



Analysis of The Bankruptcy of Companies with Altman Model and Ohlson Model

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Abstract

Often companies that have been operating for a certain period forced to disperse because of increased financial distress that caused bankruptcy. There are two models that can be used to predict bankruptcy of companies, that is Altman model (Z-score) and Ohlson model. This study aims to determine the accuracy of the Altman model (Z-Score) and Ohlson's model in predicting bankruptcy of delisting companies in Indonesia Stock Exchange for 2015-2019 period. The population in this study were all of delisting companies in Indonesia Stock Exchange for 2015-2019 period, totaled 17 companies. The number of samples used in this study were 8 companies, by using purposive sampling method. Data analysis used data processing application SPSS version 25. The results showed that accuracy of the Altman model is 58.3%, while the Ohlson model is 79.2%. The conclusion of this research Ohlson model has the highest accuracy that compared to Altman model in predicting bankruptcy at delisting companies in Indonesia Stock Exchange for 2015-2019 period, with accuracy values of Ohlson model is 79.2% and 58.3% for the Altman model. For further researchers, it is expected to increase the number of samples of companies studied and extend the research periods in order to provides more accurate results, and combining the Altman and Ohlson models with other bankruptcy prediction models that can be applied in companies in Indonesia.

INTRODUCTION

With the increasing development of world economy and international trade pose a very tight business competition (Guniarti, 2014). Companies are able to survive in the competition is the company that can adapt to the changes occurring in the business world (Pitoy et al., 2016). Therefore, managers are required to have a better ability to manage the company that the company could move quickly to anticipate changes in the existing (Wulandari et al, 2015).

One of the barriers to business development is the amount of capital required. Good working capital management is very important in the financial sector because of mistakes and errors in managing working capital could result in business activities be im-

peded or stopped (Wibowo & Wartini, 2012).

Bankruptcy for the company is the final statement of the inability to maintain current operations caused by the current debt obligations. Analysis of the financial statements essentially to conduct an assessment of the financial situation and changes in the financial position or the progress of a company (Burhanuddin, 2013).

Almost all companies must have some debt load to expand operations or simply to retain the company. Good economic planning often requires companies to finance some operations caused by the current debt obligations. Almost all companies must have some debt load to expand operations or simply to retain the company. Good economic planning often requires companies to finance some operations with debt. A company has more debt than assets or unable to pay the

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debt, are the two most common factors in bankruptcy (Pongsatat et al., 2004).

Because of business failure is a major concern parties involved and can lead to high costs and large losses, the prediction would be very helpful. If bankruptcy can be predicted with reasonable accuracy from time to time, companies can protect their business with better and can take action to minimize the risk and loss of business and may even prevent bankruptcy (Pongsatat et al., 2004).

The information is based on financial statement analysis includes an assessment to identify any weaknesses state companies that have past or present (Nurchayono & Sudharma, 2014). Through the information contained in the financial statements, the company's stakeholders can assess the condition of the company. With the financial ratio analysis, investors can be guided to make decisions about what will be accomplished and prospecting in the future (Windi, 2012).

In general, many companies have many difficulties or obstacles to achieving corporate goals. One of the obstacles that need to watch by the company are financial difficulties (financial distress). Financial distress is a condition in which a financial company in unhealthy conditions or crisis, financial distress occurred before the bankruptcy, and occurs when the company suffered losses several years (Hapsari, 2013).

According to Safitri and Witiastuti (2016), financial difficulties described between the two extremes point, that is short-term liquidity difficulties to the point insolvable. Short-term financial difficulties are temporary. If these difficulties are not addressed, then the financial difficulties will evolve into trouble is not solvable. Company said to be solvable if the debts of the company is greater than the assets owned by the company.

Financial distress can be identified early before the occurrence by using a model of an early warning system. This model can be used as a tool to recognize the early symptoms of financial distress for further efforts to improve conditions prior to the crisis or bankruptcy. From the first, there have been several researchers who developed a predictive model that tries to help prospective investors and creditors in choosing the company a place to put up the money so do not get caught up in the problems of financial distress (Rismawaty, 2012).

The prediction of financial distress is very important for the internal and external parties the company mainly for creditors and investors, because by knowing the condition of companies experiencing financial distress then the parties

concerned can take decisions or action to remedy the situation or to avoid more big losses (Ratnasari & Wijayanto, 2015).

