

SURVIVAL ANALYSIS OF DELISTED INDONESIAN COMPANIES

ABSTRACT: The research purposes are to study the correlation between selected financial components and stock price. The analysis was done by calculating the correlation between financial components with stock price using 10-years period data. The results show there are six classes of companies according to correlation analysis: significant with EBIT, significant with dividend, significant with RE, significant with DER, multi significant, and insignificant. The most substantial component is the debt to equity ratio. Recommendation for investors is to understand the industry and aware of companies' activities before investing. Investing in sustainable companies leads to stable capital gain while for risk-taker investors, investing in other companies should be based on the projects handled by the company. For companies, they should have focused on the factors that correlate with their stock price

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1. Introduction

There are some ways to invest the money, and the options could be invested in real assets or financial assets. Investment in tangible assets is intangible investment asset like real estate, infrastructure, machine, and commodities such as oil and gas. Real assets used to produce goods and services and usually have a strong correlation to inflation. Investment in financial assets commonly more liquid and often more transparent pricing since they are the trade in well-functioning markets, financial assets like fixed income securities, common stocks, etc. In essence, financial assets represent the legal claim on future economic benefits. Financial assets are the means by which investors hold their applications on real assets and the income generated by these tangible assets.

One type of investment in financial assets that offers high return is investing in the capital market but has a high risk as well. Capital Market becomes a means for people to invest in financial instruments such as

One of many corporate financial issues that affect the listed company in regional stock exchange is delisting. Delisting itself is defined as the removal of listed company's

stocks, bonds, mutual funds, and others. Thus, the public may place the funds it owns under the profit and risk characteristics of each of the above financial instruments. Stock markets provide services

Investments in stock markets have the potential to earn high profits along with high risks as well. One of the traits of stocks is that it has high volatility, meaning that prices rise high quickly and then suddenly drop in too rapidly, resulting in a massive difference between the There are two common terms in the capital markets: the first one is bears market, this is a market condition where the stock price is continually falling, and therefore the investments think this trend would continue for a long time. The second one is bulls market:

This is a market condition where the stock prices are rising, and hence this market is characterized by the steady rise of the stock prices in the market. that are to connect the relationship between the investor with the companies.

stock from the stock exchange market on which it trades (Siddaiah, 2011). Some of the shareholders may be willing to choose to delist the company they invest in, this is

known as voluntary delisting, where the delisting is done by the approval of General Meeting of the Shareholders; this voluntary delisting is referred to as a "GoingPrivate Transaction" (GPT) (Djama et al., 2012). While in the forced delisting context, a firm gets delisted because it experiences financial distress or has been merged and/or acquired by another firm (Djama et al., 2012).

Survival analysis is a data analysis where the variables that are considered are the time period from the beginning of the observation until an event occurs by looking at the variables that affect the event. In the survival analysis, several factors are needed, namely: a clear start point, a definite end time to find out the censored status or not censored data, and clear measurement timescale. The scale is measured in days, weeks or years. Survival analysis has several primary objectives, namely estimating survival function and hazard function, comparing between survival function and hazard function and looking at the relationship between variables on survival time.

This is generally interesting in survival studies to illustrate an interesting factor relationship with time for events in the presence of several covariates, such as financial ratios, corporate sector, etc. The popular regression model for survival data analysis is the Cox Proportional Hazard Regression model. This allows testing for differences in survival time of two or more group interests while allowing it to adjust for covariate interests. The Cox Proportional Hazard Regression model is a semiparametric model, making fewer assumptions than ordinary parametric methods but more assumptions than the nonparametric methods described above. The Cox regression model provides useful and accessible information to interpret the relationship between hazard functions and predictors (Despa, 2017)

2. Methods

The research objective of this final project is to analyzing the fundamental condition and sectoral of financial distress

company in IDX. The conceptual framework begins with collect the quantitative data of the 45 fundamental condition from company from 2013 and 2018. The second stage is to do analysis or calculation using survival analysis to see determinant factors that affect price movements.

