VERIFICATION OF FINANCIAL DISTRESS MODEL: A CASE STUDY ON CPO INDUSTRY COMPANY IN INDONESIA STOCK EXCHANGE

Kevin G. S. N.[1], Hadi Paramu[2], Hari Sukarno[3].

[1]Student of Management Master, UNEJ, Jember and 68121, Indonesia
[2]Lecturer of Management Master, UNEJ, Jember and 68121, Indonesia
[3]Lecturer of Management Master, UNEJ, Jember and 68121, Indonesia

Abstract

This study aims to verify the accuracy of the three previous research models, namely the Altman, Springate, and Grover models, as well as the proposed financial distress model for the palm oil sub-industrial manufacturing companies listed on the IDX. This study uses data from all manufacturing companies of the palm oil sub-industry listed on the BEI that have issued financial reports for at least four years before 2019. The analytical method used is to test the level of accuracy using the Bemman Contingency table.

The results showed that the Altman, Springate, and Grover models were able to predict financial distress in CPO companies by 86.67%, 90%, and 90%, respectively, while the proposed model that consist of selection from some of the most popular financial ratios was less worthy to predict financial distress on CPO companies because it can only predict 6.67%. The most accurate models are the Springate and Grover models. The high prediction results can be used as a guidance for financial managers to predict financial distress in their companies, especially palm oil sub-industry manufacturing companies.

Keywords : Financial Distress, Palm Oil Sub-Industry, Altman Model, Springate Model, dan Grover Model.

1. INTRODUCTION

Crude Palm Oil (CPO) has become one of Indonesia's leading exports since 2000. CPO have continued to increase in exports in the following years, except in 2016. CPO has a pretty good prospect in the future because processed CPO can be used for many things. One of them is to become biodiesel which is estimated to 100% replace the function of fossil fuels which will deplete in the next few hundred years or decades. Biodiesel will become a renewable energy source in the future.

However, in early 2015, the European Union rejected CPO oil. This was revealed by GAPKI that since 2015 to the first quarter of 2017, Indonesia faced considerable pressure, especially from European Union countries. Some economic observers speculated that deforestation caused the European Union to reject CPO and some said that there was a trade war to increase their renewable oil products, namely sunflower seed oil, therefore CPO oil experienced rejection in the European Union. This refusal will indirectly affect Indonesia's CPO exports. If Indonesia's CPO exports will decrease, then Indonesian CPO companies will reduce their income and will automatically disrupt disrupt the viability of the company. It is even possible that in the future CPO companies will experience financial difficulties. Therefore, according to Muslim, Gumanti, and Sukarno (2016), an early warning system is needed to anticipate a financial crisis that threatens business continuity. This situation encourages CPO companies to have a predictive model of financial distress.

Currently, there are many models used to predict financial distress. Researchers in this study used 3 models as research samples, namely the Altman Z-Score model (Edward I Altman, 1968), the Grover model (owned by Jeffrey S Grover, 1968) and the Springate model (owned by Gordon L. V. Springate, 1981).

Research by Purnajaya and Merkusiwati (2014), Yoewono (2018), Peto and Rosza (2015), and Turk and Kurklu(2017) state that the Altman method is the most

accurate model. Other studies, such as Kurniawati and Kholis (2016), Prihanthini and Sari (2013) and Aminian, et al. (2016) found that Grover's model was the most accurate model. Meanwhile, other studies found that the Springate model was the most accurate model (Sondakh, et al. (2014), Permana, et al. (2017) and Siahoee and Kordlouie, (2018)). The results of these different studies are due to the company's financial condition and the varied characteristics of the company.

The difference in the prediction accuracy of the financial distress model indicates that further studies are needed to confirm the existing model, especially for the context of the CPO sub-sector. In addition, the researcher makes a proposed model that is selected from popular financial ratios which later be used to predict the financial distress of CPO companies, so it needs to be tested as well. This research is important to do to conclude whether the proposed model has a better accuracy rate than the previous model.

This research generally aims to find out which model has the best level of accuracy for predicting the financial difficulties of CPO industry companies on the IDX.

2. LITERATURE REVIEW AND PREVIOUS STUDIES

2.1. Financial distress

Financial distress begins with the company's inability to fulfill its liabilities, especially short-term liabilities, including liquidity liabilities, and also includes liabilities in the solvency category. The definition of financial distress according to Hanafi (2007) can be described from two extreme points, namely short-term liquidity distress to insolvability. Short-term financial distress are usually short-term, but can develop to be severe. Financial distress indicators can be seen from cash flow analysis, company strategy analysis, and company financial statements.

