TESTING OF BANKRUPTCY PREDICTION METHODOLOGIES FOR LITHUANIAN MARKET

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Abstract
In this article we will describe four bankruptcy-prediction methodologies (two factor models, Altman Model, Springate coefficient, Seyfulin-Kadykov coefficient), which were tested on the biggest Lithuanian diary products companies.
Results of this research showed that AB „Pieno žvaigždės” is at the safe levels by two-factor model and Seyfulin-Kadykov coefficient, although Altman and Springate coefficient predicted bankruptcy. Because of the different results and small predictability we would like to affirm that all four widely recognized bankruptcy prediction methods aren’t suitable for Lithuanian conditions.
The Main Aim Of Research is to overview of widely recognized bankruptcy methods and possibility to implement them in Lithuania.
The object of this Research – Analysis of financial statements and methods of bankruptcy probability for 45 Companies.
Methods of Research – Analysis of scientific literature, statistical data analysis, mathematical and graphical analysis, aggregation and conclusions of research results.

Introduction
The problem of bankruptcy prediction was analyzed at the academic level for a long time.
Low transparency and complexity of the bankruptcy prediction models were the main reasons for unpopularity of these models. However, these days using advanced IT systems more and more users can afford to use those models and it could be implemented in the practice.
The Basis for diagnostic of Bankruptcy is monitoring and assessment of company’s financial condition and the main aim is to spot early signals and reasons of bankruptcy and also establish mitigants to avoid bankruptcy.
The bankruptcy of the company could cause external and internal reasons. In the period of economical down cycle the main reasons for bankruptcy can arise from external conditions such as inflation, tax and legal system, foreign currency depreciation and other reasons. Internal factors could be described such as lack of management experience, lack of knowledge how use effectively company’s assets and liabilities. Analyzing company’s financial statements, dynamic and trends of main financial ratios and competitiveness we can observe early signals of bankruptcy. The possibility to predict bankruptcy is very important for all market participants: company’s management, creditors and investors and also, regulators. The bankruptcy usually associated with big costs and risk. Regardless those and other reasons were developed a lot of models to forecast and predict bankruptcy of the company.

Prediction of the bankruptcy as a problem basically became an issue after Second World War in US. The main reason for that was steeply increased number of bankruptcies. At the beginning problem of bankruptcy was solved based using empirical experience and evidence, which led to a number of mistakes. The first experiments to develop effective prediction method for bankruptcy were seen in the early 60’s. It was related with intense development of new financial models and also, beginning of IT era.

All bankruptcy prediction models we can divide into two main groups. First group: are the models based on financial indicators, and on this basis calculated coefficients: Altman Z index (Z Score), Springate coefficient and etc. In simple words all of them were based on the balance sheet and financial statements information. The second group and methods are simpler. They were based on the benchmark of financial indicators between already bankrupted companies and existing companies. In this publication we will overview just methods of first group, because we believe they are more efficient and correct. [2] However, these methods have some disadvantages listed below:
• Firstly, companies, which are struggling financially, usually delay to publish publicly financial statements and also, could provide lack of financial transparency.
• Secondly, even in the published data could be speculations and some hidden information. Usually companies are trying to make
up their poor financial performance or to convince regulators and investors that they perform well. We remember some good examples about, one of the biggest companies Enron, WorldCom, Parmalat bankruptcies, when they was able to convince regulators, investors, rating and audit companies about successful business just before they became bankrupted.

- Third problem is that very often some of the financial indicators and ratios show poor performance and critical conditions of the company while others shows efficient and stable situation. Based on that it’s very difficult to make decisions and to assess real financial situation of the company.

Many methods of bankruptcy prediction were developed but majority of them based on one-factor models, multi factors or logarithmic analysis. In the next chapters we will describe some of widely recognized methods.

1. Methods of Bankruptcy probability assessment

1.1. Two Factor Model

One of the simplest methods of bankruptcy prediction is a model, which includes two factors. It is based on two coefficients for instance current ratio coefficient and total asset and liability coefficient. Based on the values of coefficients we could decide about the possibility of bankruptcy.

These two ratios multiplied by weighting coefficients (which we can find experimentally or statistically) we could easily describe as regression equation. Value of the regression equation is benchmarked with critical limit.