2.1 Distribution Data

The data obtained in this study is nominal data, i.e., the numbers given to objects only have meaning as labels, and do not show any level. For this type of data, the analysis used is non-parametric statistical analysis, because we do not consider testing the distribution of normality in the data. These data can be grouped into several categories, to see the effect of each category on their survival time. In this case, the variables is defined as two groups:

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- **Dependent Variable**
Dependent variable is a variable being tested and measured in the scientific experiment. In this study, the dependent variables are:
 - Duration: Days of the stock being dead (delisting from IDX)
 - Status of Stock: either performing non dead or dead
- **Independent Variables**
The selection independent variables in this study based on data from Annual Report for each company in IDX. The variable is divided into 3 parts by percentile. (J.Ni. 2009)

2.2 Survival Analysis

From the available data, the time for the event data will be determined. Analysis of time to event data will not only consider whether an event occurred or not but also when the event occurred. Thus, the data is divided into two groups:

1. **Uncensored data**, i.e. Stock who have a delisting status until the end point. The time from the equity reached negative until delisting from IDX was exactly known and measured in days. (Parker, et al., 2011)
2. **Censored data**, i.e. Stock have a financial distress, but still have listing status in IDX until the end point Time to censoring measured by time from stock have a financial distress until the end point's date. (Parker, et al., 2011)

Figure 1 below shows the illustration of both uncensored and censored data:

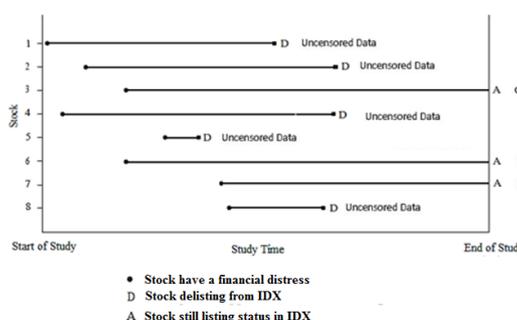


Figure 1 Time to Event and Time to Censoring Data in Bearish Condition

From the data, there were 15 data with dead status and 30 data with sensors.

2.2.1 Survival Function in 2013

Life tables can be calculated from grouped data, which is usually presented graphically as Kaplan Meier's survival curve. The Kaplan Meier method assumes that the risk of an event is the same for uncensored and censored data. The Kaplan Meier method works by dividing the estimated survival function into a series of intervals based on the time of the observed event. The function of survival is the probability that the stock will not die in the first t days of stock.

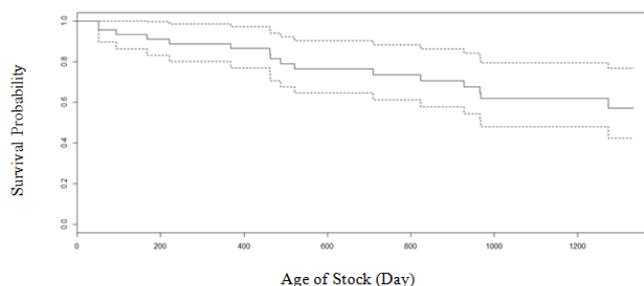


Figure 2 Survival Function

The figure 2 above shows the probability that the stock delisting will survive beyond time t . The x-axis is time. In this research, time measured by day. While the y-axis show estimate survival probability from the figure 2 above, we conclude in during 220 days after stock have a financial distress, the survival probability of those stock is 88%. It means 88% of the stocks survive more than 220 days. And the portion of stock who survive for more than 500 days, goes down to 76%. Meanwhile, only 57% of stock who survive for more than a 1200 days.