One of bankruptcy symptom analysis is through the information in the financial statements. The financial statement information can be determined by analyzing financial ratios (Khajar, 2010). Analysis of the financial statements essentially to conduct an assessment of the financial situation and changes in the financial position or the progress of a company (Burhanuddin, 2013).

Errors in predicting the continuity of operations of an enterprise in the future can be fatal, namely the loss of income or investment. Therefore, it takes a bankruptcy prediction model is accurate which can be used by various parties such as creditors, investors and the management itself. In Indonesia Stock Exchange (IDX) is identical to the company's bankruptcy experiencing delisting (Sembiring, 2016).

Data idx.co.id (2019), Pointed out in the last five years almost every year appear issuers / companies that have delisted. The following overall data companies that are delisted by the stock exchange for the last 5 years, which amounted to 17 companies.

Based on these data indicate that there are still many companies that indicated bankruptcies are caused by many factors. According to Rismawaty (2012) the introduction of early state companies experiencing financial distress becomes important. Early information on the company's financial distress provides an opportunity for management, owners, investors, regulators, and other stakeholders to undertake the relevant measures. The management and owners concerned to make efforts to prevent more severe conditions towards bankruptcy.

Based on the decision of the board of directors Jakarta Stock Exchange Inc. Number: Kep-308 / BEJ / 07-2004 concerning the Exchange Rules 2004 No. II concerning the delisting (Delisting) and recording back (relisting) stocks that, there are two types of delisting, namely voluntary delisting and forced delisting.

Referring to Stock Exchange Regulations No. II on delisting (Delisting) and recording back (relisting) stocks that, companies in delisting forcibly by the exchanges occur if the company has a condition or event that negatively affect the continuity of the status of the listed company as a public company. In addition, the delisting done if the listed company can not show sufficient indications of recovery, as well as the company's shares are due to the suspension in the regular

market and the cash market, traded only on the negotiated market for at least 24 (twenty-four) months.

Voluntary delisting is a delisting request submitted by the company to the capital market authorities that shares are no longer traded on a stock exchange (Hidayat et al., 2017). Delisting on the orders of IDX is usually because the company can not meet its obligations and rules that have been established. Indonesia Stock Exchange (IDX) as the organizer of the Indonesian stock market authorities the right to expel the company from the stock exchange if the company does not comply with the regulations set IDX, it is often referred to as involuntary or forced delisting. Basically, the elimination of forced (involuntary delisting) is done to minimize the possibility of greater losses suffered by the company itself and the other parties concerned (stakeholders) with companies such as lenders, investors, etc. (Prabowo & Wibowo, 2015).

According Hirawati (2017), bankruptcy prediction models need to be developed as an early warning system, so that companies can anticipate the conditions that lead to bankruptcy. Literature that describes the company's bankruptcy prediction model has many, but few studies discussing the bankruptcy prediction model that is appropriate to be applied in a company. In addition, studies have shown different results regarding the predictive models are most appropriate to use.

Incautiousness investors in selecting investment will result in huge losses for investors and so we need an accurate analytical models in predicting corporate bankruptcies. There are two models commonly used for predicting the bankruptcy of the company that is Altman model (Z-Score) and Ohlson model (Sembiring, 2016).

Bankruptcy prediction model can be calculated by using two analysis namely discriminant analysis and logit analysis. Discriminant analysis have the judgment that the data derived from the multivariate normal distribution and the correlation matrix of the two companies are the same. Multivariate normal distribution assumption is needed to test the significance of the variables and the discriminant function (Meshbane & Morris, 1996).

Research Lestari and Wijayanto (2016) results that the model of the Altman Z-Score with Discriminant Analysis Multiple testing can be used to predict the bankruptcy of the enterprise.