2.2. Altman Model (Z-Score)

The Z-Score analysis according to Rudianto (2013) is a model for predicting the bankruptcy of a company by combining several common financial ratios and giving different weights to others.

The Altman Z-Score analysis was first proposed by Edward I Altman in 1968 as a result of his research. After selecting 22 financial ratios, found 5 ratios that can be combined to see companies that are bankrupt and not bankrupt. Altman did some research with company objects with different conditions. Because of this, Altman produced several formulas that exist for use in several companies with different conditions. This model emphasizes profitability as the most influential component of bankruptcy.

Rudianto (2013) states that the model developed by Altman is as follows:

$$Z_{Score} = 1,2\ X_1 + 1,4\ X_2 + 3,3\ X_3 + 0,6\ X_4 + 1,0\ X_5$$

Description:
X_1 = Working Capital / Total Assets
X_2 = Retained Earnings / Total Assets
X_3 = Earnings before Interest and Tax / Total Assets
X_4 = Market Value Equity / Total Liabilities
X_5 = Sales / Total Assets

Altman's model categorizes healthy companies and does not experience financial distress with a score of more than 2.99. Meanwhile, the score for companies experiencing financial distress or having a great chance of facing bankruptcy is less than 1.81. Meanwhile, Altman also added an additional score for companies that have the opportunity to go bankrupt but the chances of being saved and the chance of going bankrupt are the same, depending on the management's handling of the company, namely the score is between 1.81 and 2.99.

2.3. Springate Model (S-Score)

The Springate model was invented by Gordon L.V. Springate in 1978 as a development of the Altman model in predicting bankruptcy. According to Rudianto (2013), Springate Score is a model to predict the survival of a company by combining several financial ratios by giving different weights between these ratios. The formula of the Springate model is as follows:

$$S_{Score} = 1,03\ X_1 + 3,07\ X_2 + 0,66\ X_3 + 0,40\ X_4$$

Description:
X_1 = Working Capital / Total Asset
X_2 = Earning before Interest and Tax / Total Assets
X_3 = Earning before Tax / Current Liability
X_4 = Sales / Totals Assets

According to Springate, a company will be classified as bankrupt if it has a score of less than 0.862

(S$_{Score}$ < 0.862). On the other hand, if the S-Score calculation result is more than or equal to 0.862 (S$_{Score}$ > 0.862), then the company is classified as a financially healthy company.

2.4. Grover Model (G-Score)

The Grover model is a model created by designing and reassessing the Altman Z-Score model. Jeffrey S.Grover used a sample according to the Altman Z-score model in 1968 by adding thirteen new financial ratios. The sample used as many as 70 companies with 35 companies that went bankrupt and 35 companies that did not go bankrupt in 1982 to 1996. Jeffrey S. Grover (2001) produced a formula for predicting financial difficulties, namely as follows:

$$G_{Score} = 1{,}650\ X_1 + 3{,}404\ X_2 - 0{,}016\ ROA + 0{,}057$$

Description:
X_1 = Working Capital / Total Assets
X_2 = Earning before Interest and Taxes / Total Assets
ROA = Net Income / Total Assets

Grover's model categorizes companies in bankruptcy with a score less than or equal to -0.02 (G$_{Score}$=-0.02). While the value for companies that are categorized as not bankrupt is more or equal to 0.01 (G$_{Score}$=0.01)

a) Financial Ratios as Predictors

Previous researchers tested predicting financial distress in a company using financial and accounting ratios. The reason is because the financial performance of a company will reflect the general performance of the company. Although macroeconomics has a considerable influence on a company such as world economic shocks, business competition from today's superpower countries, etc., however, adding macro variables will require complex models that are not worth to use in simple financial distress prediction models in general.

Back et al. (1996) stated that there is no standard and uniform theoretical basis in determining the type and number of financial ratios as predictor variables. Back et al (1996) also conducted a study on the variables that were often used by previous researchers to predict the financial difficulties of a company. The list of these ratios is presented in Table 1.