2.2.2 Cox Proportional Hazard Model 1

This model describes the relationship between the covariate and the events that are expressed by the hazard function. The Cox Proportional Hazard model is a linear model for log hazard ratios. Estimated parameters generated in R software use the Cox proportional hazards regression model related to a set of risk factors that are extended to time until dead. The Trade sector is selected as the reference for the sectors and one dummy variable is created for each of the other 8 sectors. Below is a parameter estimate for all covariates using the Breslow Method:

Table 1. Parameter Estimates of Covariates Model 1

Variable	Parameter Estimate	Z	(Pr(> z))	Significant Level	Result
EPS	-2.378	-0.798	0.3377	0.05	Not Significant
ROE	-2.641	-1.887	0.0513*	0.05	Significant
PBV	4.538	2.563	0.0145*	0.05	Significant
PER	-0.156	-0.488	0.7859	0.05	Not Significant
DER	2.816	0.787	0.4311	0.05	Not Significant
DAR	5.411	2.152	0.0314*	0.05	Significant
ROA	-2.508	-1.933	0.8196	0.05	Not Significant
NPM	-2.676	-2.235	0.0807*	0.05	Significant
X1	0.231	0.367	0.2813	0.05	Not Significant
X2	3.465	1.466	0.2813	0.05	Not Significant
X3	3.596	1.259	0.2081	0.05	Not Significant
X4	2.294	1.025	0.1229	0.05	Not Significant
X5	-1.634	-1.563	0.1180	0.05	Not Significant
X6	3.124	1.003	0.3157	0.05	Not Significant
X7	-2.634	-1.563	0.1180	0.05	Not Significant
X8	3.641	1.003	0.3157	0.05	Not Significant

Source: estimation results:

*) significant at alpha 5%

**) significant at alpha 1%

***) significant at alpha 0.1%

Concordance= 0.899 (se = 0.094)

R Square= 0.798 (max possible= 0.979)

From table 1, some information can be known that:

- ROE, PBV, DER, and NPM and Sector has significant effect value because probability values that are below the tolerable error of 5% (95% confidence level).
- EPS, PER, DAR, ROA, Sector2, Sector3, Sector4, Sector5, and Sector 6 has no significant effect value because probability values that are above the tolerable error of 5% (95% confidence level).

From table 1 shows regression coefficients, the statistical significance for each variable with overall survival. From the above output, we can conclude that:

- PBV, DAR, DAR, Sector2, Sector3, Sector4, Sector5, and Sector 6 have a positive sign of regression coefficient. These factors have a relationship to increase dead probability from a stock.
- EPS, PER, ROE, ROA, NPM, and Sector5 have a negative sign of regression coefficient. These factors have a relationship to decrease dead probability from a stock.

From this analysis, finally we can form The Cox PH model as shown as below:

$$H(t) = h_0(t) \exp(-2.378 \text{ EPS} - 2.641 \text{ ROE} + 4.538 \text{ PBV} - 0.156 \text{ PER} + 2.816 \text{ DER} + 5.411 \text{ DAR} - 2.508 \text{ ROA} - 2.676 \text{ NPM} + 0.231 \text{ X1} + 3.465 \text{ X2} + 3.596 \text{ X3} + 2.294 \text{ X4} - 1.634 \text{ X5} + 3.124 \text{ X6} - 2.634 \text{ X7} + 3.641 \text{ X8})$$

The dummy variables are included to exempt industry effects. This model could implement for screening tools when the investors want to pick the stocks reduce probability delisted from IDX.

2.2.3 Cox Proportional Hazard Model 2

In model 2, only 3 independent variable parameters are used to see the independent variable relationship with probability dead (delisted from IDX), the three parameters are net profit margin (NPM), return on assets (ROA), and debt asset ratio (ROA) This model describes the relationship between the covariate set and the events that are expressed by the hazard function. Estimated parameters generated in R software use the Cox proportional hazards regression model related to a set of risk factors that are extended to time until Death. Below is a parameter estimate for all covariates using the Breslow Method:

Table 2. Parameter Estimates of Covariates Model 2

Variable	Parameter Estimate	Z	(Pr(> z))	Significant Level	Result
NPM	-0.8954	-0.798	0.3377*	0.05	Not Significant
ROE	-0.9569	-1.978	0.0480*	0.05	Significant
DAR	1.1946	2.398	0.0165*	0.05	Significant

Source: estimation results:

*) significant at alpha 5%

**) significant at alpha 1%

***) significant at alpha 0.1%

Concordance= 0.719 (se = 0.094)

R Square = 0.62 (max possible= 0.979)

From table 2, some information can be known that:

- ROE, DAR, and NPM and Sector has significant effect value because probability values that are below the tolerable error of 5% (95% confidence level).