US scientists found these values of ratios and weight coefficients:

\[ C_1 = -0.3877 - 1.0736A_1 + 5.79A_2 \]  \( (1) \)

Where:

\[ A_1 = \text{Current ratio} \]
\[ A_1 \left( A_1 = \frac{\text{Current Assets}}{\text{Current Liabilities}} \right) \]
\[ A_2 = \text{Asset and Liability Ratio} \]
\[ A_2 \left( A_2 = \frac{\text{Debt Capital}}{\text{Assets}} \right) \]

If value \( C_1 \) is 0, then probability of company’s bankruptcy equals 0.5 or 50%.

If value \( C_1 < 0 \), then probability of company’s bankruptcy very low. The lower value the lower probability for company to go into the bankruptcy.

If value \( C_1 > 0 \), then probability of company’s bankruptcy are higher than 50% and higher ratio indicates higher probability for company to go into the bankruptcy.

We would like to note that we couldn’t find evidence and transparency how these weighting coefficients were found and developed in the late 60’s. Also, it is obvious Lithuanian economy at these days is completely different from US in late 60’s. The differences are not just inflation levels, macro and micro economical cycles but also capital markets, return of capital, capital efficiency, tax system, legal system and etc. Summarizing all of above we believe it’s very difficult to implement those methods into the Lithuanian market today.

So, after all: accuracy and reliability of two-factor model isn’t high enough and the variance between forecasted values and real situation are huge. There is no statistical or practical confidence for this method to be used in our market.

For better results American scientists recommends to include into this ratio rentability of sales coefficient which has strong direct impact for companies financial performance.

If value of bankruptcy risk ratio \( C_1 \) are at the safe levels and sales rentability are high then probability for company to go into the bankruptcy are very small [18]. The main advantages of this method are:

- Simplicity;
- Adaptability under limited information;

Disadvantages:

- The accuracy of the method just 65%;
- Very limited assessment of companies financials;

1.2. Altman Index (Z Score)

In the developed economy countries widely used method for prediction of companies bankruptcy is Altman Index sometimes also, known as Credit capacity index or Z score. American scientist Edward Altman in 1968 has developed first method of bankruptcy prediction, which had relatively high accuracy and predictiveness levels. In his research he used financial data of 66 companies. Half of these companies did bankrupt between 1946 and 1965.
He found 22 coefficients, which could be used to predict bankruptcy probability of company. Later he established 5 main factors, which were included into the multi regression equation [1;2]. The equation of Z index showed below:

\[ Z = 3.3K_1 + 1.0K_2 + 0.6K_3 + 1.4K_4 + 1.2K_5 \]  (2)

Where:

\[
K_1 = \frac{\text{Profit before tax}}{\text{Total Assets}}; \\
K_2 = \frac{\text{Sales}}{\text{Total Assets}}; \\
K_3 = \frac{\text{Owner’s equity}}{\text{Debt Capital}}; \\
K_4 = \frac{\text{Not Allocated Profit}}{\text{Total Assets}}; \\
K_5 = \frac{\text{Working Capital/Assets}}{\text{Total Assets}}.
\]

If Corporate Z index value is less than 2.675, then corporate is described as close to bankruptcy.

Table 1 shows relation between Z index and bankruptcy probability.

<table>
<thead>
<tr>
<th>Value of Z Index</th>
<th>Probability of Bankruptcy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1,8</td>
<td>Very High</td>
</tr>
<tr>
<td>From 1,8 To 2,7</td>
<td>High</td>
</tr>
<tr>
<td>From 2,7 To 2,9</td>
<td>Medium</td>
</tr>
<tr>
<td>Higher than 2,9</td>
<td>Very Low</td>
</tr>
</tbody>
</table>

As Altman concluded: using this model allows predicting bankruptcy of the company with very high confidence level.

Accuracy ratio of the model is around 95% for one-year prediction term. Model also, showed 6% of first type errors when forecast was that probability to go into bankruptcy very low but during one-year period those companies bankrupted. Also, model showed, 3% errors when predictions were to go into bankruptcy during next year but companies succeeded very well and didn’t bankrupt.

However Altman model has some disadvantages because this index was developed in 1968 and based on small sample of 66 US companies and thus doesn’t match today’s needs and can’t be beneficial for Lithuanian market.

1.3. Coefficient of Springate

Gordon L.V. Springate a Canadian scientist on the basis of Altman developed own coefficient. He selected 4 major ratios from 19. The main criteria for this selection were independency between ratios and also highest correlation and predictiveness of company’s bankruptcy.