No	Financial Ratios	Type	Studies
1	Cash / Current Liability	L	E, D
2	Cash Flow / Current Liability	L	E
3	Cash Flow / Total Asset	L	E-M
4	Cash Flow / Total Liability	L	Bl, B, D
5	Cash / Net Sales	L	D
6	Cash / Total Asset	L	D
7	Current Asset / Current Liability	L	M, B, D, A-H-N
8	Current Asset / Net Sales	L	D
9	Current Asset / Total Asset	L	D, E-M
10	Current Liability / Equity	L	E
11	Stock / Net Sales	L	E
12	Net Liquid Quick Assets / Stock	L	Bl
13	EBIT / Total Interest Payment	L	A-H-N
14	Liquid Quick Assets / Current Liability	L	D, E-M
15	Liquid Quick Assets / Net Sales	L	D
16	Liquid Quick Assets / Total Asset	L	D, T, E-M
17	Working Capital / Net Sales	L	E, D
18	Working Capital / Equity	L	T
19	Working Capital / Total Asset	L	W-S, M, B, A, D
20	Net Profit / Total Asset	P	B, D
21	Net Sales / Total Asset	P	R-F, A
22	Operating Profit / Total Asset	P	A, T, A-H-N
23	Yield / Capital Stock	P	Bl
24	Retained Earning / Total Asset	P	A, A-H-N
25	*Return on Stock*	P	F, T
26	Equity Market Value / Liability Book Value	S	E-M
27	Equity / Current Asset	S	F
28	Equity / Net Sales	S	R-F, E
29	Long-term Liability / Equity	S	A, A-H-N
30	Total Liability / Equity	S	M
31	Total Liability / Total Asset	S	B, D

Table 1. Frequently Used Financial Ratios

Tipe: L = Liquidity, P = Profitability, S = Solvability
A   Altman, 1968
A-H-N   Altman, Haldeman, and Nayaranan, 1977
B   Beaver, 1966
Bl   Blum, 1974
D   Deakin, 1972
E   Edminster, 1972
E-M   El Hennawy and Morris, 1983
F   Fitzparick, 1932
M   Merwin, 1942

R-F   Ramser and Foster
W-S   Winakor and Smith, 1935
T   (Not listed)

Some researchers select predictor variables using a stepwise procedure, namely choosing the best ratio and then inserting it into the existing model. However, there are also researchers who directly determine the financial ratio variables to be included in their analysis model.

2.5. Previous Studies

Quite a lot of previous researchers who took the theme of research on predicting models of financial difficulties in several sectors, such as manufacturing companies, service companies, property, etc. However, these researchers stated that their findings were varied. Like the research of Purnajaya and Merkusiwati (2014), which states that the Altman method is the best. This is evidenced by the level of accuracy of the Altman method which is the most accurate compared to the Zmijewski model and the Springate model. Research by Yoewono (2018), Peto and Rosza (2015), and Turk and Kurklu (2017) states the same thing.

Other researchers claim that the Springate model is the most accurate. This is evidenced by the research of Sondakh et al. (2014), Permana et al. (2017), and Siahoee and Kordlouie (2018) who stated so. Meanwhile, some researchers agree that Grover's model is the most accurate. This is evidenced by the research of Prihanthini and Sari (2013), Aminian et al. (2016), and Kurniawati and Kholis (2016).

2.6. Conseptual Framework

Based on the description of the theoretical study and previous research above, the conceptual framework in this study is arranged in Figure 2.
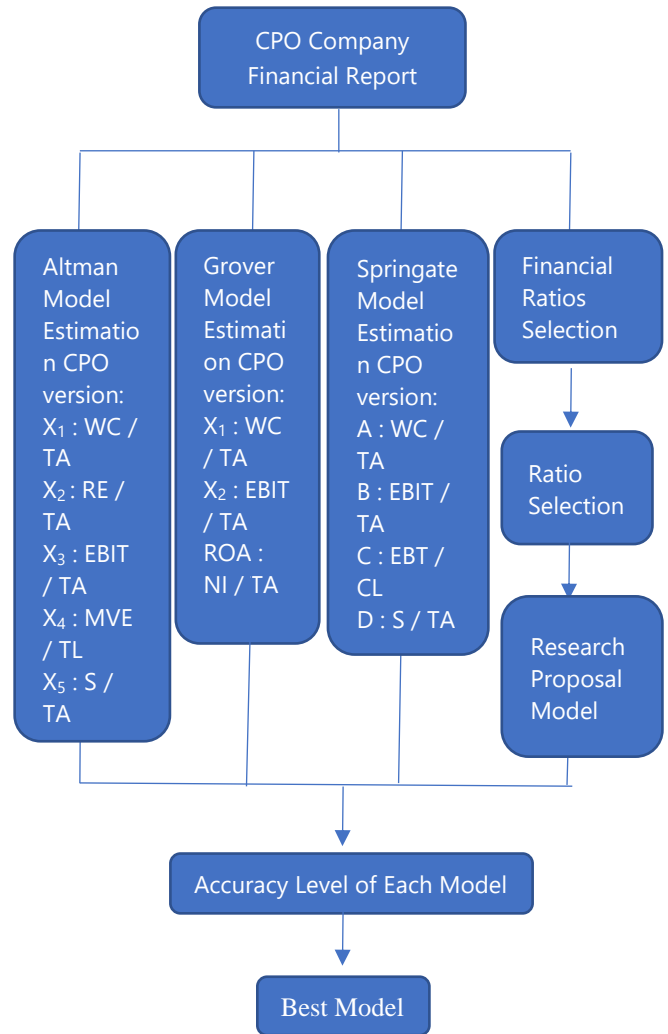

