina Tbk (BRNA) with a value of 0.0601. And the highest *Z-Score* this year belongs to PT Champion Pacific Indonesia Tbk (IGAR) with a value of 13.6499. The results can be seen in Table 5.

After calculating the *financial distress ratio using the Altman method*, a *financial distress ratio* is produced as shown in Table 5 above. It is known that the lowest *Z-Score value* is owned by PT Yana Prima Hasta Persada Tbk (YPAS) from 2016 to 2017, with values of 1.5445 and 0.6621. In 2017, PT Asiaplast Industries Tbk (APLI) had the lowest *Z-Score value of 0.7846*. Whereas in 2019, PT Berlina Tbk (BRNA) had the lowest *Z-Score value* with a value of 0.0601. During the research period, YPAS was included in the red zone category by 2 (two) times, APLI 1 (one) time, and BRNA 2 (two) times. The three companies that had a red zone during the study period indicated that there was a



company's financial turmoil. Furthermore, the *Z-Score value* in the gray category during the study period was owned by PT Argha Karya Prima Industry Tbk for 4 consecutive years, this indicates the potential for bankruptcy in companies that need to be watched out for. Meanwhile, the highest *Z-Score value* is owned by PT Champion. Pacific Indonesia Tbk (IGAR) in 2016 to 2019, with values of 13.3244, 13.4666, 12.0365 and 13.6499, this indicates that the company is predicted not to experience *financial distress* and has a good *going concern* forward. Overall, the calculation of the *Z-score* using the *Altman method or formula* states that during the study period of the 9 (nine) manufacturing companies in the packaging and plastics industry, not all companies were in good health, there were several companies that experienced significant decreases and increases., there are also companies that have consistently been able to withstand economic turmoil in the plastics industry. However, the good news is that in the last year of research, around 77% of companies were in the healthy category (*non-financial distress*), this indicates an effort by company management to restore and stabilize the company's financial condition.

### 3.2 Discussion

Can be seen in the results comparison table method *Altman* have 3 criteria which determined namely the red zone, gray zone, and green zone, while the other methods only there is 2 criteria ie zone red and zone green. *Altman* method have condition bankrupt highest ie as much 5 (five) results ratio stated bankrupt in 30 yield ratios over the study period. In addition the *altman method* has the gray criteria are 7 (seven) values indicating potential bankruptcy on period which will come. The *altman* method has a significant value based on the entire sample that existed during the study period, p concluded that in analyzing the prediction of *financial distress* in the packaging and plastic industry can use the *altman method* as method which most significant.

This study supports the results of previous studies conducted by [11] which title Analysis *Financial Distress* on Company Sector *Properties Real estate* and Construction Building Which Registered in Exchange Effect Indonesia, however on study the use method level accuracy for know the method the most accurate. Results his research same with results study this, that method *Altman* is the most accurate method of analyzing *Financial Distress* at the moment circumstances economy something Country currently bad or currently good. There is also on study [5] which test Method *Altman, springate, Fulmer, ohlson, CA-Score* and *Zmijewski* on company *Food. And Beverages* with research results that are different from this research that *ohlson* method has the highest significance value when tested using regression analysis. While in research [9] which test Method *Altman, springate, and Zmijewski* on company textiles and Garment with results which different also with study this that method *zmijewski* is the method with the highest level of accuracy tested with calculation level accuracy.

Results discussion show that method analysis *financial distress* could used as gauge measuring for see circumstances finance something company and can be considered in overcoming the occurrence difficulty finance something company. Benefit for management company for find out the problems experienced based on the company's financial condition according to the ratio calculation analysis on the method used. Predictions financial assistance to management in evaluating and improving performance so that these problems can be immediately addressed or minimized. Benefit for investors, the

results of this prediction are very important in decision making in invest, with base consideration for knowing condition company, the better the condition of the company, the more profitable it will be for second split party good company and investors. Company will get additional funds through the funds invested by investors and Investors will benefit through dividends that will be paid by company.

And there is anyway benefit for creditor, prediction *financial distress* could be taken into consideration and prudence in decision making in give fund to company based on condition finance companies described in the calculation of the *financial distress ratio*. Besides In addition, the creditor can ultimately determine the amount of the loan that can be obtained given to the company on the basis of the company's ability. Therefore, prediction of *financial distress* should be done every year so that the company get early warning so things could potentially lead to bankruptcy can be anticipated earlier, it can save company from liquidation and *going concern* company more awake forward.

## 4 Conclusion

The altman method has a significant value based on all existing samples during the study period, it can be concluded that in analyzing predictions of financial distress in the packaging and plastics industry, the altman method can be used as the most significant method.

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