Two main methods used in western countries for predicting bankruptcy is the Altman Z-score and O-score Ohlson (Lawrence et al., 2015). Some studies have shown different results regarding the predictive models are most appropriate to use. Research Suryawardani (2015) and Christiani (2013), results shows a model of Ohlson more accurate than Altman model in predicting bankruptcy of the enterprise. Research Wulandari et al. (2014) stating that the model Ohlson is a model that has the highest level of accuracy than other models in predicting the condition of the bankruptcy of the company, the next model of Altman became the second model with the highest accuracy in predicting corporate bankruptcies conditions. Research Karamzadeh (2013) result, Shows that Altman model works better than Ohlson models for predicting bankruptcy. While the research Wu et al. (2010) shows that the Ohlson model is more accurate than the model Altman. Research Sembiring (2016) stating that the model Ohlson has not too good accuracy in predicting bankruptcy.

Based on the above research gap, researcher interested in comparing focus on two main methods and the best method commonly used in western countries for predicting bankruptcy, and is the foundation of the birth methods other bankruptcy prediction. The model is a model of Altman Z-score and O-score Ohlson. Object in this study will use forced delisting companies and bankruptcy companies according to the Indonesia Stock Exchange (IDX), so as to obtain the maximum predicted results.

Altman model and Ohlson model is a valuable method for companies to take into account the company's bankruptcy prediction. However, companies need to determine which one is best predictive model for use in predicting bankruptcy. According to Puspita (2017), It is very important for companies engaged in investment activity because of the many factors that led to the bankruptcy then do the calculations with these methods is needed in the company.

Hypotheses Development

This study aimed to compare the results of predictive analytics bankruptcy of the enterprise that are delisted from the Indonesian Stock Exchange 2015-2019 period, which in that period many companies that are delisted from the Indonesian Stock Exchange. The model will be compared to measure financial distress prediction model is Altman and Ohlson. The model has the highest level of accuracy means that the

model can be used to predict bankruptcy experienced by the company so that it can be used as a signal for those who use financial statement information such as investors, creditors, auditors, management companies and others to make informed decisions that did not experience loss. Thus, the proposed hypothesis is as follows:

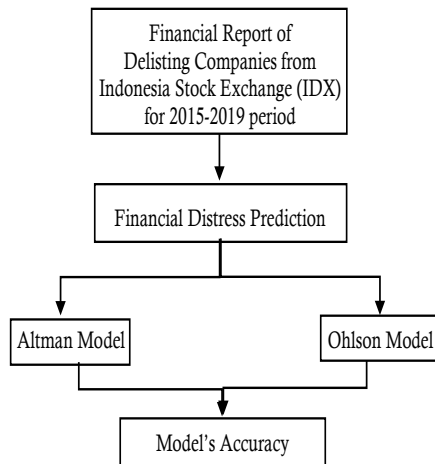


Figure 1. Research Model

H1: Ohlson models have the highest accuracy rate compared with Altman model in predicting bankruptcy of companies delisting in Indonesia Stock Exchange (IDX) in the period 2015-2019.

METHODS

The type of data in this study using secondary data. Secondary data sources are not directly provide data to data collectors, for example through others or through documents (Sugiyono, 2010). Secondary data used in this study were obtained official website of Indonesia Stock Exchange (IDX) is www.idx.co.id and www.sahamok.com, as well as some of the website provider of corporate financial statements.

The population in this study are all companies delisted from the Indonesian Stock Exchange (IDX) in the period 2015-2019. Based on the data obtained in the period 2015-2019 there are 17 companies that are delisting in Indonesia Stock Exchange (IDX). Sampling this study using purposive sampling technique. Purposive sampling is a sampling technique with specific consideration (Sugiyono, 2008). So that the sample taken is based on the consideration or criteria. Criteria for delisting companies sampled in this study, as follows: (a) the delisting of the Company in the Indonesia Stock Exchange (IDX) in the period 2015-2019. (b) The Company experienced

involuntary delisting (involuntary delisting) in the period from 2015 to 2019 because of financial problems that indicate that the company is experiencing signs of bankruptcy. (c) A company that provides financial data for three consecutive years before the stated delisted by the Indonesia Stock Exchange (IDX). If the latest annual financial statements before the stated delisting is not available, then the financial report will be taken before the last year the company declared delisting. Based on the criteria that have been established, the number of delisted companies that meet the criteria to be sampled are eight companies. The study period was three years before the company declared delisting, so we get the number of samples processed observations are 24 sample company's financial report.