Figure 2. Conseptual Framework

Figure 2 explains that the financial statements of CPO companies listed on the IDX were studied using the three previous financial distress prediction models by confirming the existing models. The three models are the Altman model, the Springate model, and the Grover model. In addition, the researcher makes his own proposed model by selecting financial ratios that are popularly used to predict the company's financial difficulties. These financial ratios are selected arbitragely and then selected using the Stepwise method. So that the best ratio is obtained which will be applied to the discriminant model. After that it will be obtained which company categories are included in financial distress and non-financial distress. Then the accuracy level of the 3 previous models and 1 proposed model from the

researcher was tested for accuracy. So we get a model that has the best level of accuracy.

3. RESEARCH METHODS

The population in this study were 20 CPO industrial companies listed on the IDX. This study uses purposive sampling method to determine the sample. The criteria used to obtain the sample are:

a) Companies that have maximum IPOs in 2014. The reason is because the researchers took the initial sample year, namely in 2015, where at the beginning of that year, there was a rejection of the export results of the Indonesian CPO industry in European countries. So that researchers need financial data for companies that have IPOs before 2015.

b) Companies that publish annual financial reports in 2015-2018. The reason is because the researcher took the sample for 4 years, starting from 2015 to 2018, so it requires data published by the company in that year.

The sample of this research is 15 of 20 companies by taking its samples for 4 years, starting from 2015 (the beginning of the CPO pressure from European countries) until 2018. Data from 20 CPO industrial companies listed on the IDX are attached in table 2.

No	Company Name	Company Code	IPO Date
1	Astra Agro Lestari Tbk.	AALI	09-12-1997
2	PT. Austindo Nusantara Jaya Tbk.	ANJT	08-05-2013
3	PT. Andira Agro	ANDI	16-08-2018
4	Eagle High Plantation Tbk.	BWPT	27-10-2009
5	Cisadane Sawit Raya	CSRA	09-01-2020
6	PT. Dharma Satya Nusantara Tbk.	DSNG	14-06-2013
7	Golden Plantation	GOLL	17-12-2014
8	Gozco Plantation Tbk.	GZCO	15-05-2008
9	Jaya Agra Wattie Tbk.	JAWA	30-05-2011
10	PP London Sumatera Indonesia Tbk.	LSIP	05-07-1996
11	Multi Agro Gemilang Tbk.	MAGP	16-01-2013
12	Mahkota Group	MGRO	12-07-2018
13	Provident Agro Tbk.	PALM	08-10-2012
14	PT. Palma Serasih Tbk.	PSGO	25-11-2019
15	Sampoerna Agro Tbk.	SGRO	18-06-2007
16	Salim Ivomas Pratama Tbk.	SIMP	09-06-2011
17	Sinar Mas Agro Resource and Technology Tbk.	SMAR	20-11-1992
18	PT. Sawit Sumber Mas Sarana Tbk.	SSMS	12-12-2013
19	Tunas Baru Lampung Tbk.	TBLA	14-02-2000
20	Bakrie Sumatera Plantation Tbk.	UNSP	06-03-1990

Tabel 2. List of Companies Research Population

3.1. Types and Sources Data

The data used in this research is secondary data. Secondary data used in the form of the company's annual financial statements that have been published. The data used in this study was obtained through the official website of the Indonesia Stock Exchange.

3.2. Operational Variabel and Variable Measurement Scale

The dependent variable in this study is the financial distress status of the sample object. Companies experiencing financial distress in this study are defined as companies having negative net profits and experiencing losses for at least 2 consecutive years. This variable has a nominal scale, namely code 1 for companies that is experiencing financial distress and code 0 for companies that is not experiencing financial distress. While independent variables used in this study are described in Table 3.

