ANALYSIS ON THE PREDICTION OF BANKRUPTCY OF CIGARETTE COMPANIES LISTED IN THE INDONESIA STOCK EXCHANGE USING ALTMAN (Z-SCORE) MODEL AND ZMIJEWSKI (X-SCORE) MODEL

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Abstract: This study aims to identify the results of bankruptcy predictions using Altman (Z-Score) model and Zmijewski (X-Score) model. The object of this research is four cigarette companies listed in the Indonesia Stock Exchange from 2013 to 2017. This study finds that Altman (Z-Score) model and Zmijewski (X-Score) model produce similar results. Both models can be used as considerations in predicting bankruptcy. The results of the Altman model show that PT. Sampoerna Tbk had not been in bankruptcy potential during the study period, PT. Gudang Garam Tbk was in the vulnerable zone from 2013 to 2015, PT. Wismilak Tbk was not in bankruptcy potential in 2013, in the vulnerable zone from 2014 to 2015, and not in bankruptcy potential from 2016 to 2017, and PT. Bentoel Tbk was in bankruptcy potential from 2013 to 2015 and the vulnerable zone from 2016 to 2017. The results of the Zmijewski Model show that three companies did not have the potential for bankruptcy; they are PT. Gudang Garam Tbk., PT. Sampoerna Tbk., and PT. Wismilak Tbk. However, PT. Bentoel Tbk. Had the potential for bankruptcy in from 2013 to 2015 and had no potential bankruptcy from 2016 to 2017.

Keywords: Bankruptcy, Altman (Z-score) Model, Zmijewski (X-score) Model


Companies are established with the hope that they will achieve long-term success. In fact, they must face uncertainties. There are many successful companies, yet many of them must struggle to survive but fail in the end. Failure is common in developing the economy (Altman, 1979). Predicting a company’s failure is an important research subject because it relates to the continuity of the companies in the future.

Bankruptcy is a very important phenomenon related to compromises in financial performance and company activities. A company is declared bankrupt if its total liabilities exceed its total assets.
Company’s financial condition can be used as a measurement of its ability to maintain its operations. Thus, companies need to analyze and evaluate their financial statements.

Financial analyses are conducted through the calculation of ratios, so the financial condition of companies in the past, present, and future can be assessed (Syamsudin, 2011). Many analytical methods can be used to predict bankruptcy.

The analyses that can be used to predict bankruptcy are Altman (Z-Score) model and Zmijewski (X-Score) model. Both models use financial statements, but the ratios they use are different, and so are the results. These results can be used as a consideration for the management, in this case, by considering the similar results of the two.


Grant Richardson, Grantley Taylor, and Roman Lanis (2015) examined the impact of financial difficulties on corporate tax avoidance, which encompassed the global financial crisis. William Megginson, Antonio Meles, Gabriele Sampagnaro, and Vincenzo Verdoliva (2016) examined the risk of financial difficulties in initial public offerings.


The cigarette industry is a sub-sector in manufacturing that still contributes to the national economy in labor absorption and the state’s income. In addition, cigarettes are important for Indonesian farmers.

The data of the Ministry of Industry show that the contribution of this industry is increasing. In 2014, 700 cigarette factories were producing 346.3 billion cigarettes, and in 2016, 600 cigarette companies were producing 350.03 billion cigarettes.

However, the data of the Central Bureau of Statistics show a decline (Tirto.id, 2018), which is caused by government policies that raise excise and cause price increases, in addition to the decrease in people’s purchasing power and the enactment of smoking prohibition rules.

Nevertheless, the profits of four Indonesian major cigarette companies, i.e., PT. Sampoerna Tbk., PT. Gudang Garam Tbk., PT. Wismilak Tbk., And PT. Bentoel Tbk., listed as issuers in the Indonesia Stock Exchange, are still increasing.

The net income of PT. Sampoerna Tbk., PT. Gudang Garam Tbk., And PT. Wismilak Tbk. increased (Tirto.id, 2018), while PT. Bentoel Tbk. experienced losses. The increase in net income indicates that pressures do not affect cigarette companies. Therefore, it is important to predict the bankruptcy of cigarette companies listed in the Indonesia Stock Exchange during 2013-2017.

Based on the background, the objective of this study is to predict the bankruptcy of those cigarette companies during 2013-2017 using Altman (Z-Score) model and Zmijewski (X-Score) model.

For financial management science, this research is expected to improve insight and develop knowledge about bankruptcy prediction using Altman (Z-Score) model and Zmijewski (X-Score) model. For investors, this research produces information to help investment plans in cigarette companies.

For the companies, the results of this research can be used as information to improve their financial performance, which is related to their decision making. This research is also expected to provide information for further research on Altman and Zmijewski Model.