From table 2 shows regression coefficients, the statistical significance for each variable with overall survival. From the above output, we can conclude that:

- DAR have a positive sign of regression coefficient. These factors have a relationship to increase dead probability from a stock.
- ROE and NPM have a negative sign of regression coefficient. These factors have a relationship to decrease dead probability from a stock.

From this analysis, finally we can form The Cox PH model 2 as shown as below:

$$H(t) = h_0(t) \exp(-0.8954NPM - 0.9569ROE + 1.1946DAR)$$

This model could implement for screening tools when the investors want to pick the stocks reduce probability delisted from IDX.

3. Results and Discussions

From the model 1 and model 2, can be known that NPM and ROA have a strong relationship to decrease dead. PBV and DAR have a strong relationship to increase dead. Below will be explained the relationship each variable.

Return of Equity (ROE)

ROE has a negative and significant effect on delisting company from IDX. The higher the ROE means the more efficient use of own capital conducted by the management company to generate profits for shareholders. ROE measures the ability of firms to generate income based on specific capital. The increase in ROE signifies the increased performance of management in managing the existing funding sources to generate profit. With the increase in net profit, the value of ROE will increase.

Price to Book Value (PBV)

Price to Book Value or PBV measures the relative value of a company compared to its stock price or market value. This ratio shows how many equity investors pay for each dollar in net assets. PBV is an essential figure for potential investors and analysts because it provides a simple way to assess whether a company is rated low (undervalued) or high value (overvalued).

For delisting company, equity is decreased while the number of shares outstanding remains. So that for a delisting company, the PBV value will increase in each period before delisting. The high value of shares (PBV) compared to the actual price with low growth rates shows that the company experiences business discontinuity, this is in accordance with IDX regulation that is one of the reasons for the delisting of the company because the company experienced conditions, or events, which significantly negatively affect its business continuity.

Debt to Asset Ratio (DAR)

The increasing use of debt in comparison to its own capital will have an impact on the decline in corporate value. The high DAR indicates the high dependence of the company's capital on external parties, resulting in the company's expense because of the obligation to return or pay interest. If the company is not profitable, it is likely to suffer losses so there would be a chance that the company would enter into a financial distress condition.

Increased debt will increase the risk of non-payment of fixed obligations of the company, and this can cause those companies to suffer financial distress. This happens in companies because the larger the debt of the company is, the bigger the risk of the company in being unable to pay for its fixed obligations.

This is what investors consider negative. With the increase in debt the company will be viewed poorly by potential investors, and will hamper in providing benefits to shareholders. If a company bears a high debt burden, i.e. exceeds its own owned capital.

NPM (Net Profit Margin)

The prospective shareholders are interested in large earnings per share, because this is one indicator of the success of a company. The higher NPM value reflects the greater success of a business in its field of business. If the profit reported by the company increases then the information can be categorized as a good signal because it identifies the company is in good condition and vice versa if the company's reported earnings decreased then the company in bad condition.

4. Results and Discussions

The result indicates, there are several factors that have a significant effect on companies that are delisted from IDX, these factors are ROE, NPM Sector, PBV, and DAR. The increase in ROE and NPM values has a strong relationship to decrease dead, while the increase in PBV and DAR has a strong relationship to increase dead

ROE analysis is independent profitability of capital costs. Therefore, the delisting company, which has a decrease in ROE, especially those with negative values is a company that lacks good business continuity, but the increase in ROE signifies the increased performance of management. The higher the ROE means the more efficient use of own capital conducted by the management company to generate profits for shareholders. NPM measures the ability of firms to generate income based on specific capital.