No	Variables	Description	Measurement Scale
1	CNS	Cash / Net Sales	Ratio
2	CACL	Current Asset / Current Liability	Ratio
3	CATA	Current Asset / Total Asset	Ratio
4	EBITTIP	Earning before Interest / Total Interest Payment	Ratio
5	WCTA	Working Capital / Total Asset	Ratio
6	NPTA	Net Profit / Total Asset	Ratio
7	NSTA	Net Sales / Total Asset	Ratio
8	OPTA	Operational Profit / Total Asset	Ratio
9	RETA	Retained Earning / Total Asset	Ratio
10	ROE	Yield / Share Capital	Ratio
11	EFA	Equity / Fixed Asset	Ratio

12	ENS	Equity / Net Sales	Ratio
13	LTLE	Long Term Liabilty / Equity	Ratio
14	TLE	Total Liability / Equity	Ratio
15	TLTA	Total Liability / Total Asset	Ratio
16	EBITTA	Earning before Interest / Total Asset	Ratio
17	MVETL	Market Value Equity / Total Liability	Ratio
18	STA	Sales / Total Asset	Ratio
19	NITA	Net Income / Total Asset	Ratio
20	EBTCL	Earning before Tax / Current Liability	Ratio

Table 3. Independent Variable and Variable Measurement Scale

3.4. Data Analysis Method

a. Hypothesis Test

This study uses three models of bankruptcy prediction analysis which are re-estimated according to the version of the CPO industry company. In addition, there is a proposed model which is estimated using discriminant analysis by selecting 15 of the 31 popular financial ratios selected. This selection method was adapted from Taslim's research (2001). The selection of 15 financial ratios used as independent variables by the researchers was carried out using the Equality of Group Mean test. In Taslim's (2001) study, the requirements to determine which variables are significant to distinguish the distress and non-distress groups are variables that have a Wilks' Lambda number below 1 and a variable that has a significance below 0.05.

The selected variables are used as independent variables in the proposed model. The proposed model is formulated with the following specifications:

$Z_i = a + W_1X_1 + W_2X_2 + W_3X_3 + ...+ W_nX_n$

Description:

Z_i = score number

$X_1, X_2, X_3 .... X_n$ = independent variable / predictor

b. Determine cut-off values

it is necessary to have a cut-off value as a separator between the two categories that can be used to determine the prediction results whether the company is classified as distress or non-distress:

$$Z_{cu} = \frac{N_A Z_A + N_B Z_B}{N_A + N_B}$$

Description:

Z_A dan Z_B = the centroid number or the average value of the discriminant score for groups of companies experiencing financial distress and companies not experiencing financial distress

N_A and N_B = sample groups number of distress companies and non-distress companies

c. Testing the Accuracy Level of Each Model

After analyzing using three previous prediction models of the CPO industry version and one proposed model using discriminant analysis, the results of those four models were tested for accuracy. The results of each model per year sample are tested for accuracy using the Bemman contingency table (2005). The contingency table is presented in table 4.

Actual	Prediction		Σ
	Non-Distress	**Distress**	
Non-Distress	✓ Accurate	X not Accurate	100%
Distress	X not Accurate	✓ Accurate	100%
Σ	100%	100%	

Table 4. Bemman's Contingency Table

Furthermore, the way to calculate the accuracy of the bankruptcy prediction model is as follows:

$$Accuration\ Level = \frac{Correct\ Predictions\ Number}{Sample\ quantity} x100\%$$

4. RESULTS AND DISCUSSION

4.1. Data Analysis Results

Before re-estimating the previous model and estimating the proposed model, classical assumption tests (such as: data normality test, multicollinearity test, heteroscedasticity test, autocorrelation test, and multiple regression test) on the data need to be carried out on the proposed model. The five tests were carried out to select 15 popular financial ratios that have been chosen by the researchers so as to create the latest proposed model for predicting financial difficulties, especially for manufacturing companies in the palm oil sub-industry. After those five tests were carried out, the proposed model formed was as follows:

$Z_i = a + W_1X_1 + W_2X_2 + W_3X_3 + W_4X_4 + W_5X_5$

Description:

X_1 = Working Capital / Total Assets

X_2 = Retained Earning / Total Asset

X_3 = Current Asset / Total Asset
X_4 = Net Profit / Total Asset
X_5 = Total Liability / Total Asset

a. Model Accuracy Level Test

Before testing the accuracy of each model, the researcher re-estimated the CPO version in each model, both on the previous research model or on the proposed model according to the research theme, which aims to make the model can predict more accurately. After re-estimating, the next step is to find the cut-off point in each model so that the companies studied can be identified as being in distress or non-distress category. The cut-off point is determined from the results of the formula attached to the methodology. The cut-off point of each model is presented in table 5.