LITERATURE REVIEW

Bankruptcy

According to Law No. 4 of 1998, bankruptcy is a condition when a company is declared by a court decision as having two or more creditors and not
paying at least one of the overdue and collectible debts. Bankruptcy can also be interpreted as a failure of a company to carry out its operations and generate profits.

**Altman (Z-Score) Model**

This model developed was by Edward I. Altman in 1969, using a discriminant analysis statistical technique, a well-known multivariate bankruptcy prediction. In general, the formula of this model is as follows.

\[
Z = 1.2 X_1 + 1.4 X_2 + 3.3 X_3 + 0.6 X_4 + 1.0 X_5
\]

\[X_1 = \text{Working capital/Total assets}\]
\[X_2 = \text{Retained earnings/Total assets}\]
\[X_3 = \text{EBIT/Total assets}\]
\[X_4 = \text{Market value of equity/Book value of total debt}\]
\[X_5 = \text{Sales/Total assets}\]

The critical score of this model is 1.8. If the score of a company is below 1.8, the company has a high probability of going bankrupt.

In Indonesia, this model can be used for companies that have gone public. However, the value of companies that have not gone public cannot be calculated. Altman then used the book value of common stock and preferred stock as the components of the independent variable. The development of the bankruptcy discriminant model is as follows.

\[
Z = 0.717 X_1 + 0.847 X_2 + 3.107 X_3 + 0.420 X_4 + 0.998 X_5
\]

The critical Z score of the model is 1.2. If the score of a company is above 1.2, the company is predicted not to experience bankruptcy. The model above can be used in companies that have and have not gone public.

**Zmijewski (X-Score) Model**

In 1983 Zmijewski examined the results of previous studies on bankruptcy. He used F-tests on group ratios, rate of return, liquidity, leverage, turnover, fixed payment coverage, trends, firm size, and stock return volatility, where significant differences between healthy and unhealthy companies were found. The model he developed is as follows.

\[
X = -4.3 - 4.5 X_1 + 5.7 X_2 - 0.004 X_3
\]

\[X_1 = \text{EA T/Total assets}\]
\[X_2 = \text{Total liabilities/Total assets}\]
\[X_3 = \text{Current assets/Current liabilities}\]

The Zmijewski model produces the X-Score as follows.

1. If \(X < 0\) or negative, the company is healthy or has no potential for bankruptcy.
2. If \(X > 0\) or positive, the company is unhealthy or has the potential for bankruptcy.

**Conceptual Framework**

**METHOD**

This quantitative descriptive study was conducted on cigarette companies listed in the Indonesia Stock Exchange from 2013 to 2017. Using purposive sampling, the criteria of the sample are:

2. Companies that successively published financial statements during the study period.
Operational Definition and Research Variables

1. Altman (Z-Score) Model
   a. Working Capital to Total Assets ($X_1$)
      This ratio shows the ability of the company to produce net working capital from the total of assets (Altman, 1968).

      \[ X_1 = \frac{\text{Working capital}}{\text{Total Assets}} \]

   b. Retained Earnings to Total Assets ($X_2$)
      This ratio shows the company’s ability to generate retained earnings from total assets (Altman, 1968).

      \[ X_2 = \frac{\text{Retained Earnings}}{\text{Total Assets}} \]

   c. Earnings Before Interest and Taxes to Total Assets ($X_3$)
      This ratio shows the company’s ability to generate profits from its assets before interest and tax payments (Altman, 1968).

      \[ X_3 = \frac{\text{EBIT}}{\text{Total Assets}} \]

   d. Book Value of Equity to Book Value of Total Debt ($X_4$)
      This ratio shows the company’s ability to fulfill all of its obligations obtained from the market value of equity (Altman, 1968).

      \[ X_4 = \frac{\text{Book Value of Equity}}{\text{Book Value of Total Debt}} \]

   e. Sales to Total Assets ($X_5$)
      This ratio shows the company’s ability to use all of its assets to make sales (Altman, 1968).

      \[ X_5 = \frac{\text{Sales}}{\text{Total Assets}} \]

2. Zmijewski (X-Score) Model
   a. Earnings After Tax to Total Asset ($X_1$)
      This ratio measures the company’s ability to generate profits from assets that it has used (Zmijewski, 1984).

      \[ X_1 = \frac{\text{EAT}}{\text{Total Assets}} \]

   b. Total Liabilities to Total Assets ($X_2$)
      This ratio shows the extent to which obligations can be covered by assets. This ratio also shows proportion or all obligations and all assets owned (Zmijewski, 1984).

      \[ X_2 = \frac{\text{Total Liabilities}}{\text{Total Assets}} \]

   c. Current Assets to Current Liabilities ($X_3$)
      This ratio shows the company’s liquidity. The higher the liquidity, the more the guarantee over the company’s debts (Zmijewski, 1984).

      \[ X_3 = \frac{\text{Current assets}}{\text{Current liabilities}} \]
RESULT AND DISCUSSION