Test the accuracy of the model used to answer the hypothesis (H1) that is proposed in this study. The prediction results distress and distress not be determined by looking at a cutoff value on every model. Furthermore, to determine the level of accuracy, is calculated by comparing the number of correct predictions by the number of samples.

As for the errors in predicting financial distress plantation companies there are 2 types, namely: error type I and type II errors. Type I error is an error that occurs if the model predicts the samples did not experience distress when in fact experiencing distress. Whereas type II error is an error that occurs if the model predicts a sample experiencing distress when it is not experiencing distress. The level of error is the error description on every model (Altman, 2000).

Bankruptcy Prediction Model

Altman Model

Altman (1968) was the first to implement the Multiple Discriminant Analysis with five types of financial ratios and working capital to total assets, retained earnings to total assets, earnings before interest and taxes to total assets, market value of equity to book value of total debts and sales to total assets. Multiple Discriminant Analysis Altman used in research such as logistics, this statistical technique also can be used to create a model where the dependent variable is a qualitative variable, the output of Multiple Discriminant Analysis is a technique of linear equations that can distinguish between the two states dependent variable (Primasari, 2017).

In 1993 Altman returned to revise the model by eliminating variables SATA (sales / total assets) (Anjum, 2012). The elimination is done because this ratio is very varied in the indus-

try asetnyaanya different sizes. Altman model has the latest revision of 90.9% accuracy rate in predicting bankruptcy one year before the company went bankrupt. Altman model used in this study is a model Altman Altman model modification modified for application not only in manufacturing companies go public but also includes companies manufacturing non-public and corporate bonds firm (Ramadhani & Lukviarman, 2009).

This is the equation model of Altman Z-Score modified by Edward I. Altman (Ramadhani & Lukviarman, 2009) :This is the equation model of Altman Z-Score modified by Edward I. Altman (Ramadhani & Lukviarman, 2009) :

$$Z = 6,56(WCTA)+3,26(RET A)+ 6,72(EBITA)+ 1,05(MVEBVD)$$

Information :

WCTA	=	Working capital / Total assets
RETA	=	Retained earnings / Total assets
EBITA	=	Earnings before interest and taxes / total assets
MVEBVD	=	Book value of equity /Book value of total debt
Z	=	Bankruptcy Index

Category of healthy and bankrupt companies based on the value of Altman model, namely: If the value of $Z < 1.1$ then include companies that go bankrupt, if the value of $1.1 < Z < 2.6$ then include the gray area (can not be determined whether the company in healthy or bankruptcy), and if the value of $Z > 2.6$ then include companies that are not bankrupt.

Ohlson Model

Ohlson inspired by earlier studies also conducted a study on financial distress by doing some modifications in 1980. Ohlson (1980) Using data from the years 1970-1976 and a sample of 105 manufacturing companies that go bankrupt and 2,058 companies that went bankrupt during the period. Ohlson not using matched-pair sampling technique. If Altman and Beaver using source data from Moody's Manual, then Ohlson (1980) to get the data from the financial statements issued for taxes (10-K financial statement). The service used is Compustat. Ohlson using a statistical method called conditional logit. Ohlson believes that this method can cover the deficiencies contained in the MDA method used Altman and Springate. Research conducted Ohlson estimate three models, where model 1 foresee bankruptcy within one year, 2 models predict bankruptcy in two years and three models predict bankruptcy

within one or two years. The model is built Ohlson has nine variables consist of several financial ratios (Manurung, 2012) :

$$O = -1.32 - 0,407(\text{LOGTAGNP}) + 6,03(\text{TLTA}) - 1,43(\text{WCTA}) + 0,0757(\text{CLCA}) - 2,37(\text{NITA}) - 1,83(\text{CFOTL}) + 0,285(\text{INTWO}) - 1,72(\text{OENEG}) - 0,521(\text{CHIN})$$

Information :

O	=	Bankruptcy index
LOGTAGNP	=	Log (total assets / GNP-level price index))
TLTA	=	Total liabilities / total assets
WCTA	=	Working capital / total assets
CLCA	=	Current liabilities / current assets
NITA	=	Net income / total assets
CFOTL	=	Cash flow from operations / total liabilities
INTWO	=	1 if net negative income; 0 if otherwise
OENEG	=	1 if the total liabilities > total assets; 0 if otherwise
CHIN	=	(Net income T - Net income T-1) / (Net income T + Net income T-1)

This model has the optimal cutoff point at a value of 0.38. Ohlson chose this cutoff because of these values, the number of errors can be minimized. The purpose of this cutoff is that companies that have a value of O above 0.38 means the company predicted distress. Otherwise, if the value of O company under 0.38, the company predicted without experiencing distress (Wulandari et al, 2015).