Model	Cut-off Point
Altman	0,0003
Springate	0,0001
Grover	0,0003
Versi Peneliti	0,0003

Table 5. Cut-off Point of Each Model

If the cut-off value of the four models is smaller than the value in table 5, it means that the company is classified as distress category. On the other hand, if the value is greater than the value in table 5, then the company is classified as non-distress category. The prediction results from the models studied in 2015-2018 concluded that 3 of the 4 models (CPO version of Altman model, CPO version of Springate, and CPO version of Grover) had quite a lot of accurate predictions, while few inaccurate predictions were made. On the other hand, the remaining model (researcher's proposed model) has a smaller accurate prediction than the inaccurate prediction. the prediction results of the four models are converted to the Bemman contingency table. For example, the Altman model that is converted to the Bemman Contingency table is in table 6.

| Actual | Prediction | | ∑ |
	Distress	Non-distress	
Distress	14	6	23,33%
Non-distress	2	38	63,33%
∑	23,33%	63,33%	86,67%

Table 6. Bemman Contingency Table for Altman CPO version in 4 Years

Table 6 shows that the Altman model is able to accurately predict 52 out of 60 observations per data in the 4-year sample of the study. The accuracy level of the Altman CPO model is 86.67% with a prediction error rate of 13.33%. Furthermore, the prediction results from the CPO version of Springate model are converted to the Bemman Contingency table, which is described in table 7.

| Actual | Prediction | | ∑ |
	Distress	Non-distress	
Distress	16	6	26,67%
Non-distress	0	38	63,33%
∑	26,67%	63,33%	90%

Table 7. Bemman Contingency Table for Springate CPO version in 4 Years

Table 7 shows that the Springate model is able to accurately predict 54 out of 60 observations per data in the 4-year sample of the study. The accuracy rate of the CPO version of the Springate model reaches 90% with a prediction error rate of 10%. Furthermore, the prediction results from the CPO version of Grover model are converted to the Bemman Contingency table, which is described in table 8.

| Actual | Prediction | | ∑ |
	Distress	Non-distress	
Distress	16	6	26,67%
Non-distress	0	38	63,33%
∑	26,67%	63,33%	90%

Table 8. Bemman Contingency Table for Grover CPO version in 4 Years

Table 8 shows that the Grover model is able to accurately predict 54 out of 60 observations per data in the 4-year sample of the study. The accuracy rate of the CPO version of the Grover model reaches 90% with a prediction error rate of 10%. Furthermore, the prediction results from proposed model are converted to the Bemman Contingency table, which is described in table 9.

Actual	Prediction		∑
	Distress	Non-distress	
Distress	0	40	0%
Non-distress	16	4	6,67%
∑	0%	6,67%	6,67%

Table 9. Bemman Contingency Table for Researcher's Model in 4 Years

Table 9 shows that the proposed model is able to accurately predict 4 out of 60 observations per data in the 4 years of the study sample. The accuracy rate of the proposed model is not greater than 10% with a prediction error rate of more than 90%

4.2. Discussion

a. Altman's Re-estimation Ability Model in Predicting Financial Distress in Palm Oil Sub-Industrial Manufacturing Companies

Altman's estimation model (1968) has a fairly high ability to predict financial distress in manufacturing companies of the palm oil sub-industry, which is 86.67%. With a prediction error rate of 8 out of 60 predictions in the 4 years of the study, the Altman estimation model is quite capable of predicting financial difficulties, especially in manufacturing companies of the palm oil sub-industry. This is proved in the research of Wilopo (2001) which states that the accuracy level of the Altman estimation model is quite capable to predict financial distress because it has an accuracy rate of above 50%, which means that the Altman estimation model is adequate to be used as a predictive tool for companies in overcoming financial distress in the future.

The Altman CPO version has several financial ratios that are quite good for predicting financial distresss in a company. The financial ratios in the Altman model emphasize liquidity management, leverage management, and company profitability management. This is proved from the results of previous research which states that companies that can manage liquidity, leverage, and profitability well are able to avoid financial distress, for example in this research, companies with the code AALI, SGRO, and SIMP. On the other hand, companies that cannot manage liquidity, leverage, and profitability well will experience financial distress, for example in companies with codes UNSP, GZCO, JAVA, and BWPT. However, the Altman model has a weakness

in predicting financial distress in financially resurgent company, namely companies that had a negative net profit for a year and then grow financially in following year. So that the financial manager of the company with these typical company must think carefully to use the Altman model as a predictor of financial distress in his company.