Table 2  Calculation Result of Altman (Z-Score) Model

<table>
<thead>
<tr>
<th>No</th>
<th>Company</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PT. Gudang Garam Tbk.</td>
<td>2.705</td>
<td>2.726</td>
<td>2.879</td>
<td>3.119</td>
<td>3.196</td>
</tr>
<tr>
<td>2</td>
<td>PT. Sampoerna Tbk.</td>
<td>5.463</td>
<td>5.267</td>
<td>6.428</td>
<td>5.916</td>
<td>5.802</td>
</tr>
<tr>
<td>3</td>
<td>PT. Wismilak Tbk.</td>
<td>3.070</td>
<td>2.823</td>
<td>2.895</td>
<td>3.366</td>
<td>3.698</td>
</tr>
<tr>
<td>4</td>
<td>PT. Bentoel Tbk.</td>
<td>1.024</td>
<td>0.626</td>
<td>0.401</td>
<td>1.994</td>
<td>1.914</td>
</tr>
</tbody>
</table>

Table 3  Calculation Result of Zmijewski (X-Score) Model

<table>
<thead>
<tr>
<th>No</th>
<th>Company</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PT. Gudang Garam Tbk.</td>
<td>-2.298</td>
<td>-2.266</td>
<td>-2.475</td>
<td>-2.667</td>
<td>-2.733</td>
</tr>
<tr>
<td>4</td>
<td>PT. Bentoel Tbk.</td>
<td>1.359</td>
<td>3.173</td>
<td>3.071</td>
<td>-1.908</td>
<td>-2.066</td>
</tr>
</tbody>
</table>

The results of the analysis using the Altman model show that PT. Sampoerna Tbk had no bankruptcy potential from 2013 to 2017 with the score of above 2.9. PT Gudang Garam Tbk was in the vulnerable zone in 2013-2015 with the score of between 1.2 and 1.9, but in 2016-2017 had no bankruptcy potential with the score of above 2.9. PT. Wismilak Tbk had no bankruptcy potential in 2013 with the score of above 2.9, was in the vulnerable zone from 2014 to 2015 with the score of between 1.2 and 2.9, and had no bankruptcy potential from 2016 to 2017 with the score of above 2.9. PT. Bentoel Tbk had bankruptcy potential from 2013 to 2015 with the score of below 1.2 and was in the vulnerable zone from 2016 to 2017 with the score of between 1.2 and 2.9.

Bankruptcy potential indicates that a company is in bad condition, which is negative in profit. In this case, PT. Bentoel Tbk experienced continuous losses. The management of the company had worked optimally to avoid bankruptcy, so from 2016 to 2017, the company was in the vulnerable zone, indicating that the management had made performance improvements.

Companies that are initially in the vulnerable zone but are improving to the safe zone show an increase in performance, seen from the increased profits and sales. Meanwhile, companies that do not have the potential for bankruptcy show a good and consistent performance.
The results of the analysis using Zmijewski Model show that PT. Gudang Garam Tbk., PT. Sampoerna Tbk., and PT. Wismilak Tbk did not have the potential for bankruptcy with a score of less than 0. This is a positive sign for the company’s future sustainability.

PT. Bentoel Tbk had the bankruptcy potential from 2013 to 2015 and had no bankruptcy potential from 2016 to 2017. Improvements made by the company are expected to reduce losses and make the company not return to the position of having bankruptcy potential.

Altman (Z-Score) model and Zmijewski (X-Score) model show similar results, and the ratios they use are also similar. Therefore, both models can be taken into consideration while predicting bankruptcy related to company decision making.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This study analyzes the prediction of bankruptcy as calculated using the Altman (Z-Score) model and Zmijewski (X-Score) model. Four companies are selected as research objects. The results of the analysis are that Altman and Zmijewski model gives a similar result. The results of the Altman model show that one company had no potential for bankruptcy during the study period, one company was in the vulnerable zone for three periods yet subsequently had no potential bankruptcy, one company did not have bankruptcy potential, downgraded to the vulnerable zone and bounced back of not having bankruptcy potential, and one company had the potential for bankruptcy for three periods yet upgraded to the vulnerable zone for the next two periods. The results of Zmijewski model show that three companies had no bankruptcy potential and that one company had bankruptcy potential but then had no bankruptcy potential.

Recommendations

Investors need to consider the results of both models in predicting bankruptcy related to their investment plans. Companies, especially those in the vulnerable zone and have the potential for bankruptcy, need to improve their performance. Many ways can be taken, such as increasing sales, increasing company liquidity, and increasing profitability to increase profits. Next researchers can use other bankruptcy prediction models and expand the research object.

REFERENCES

Singh and Mishra. 2016. Re-estimation and Comparisons of Alternative Accounting Based Bankruptcy