Accuracy Level Model

Test the accuracy of the model used to answer the hypothesis (H1) which is proposed in this study. The prediction results distress and distress not be determined by looking at a cutoff value on every model. Furthermore, to determine the level of accuracy, is calculated by comparing the number of correct predictions by the number of samples. Here is how to get a high degree of accuracy by Syafitri and Wijaya (2014) :

$$\text{Model's Accuracy} = \frac{\text{Prediction's Correct}}{\text{Number of Sample}} \times 100\%$$

As for the errors in predicting financial distress plantation companies there are 2 types, type I error and type II error. Type I error is an error that occurs if the model predicts the samples did not experience distress when in fact ex-

perienicing distress. Whereas type II error is an error that occurs if the model predicts a sample experiencing distress when it is not experiencing distress. The level of error is the error description on every model (Altman, 2000). For the calculation of error rates are calculated in the following manner:

RESULTS AND DISCUSSIONS

Calculation of Financial Distress Prediction Model

Differences in financial distress prediction models applied to involuntary delisting companies from the stock exchange in 2015-2019 period. The model used is Altman and Ohlson.

Table 1. Financial Distress Prediction

Company	Company Code	Year	Altman Z-Score)	Ohlson (O-score)
Davo Mas Abadi Tbk	DAVO	2011	2.1	1.35
		2012	-10.1	6.43
		2013	35.6	-0.53
PT Citra Maharlika Nusantara Corpora Tbk.	CPGT	2014	-3.2	3.47
		2015	-10.8	6.50
		2016	-20.4	11.46
Berau Coal Energy Tbk	BRAU	2012	1.1	1.59
		2013	0.0	0.29
		2014	-2.1	2.58
Inovisi Infracom Tbk	INVS	2012	33.3	0.67
		2013	12.0	1.35
		2014	4.2	1.00
PT Permata Prima Sakti Tbk	TKGA	2012	-11.9	2.92
		2013	-3.7	3.95
		2014	-4.1	4.70
PT Dwi Aneka Jaya Kemasindo Tbk	DAJK	2015	1.8	0.21
		2016	-0.8	3.68
		2017	-0.2	2.79
Truba Alam Manunggal Engineering Tbk	TRUB	2015	-2.6	-2.91
		2016	-0.7	0.37
		2017	-1.1	0.83
Sekawan Intipratama Tbk	SIAP	2016	6.3	5.26
		2017	5.9	6.00
		2018	6.3	6.38

Information :

Altman : $Z < 1.1$ = bankrupt, $1.1 < Z < 2.6$ = grey area, $Z > 2.6$ = not bankrupt

Ohlson : $O > 0.38$ = bankrupt, $O < 0.38$ = not bankrupt

$$\text{Type I Error} = \frac{\text{Number of Type I Errors}}{\text{Number of Sample}} \times 100\%$$

$$\text{Type II Error} = \frac{\text{Number of Type II Errors}}{\text{Number of Sample}} \times 100\%$$

Table 1 is the result of the calculation of prediction of financial distress companies involuntary delisting from the Stock Exchange in 2015-2019 period.

Result predictions on involuntary delisting companies from the Stock Exchange in the period from 2015 through 2019, the Altman model where only two companies predicted healthy or not bankruptcy three years before being delisted, that is Inovisi Infracom Tbk and Sekawan Intip-

ratama Tbk, and in addition to the company, the others delisting company predicted unhealthy, unstable, and went bankrupt three years before being delisted.

Prediction results on involuntary delisting companies from the Stock Exchange in 2015-2019 period, using Altman model where only two companies predicted healthy or not bankruptcy three years before being delisted, that is Inovisi Infracom Tbk and Sekawan Intipratama Tbk, and in addition to the company, the others delisting company predicted unhealthy, unstable, and went bankrupt three years before being delisted. The prediction results in involuntary delisting companies

From table 2, the results predicted per year for three consecutive years prior to the delisting of the company involuntary delisting from the Stock Exchange in the period from 2015 through 2019, the Altman model results for the first year (T-1) is 62.5%, the second year (T-2) is 75%, and the third year (T-3) is 25%. For Ohlson models for the first year (T-1) is 87.5%, the second year (T-2) is 75%, and the third year (T-3) is 75%.