The Altman model in this study does have a fairly high level of accuracy. In fact, Altman's level of accuracy in this study is higher than that of Wilopo (2001) which states that the accuracy of the Altman re-estimation model has an accuracy rate of above 50%. However, the researcher concludes that the Altman estimation model has a weakness in predicting financially resurgent company, neither financially strong companies nor companies experiencing financial distress. This conclusion is corroborated by Yoewono's research (2018) which states that the Altman prediction model has the highest level of accuracy if the sample under study is bankrupt or is being delisted on the IDX. However, Kurniawati and Kholis (2016) have a different opinion. They stated that the Altman model had the lowest level of accuracy compared to other models. This is proved from the results of their research which states that the level of prediction accuracy in financially healthy' Islamic banking companies is only 72% and its percentage is smaller than other models. In addition, the prediction error in non-distress companies is quite high. Therefore, the opinion of Kurniawati and Kholis (2016) contradicts the conclusion of this study.

b. Springate's Re-estimation Ability Model in Predicting Financial Distress in Palm Oil Sub-Industry Manufacturing Companies

The Springate estimating model has the same capabilities as the Grover estimating model in this study. Both of them have the highest level of accuracy compared to other models, which is 90%. With a prediction error rate of 6 out of 60 predictions in the 4 years of the study, the Springate re-estimation model is fairly capable of predicting financial distress, especially in manufacturing companies of the palm oil sub-industry. This is proved by Yoewono's research (2018) which states that Springate and Grover both have the highest level of accuracy compared to other models. Moreover, Yoewono (2018) states that the Springate and Grover models are capable of predicting financial difficulties because the error rate is less than 30%.

The Springate model is a development of the Altman model in predicting bankruptcy. Although the financial ratios used are not as complete as the Altman model, namely there is no corporate leverage management, the CPO version of the Springate model is one of the best models in this study. The Springate model puts forward the management of profitability ratios to predict financial distress. If it is concluded, the more company earns more profit, the more opportunities to avoid financial distress. This is proved by companies with codes AALI, DSNG, LSIP, TBLA and other palm oil companies that have positive net profits, especially for four consecutive years. This means that company financial managers can use this model as a predictor of financial distress in the company they lead. However, the profitability ratio is still considered incomplete for predicting financial distress in the coming years because the fluctuations in commodity prices on the market can be considered important for predicting financial distress in future.

The CPO version of Springate's re-estimation model puts more emphasis on profitability ratios, as 3 out of 4 financial ratios used to predict financial distress are profitability ratios. This dominant profitability ratio makes the Springate model one of the best predictive models on its accuracy level in this study. As stated in Yoewono's research (2018), the Springate model and the Grover model have the same high average level of accuracy. This average is obtained from the prediction results between companies that are still listed and companies that are delisted on IDX. On the other hand, research by Aminian et al (2016) and Kurniawati and Kholis (2016) proves that Springate is not a best bankruptcy prediction model. According to them, the error rate of the Springate model is still greater than the error rate of the Grover model. So it is Grover's model that has the highest level of accuracy even though this model only uses 3 financial ratios in predicting financial distress.

c. Grover's Re-estimation Ability Model in Predicting Financial Distress in Palm Oil Sub-Industry Manufacturing Companies

Grover's estimating model has the same accuracy as the Springate estimating model in this study. With a prediction error rate of 6 out of 60 predictions in the 4 years of the study, Grover's re-estimation model is quite capable of predicting financial distress, especially in

manufacturing companies of the palm oil sub-industry. This is proved by Yoewono's 2018 research which states that Springate and Grover both have the highest level of accuracy compared to other models. Moreover, Yoewono, 2018 states that the Springate and Grover models are fairly capable of predicting financial difficulties because the error rate is less than 30%.

The Grover model is a model created by designing and reassessing the Altman Z-Score model. Jeffrey S.Grover used a sample according to the Altman Z-score model (1968), by adding thirteen new financial ratios, which were then selected into 1 liquidity ratio and 2 profitability ratios. Although the ratio chosen is not as complete as the Altman model, the prediction result of the Grover model' CPO version in this study is one of the highest. Therefore, financial managers can use this model as a predictor of the company's financial distress in the future, but it must be accompanied by other aspects such as uncertain market conditions, etc.