The increase in NPM signifies the increased performance of management in managing the existing funding sources to generate profit. The high DAR indicates the high dependence of the company's capital on external parties, resulting in the company's expense because of the obligation to return or pay interest. The high DAR indicates the high dependence of the company's capital on external parties, resulting in the company's expense because of the obligation to return or pay interest. If the company is not profitable, it is likely to suffer losses so there would be a chance that the company would enter into a financial distress condition. For delisting

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5. Practical, Managerial Implications and Future Research

Implications for listed company at Jakarta Composite Index

For the company, to attract investors in order to mobilize funds from third parties need to make financial policy for improve company performance through efforts to improve ratios finance especially PBV, ROE, NPM and DER as well as providing that information more clearly so that it can be used by investors to be guided in investment decision-making.

Implications for Mutual Fund (Equity Fund)

In making investment decisions, fund manager should consider fundamental ratio such as PBV, ROE, NPM and DER. Because the information is influential on delisting company and so that fund manager can make the right decisions in investing in the IDX. Besides that, fund manager must also consider other financial ratios in conducting the analysis fundamental to the company as well as other factors outside the company policy.

Implications for Investor

Investors who will invest the money, it must be noticed and observed the fundamental ratio of the company, such as PBV, ROE, NPM and DER in order to minimize the risk invest in stock wigh high probability delisting from IDX.

Future Research

For further research, greater number of stocks can be observed, not just limited to company in financial distress condition. Number of fundamental variables can be added in order to increase the significant model and also period of time can be extended so can be the best result. Another

issue is condition macroeconomics which affect delisting company, future research can apply deeper analysis on market studies.

REFERENCES

- Abbasian, E & Nemen, A.Y. 2016. Investigating the Recession Sustainability of Main Industries in Tehran Stock Exchange: Using Cox Regression. *Iranian Journal of Economic Studies*, 5(1) 101-116
- Abdul Halim. 2005. *Analisis Investasi*. Jakarta: Salemba Empat.
- Andersson, N. 2014. *Estimating Companies' Survival in Financial Crisis Using the Cox Proportional Hazards Model*. Upsalla Universitet
- Budi Rusman Jauhari & Basuki Wibowo. 2004. *Analisis Fundamental Terhadap Return Saham Pada Periode Bullish dan Bearish Indeks Harga Saham Gabungan*. *Jurnal Akuntansi dan Keuangan*. 9: 17-32.
- C. Deng, C. Tang, and Q. Tang. 2011. *Survival Analysis of 2011 Chinas Stock Market*. Undergraduate Research. East Tennessee State University
- Collet, D. 2003. *Modelling Survival Data in Medical Research*.
- Cox, D. R .1972. "Regression models and life-tables," *Journal of the Royal Statistical Society. Series B (Methodological)*, 187–220.
- D.W. Marquardt. 1963. *An Algorithm for Least-Squares Estimation of Nonlinear Parameters*. *Journal of Society for Industrial and Applied Mathematics*, 11: 431–441
- Despa, S. 2017. *What is Survival Analysis?* Cornell University. Retrieved from <http://www.cscu.cornell.edu/news/statnews/stnews78.pdf>
- Gao, G & Bun, Z.2015. *A survival analysis method for stock market prediction*. International Conference on Behavioral, Economic and Socio-cultural Computing (BESC)
- Gitman, L.J. & Zutter, C.J., 2012, *Principles of Managerial Finance* (13th ed.). United State: PEARSON
- Gupta, V.2017. *A Survival Approach to Prediction of Default Drivers for Indian Listed Companies*. *Theoretical Economics Letters*, 116-138
- Jones, C. 2002. *A Century of Stock Market Liquidity and Trading Costs*. Working Paper, Columbia University.