Model's Accuracy

The results of the calculation model accuracy rate for Altman and Ohlson on involuntary companies delisting from the Stock Exchange in 2015-2019 period can be seen in the following table:

Table 3. Accuracy of Altman Model and Ohlson Model on involuntary delisting companies in Indonesia Stock Exchange for 2015-2019 period

Result	Altman			Ohlso		
	B	GA	NB	B	NB	
Real	B	14	3	7	19	5
	NB	0	0	0	0	0
TOTAL		14	3	7	19	5
Accuracy		58.3%			79.2%	
Type I error		41.7%			20.8%	
Type II error		0%			0%	

Information : B = Bankrupt, GA = Green Area, NB = Not Bankrupt

from the Stock Exchange in 2015-2019 period, using Ohlson model which there is only one company predicted no bankruptcy or distress for 2 years consecutively Truba Alam Manunggal Engineering Tbk in 2015 and 2016, but in 2017 is predicted to experience bankruptcy. In addition to these companies, the others delisting company predicted bankrupt or distress in almost every year of the study.

Table 3 shows the accuracy of Altman model is 58.3% with type I error is 41.7% and type II error is 0%. While the Ohlson model has an accuracy rate of 79.2% with type I error is 20.8% and type II error is 0%.

From Table 3 shows that Ohlson models have the highest accuracy rate compared with Altman model in predicting bankruptcy of companies delisting in Indonesia Stock Exchange

Table 2. Financial Distress Prediction Result per Year

Altman			Ohlson		
T-1	T-2	T-3	T-1	T-2	T-3
35.6	-10.1	2.1	-0.5	6.4	1.4
-20.4	-10.8	-3.2	11.5	6.5	3.5
-2.1	0.0	1.1	2.6	0.3	1.6
4.2	12.0	33.3	1.0	1.3	0.7
-4.1	-3.7	-11.9	4.7	3.9	2.9
-0.2	-0.8	1.8	2.8	3.7	0.2
-1.1	-0.7	-2.6	0.8	0.4	-2.9
6.3	5.9	6.3	6.4	6.0	5.3
5/8*100%	6/8*100%	2/8*100%	7/8*100%	6/8*100%	6/8*100%
= 62.5%	= 75%	= 25%	= 87.5%	= 75%	= 75%

Information :

Altman : $Z < 1.1 =$ bankrupt, $1.1 < Z < 2.6 =$ grey area, $Z > 2.6 =$ not bankrupt

Ohlson : $O > 0.38 =$ bankrupt, $O < 0.38 =$ not bankrupt

(BEI) in 2015-2019 period, so that H1 is accepted.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of research and discussion conducted in this study using two analytical models that is Altman and Ohlson, it can be concluded that Ohlson model have the highest percentage of accuracy compared with Altman model in predicting bankruptcy of delisting companies in Indonesia Stock Exchange (BEI) in 2015-2019, with the accuracy of each model is 79.2% for Altman model and 58.3% for Ohlson models.

These results provide additional empirical evidence related to financial distress prediction model that can be used by those who need to do the analysis of the company's performance, by selecting the financial distress prediction model that has the highest accuracy results. The results could provide advice for the company in predicting bankruptcy as a preventative measure in anticipation of bankruptcy, or just to evaluate the performance of the company should consider a model Ohlson because in this study proved to have a high degree of accuracy and a low error type. For lenders and investors before deciding on credit policy and investment policy of a company, you should not only pay attention to the stock price, but note also the company's financial condition by doing fundamental analysis. An analysis that can be performed investors and creditors by performing predictive analysis of the company's bankruptcy for the next few years, so the information can be used as one measure of investors and creditors to take a decision creditor and investment decisions, and for future research, it is expected to increase the samples and extend the study period in to provide more accurate results, and combines Altman and Ohlson models with other bankruptcy prediction model that can be applied in companies that exist in Indonesia

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