Springate coefficient is calculated by formula:

\[ Z = 1.03A + 3.07B + 0.66C + 0.4D \]  (3)

Where:

\[
A = \frac{\text{Net Working Capital}}{\text{Total Assets}}; \\
B = \frac{\text{Profit Before Tax}}{\text{Total Assets}}; \\
C = \frac{\text{Profit before Tax}}{\text{Current Liabilities}}; \\
D = \frac{\text{Sales}}{\text{Total Assets}}.
\]

If value of Springate coefficient less than 0.862 then company is classified as going to default.

By Springate analysis the accuracy ratio of the coefficient is 92.5%. However, other scientists alleged that accuracy ratio much less. I. Bother tested Springate coefficient accuracy and found 88% and another scientist A. Sand found just 83.3%.

1.4. Seyfulin and Kadykov Coefficient

As an alternative for the models developed by American and Canadian scientists we can find method developed by Russian scientists Seyfulin and Kadykov. We will briefly overview this method and coefficient. This coefficient was developed using financial data of Russian companies in 1992. This coefficient expressed as:

\[ R = 2K_1 + 0.1K_2 + 0.08K_3 + 0.45K_4 + K_5 \]  (4)

Where:

\[
K_1 = \frac{\text{Net Working Capital}}{\text{Owner’s Equity}}; \\
K_2 = \frac{\text{Current Assets}}{\text{Current Liabilities}}; \\
K_3 = \frac{\text{Sales}}{\text{Total Assets}}; \\
K_4 = \frac{\text{Net Profit}}{\text{Sales}}; \\
K_5 = \frac{\text{Gross Profit}}{\text{Owner’s Equity}}.
\]
2. **Accuracy of the Methods**

All mentioned methods we can compare by benchmarking of the accuracy of these methods and ratios. For this benchmarking were used classification matrix. (Table 2).

<table>
<thead>
<tr>
<th>Real situation</th>
<th>Forecast</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bankruptcy</td>
<td>( f_{11} )</td>
<td>( f_{12} )</td>
</tr>
<tr>
<td>Stability</td>
<td>( f_{21} )</td>
<td>( f_{22} )</td>
</tr>
</tbody>
</table>

We will overview briefly this benchmark:
- \( f_{11} \) – correct prediction: "company will bankrupt";
- \( f_{21} \) – wrong prediction: "the forecast was that company should bankrupt but in reality we have stable situation";
- \( f_{12} \) – wrong prediction: "the forecast was that will stable situation but in reality company bankrupted";
- \( f_{22} \) – correct prediction: "company’s financial status (predicted and in reality) is stable".

The total accuracy of the method is:

\[
\text{Accuracy} = \frac{f_{11} + f_{22}}{f_{11} + f_{21} + f_{12} + f_{22}} \]  

(5)

For the accuracy and predictiveness of the method we cannot use the division of just correct predictions and number of all predictions because exist errors of two types:
- First type errors (\( f_{12} \)) – errors when company is classified as stable but bankrupted in reality.
- Second type (\( f_{21} \)) – errors when company is classified, as going to bankruptcy but is stable in reality.

The weight (price) of those two errors is different. The consequences of first type errors are significantly higher than second. For example: "The bank at the time when gives loan predicted and analyzed probability of the default just by one mentioned above method. Analysis showed that the company’s financial status is stable and gives loan for this company. If this company will go to default (bankruptcy) than the creditor can loose 100% of the loan amount and accrued interest payments. By the second scenario: if company is classified as a going to default (bankruptcy) then the loan request from company will be not accepted. And in this scenario loses will be much lower (from 0% to interest rate margin percentage and depends how quick bank will find another borrower). If another company (borrower) will be found and loan issued at the same conditions than loses will be 0 or close to it. If new borrower will be not found then the loss will be equal to interest margin.

All mentioned above methods and ratios are very simple and can by used in practice. Each of the methods could be used to predict default or bankruptcy using different types of factors and reasons. There is no universal model or ratios to predict company’s bankruptcy. Methods can differ by economical cycle, sector, country and etc. Also, very important do not to rely just on one method or coefficient but to analyze set of them and to monitor trends of those coefficients.

Finalizing this comparison we also, would like to mention that bankruptcy prediction is not just science for scientist and financiers but also, an art because of the involving market also, these methods were developed based on historical data but it doesn’t mean that the same will happen in the future. All scientists assert that it’s just another one step and another alternative models were built but all decisions should be made by human experience and knowledge.