The Grover model consists of several financial ratios that are selected into the 3 best financial ratios in its version. These three financial ratios make Grover to be the best accuracy level model. This is evidenced by the research of Kurniawati and Kholis (2016) which states that Grover model has the highest level of accuracy compared to Altman model and Springate model in Islamic banking. However, Husein and Pambekti (2014) stated otherwise. They said Zmijewski's model was the most accurate in their research. They used the Altman, Springate, Grover and Zmijewski models and the result was that Zmijewski had the best level of accuracy. They mentioned that the Zmijewski ratio has complete financial ratios, which consist of profitability ratios, liquidity ratios, and solvency ratios, thus making this model the right model if used as a prediction of financial difficulties in companies in future. Moreover, the Zmijewski Model emphasizes the importance of debt management in the company, so that the company can predict its financial condition in future.

d. Proposed's Ability Model in Predicting Financial Distress in Manufacturing Companies of the Palm Oil Sub-Industry

The proposed model can be said to have a very low level of accuracy, which is not greater than 10%. With a prediction accuracy level of 4 out of 60 predictions in the 4 years of the research period, the proposed model is not capable to be used on predicting financial distress

in industrial companies, especially companies in the palm oil sub-sector. The proposed model itself is adapted from popular unselected financial ratios used in the research of Back et al (1996). These popular ratios are often used by similar studies to predict financial distress, but the researcher took 15 samples directly, consisting of liquidity ratios, profitability ratios, and solvency ratios.

The proposed model, although taken and selected from popular financial ratios used, still has a low level of accuracy. The reason is the possibility that the method of selecting the ratio directly or the selection method used is not appropriate. Therefore, this proposed model is not worth to be used to predict financial difficulties, especially in the palm oil sub-industry company, unless improvements are made to the selection method, it may change prediction results to be better. If the prediction results are getting better, the financial manager can take this proposed model as a reference in predicting financial distress in his company.

The proposed model which has the lowest accuracy level is an adaptation model of Back et al research (1996). However, the results of Back et al research (1996) have the highest predictive accuracy. Back et al research (1996) do not choose financial ratios directly, but they directly select them using Discriminant Analysis and Logit Analysis. Back et al (1996) explained that the error rate of the model has a small error rate in the first 1 and 3 years of the research period, which are both 5.26%. This result is very different from the proposed model by the researcher which has the lowest level of accuracy. However, Back et al (1996) mention that the weakness of this selection method ignores the importance of economic variables that occur in the companies studied.

4.3. Research Limitations

The limitation of this study is that the level of accuracy cannot be used as a guide because the results are not always consistent in several company sectors and in different timescales. This difference could be due to the different cut-off values for each study and the company's financial condition that often fluctuates, especially due to market conditions that are sometimes uncertain.

5. CONCLUSIONS AND SUGGESTIONS

5.1 Conclusions

Based on the research and discussion results of this study, the conclusions obtained are::

a) The Altman CPO version of the estimation model is quite feasible if used as a predictor of financial distress by financial managers. With a prediction accuracy rate of 86%, the CPO version of Altman model can be used by industrial companies, especially oil palm sub-sector companies, to predict future financial distress.

b) The Springate CPO version of the estimation model is feasible if used as a predictor of financial distress by financial managers. With a prediction accuracy rate of 90%, the CPO version of Springate model can be used by industrial companies, especially oil palm sub-sector companies, to predict future financial distress.

c) The Grover CPO version of the estimation model is feasible if used as a predictor of financial distress by financial managers. With a prediction accuracy rate of 90%, the CPO version of Grover model can be used by industrial companies, especially oil palm sub-sector companies, to predict future financial distress.

d) The proposed model is not feasible if it is used as a predictor of financial difficulties by financial managers. With a prediction accuracy rate of less than 10% within a four-year sample period, the proposed model cannot be used to predict future financial difficulties, unless improvements are made in selecting the financial variables used by researchers. It may change the prediction results to be more accurate.

5.2 Suggestions

Based on the results of interpretation and research limitations, the suggestions put forward by the researchers are as follows:

a. For Companies

The results of this study can be used as an alternative for the management of manufacturing companies to predict financial difficulties that occur in the company. The company's management can predict financial distress using existing models or create their own models from the selection of popularly used financial

ratios. However, the results of this study are not an absolute necessity that are used by companies. This is only used as an alternative input to improve the company's financial performance.

 b.   For Further Researchers

The use of discriminant analysis models is not the only method to predict the financial difficulties of a company, but there are many other methods that can be used by other researchers such as logit analysis models and genetic algorithms. However, the results of any method are not absolute results that must be used to describe companies that experience financial distress or not experience it.

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