3. **Testing Of Bankruptcy (default) Prediction Methods**

In this research we will test probability of Bankruptcy (default) for “AB Pieno žvaigždės”. For the analysis and testing were used financial statements data from Commission of Lithuanian Securities [6;7;8;9]. Also, were used mentioned above: two factors method, Altman index (Z score), Springate model, and Seyfulin-Kadykov coefficient.

3.1. Two factor model

Firstly, we will calculate probability of bankruptcy for “AB Pieno žvaigždės” using the simplest two-
factor method. Table 3 shows results of the calculation.

Table 3. Probability of Bankruptcy (default) for AB „Pieno žvaigždės” by two-factor model

<table>
<thead>
<tr>
<th>Ratio</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Ratio</td>
<td>1.70</td>
<td>1.46</td>
<td>1.68</td>
<td>1.45</td>
</tr>
<tr>
<td>Asset and Liability ratio</td>
<td>0.36</td>
<td>0.38</td>
<td>0.46</td>
<td>0.44</td>
</tr>
<tr>
<td>Coefficient</td>
<td>−1.42</td>
<td>−1.15</td>
<td>−1.39</td>
<td>−1.14</td>
</tr>
</tbody>
</table>

Picture 1 shows two-factor coefficient for this company from 2000 to 2003.

As one can see value of the two-factor coefficient was the best in 2000 and slightly lower in 2002.

The results were very strange because financial status of the company in 2000 and 2003 were completely different. It shows that it is very difficult and sometimes misleading to do any conclusions and decisions based on the results of two-factor model.

Despite all disadvantages of this method we showed (Picture 2) comparison of the companies by two-factor coefficient.

We can see that the worse ratio is for “AB Pieno žvaigždės” and the best for “AB Rokiškio sūris” and especially in 2000 when the value of two-factor coefficient was −6.92.

3.2. Altman index (Z Score)

One of the most popular methods is Altman index (Z-score). Z score is calculated using formula (2).

Altman coefficient for “AB Pieno žvaigždės” is showed in Table 4.

Table 4. AB „Pieno žvaigždės” probability of bankruptcy (default) by Altman model

<table>
<thead>
<tr>
<th>Ratio</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profitability of Assets</td>
<td>0.09</td>
<td>0.06</td>
<td>−0.01</td>
<td>0.05</td>
</tr>
<tr>
<td>Return Of Assets</td>
<td>1.91</td>
<td>1.60</td>
<td>1.33</td>
<td>1.34</td>
</tr>
<tr>
<td>Owner’s Equity Ratio</td>
<td>1.77</td>
<td>1.61</td>
<td>1.19</td>
<td>1.28</td>
</tr>
<tr>
<td>Assets Efficiency</td>
<td>0.05</td>
<td>0.06</td>
<td>0.02</td>
<td>0.07</td>
</tr>
<tr>
<td>Working Capital / Assets Ratio</td>
<td>0.20</td>
<td>0.12</td>
<td>0.15</td>
<td>0.10</td>
</tr>
<tr>
<td>Z index (score)</td>
<td>3.58</td>
<td>2.98</td>
<td>2.23</td>
<td>2.50</td>
</tr>
</tbody>
</table>

As we can see the probability of bankruptcy for AB „Pieno žvaigždės” increased. Company’s financial status was safe and stable in 2000 and later Z index decreased and in 2002 value of index showed high probability of bankruptcy. Z index slightly increased from 2.23 to 2.50.

Also, very important is to monitor trends and reasons for the changes index value.

The reason (about 53%) for Z index decrease in 2001 had return of assets ratio, which has decreased form 1.91 to 1.61. This happened because assets of the company increased at higher pace than sales.

The biggest driver for Z index decreasing in value was Return of Assets, which slowed from 1.60 to 1.33. And the reasons were rising of company’s assets and sales slowdown. Only one positive ratio was Working Capital/Assets.

Z index increased in 2002 from 2.23 to 2.50 and the main reason (about 73%) was Profitability Of Assets. This was the direct impact of increased net profit growth in 2002.

As we can see the biggest driver for Z index was Return Of Assets because company’s assets growth more than sales.

Return of Assets had the biggest impact and weight in 2001, while changes in Assets Profitability were the biggest drivers for 2002–2003 period.

The same as in Altman index case Company’s status was stable in 2000. But in 2001 coefficient started to decrease to 1.08. The critical situation was observed in 2002 when value of coefficient was just 0.64 and it was below critical value of this measure. Probability of bankruptcy increased dramatically but situation got slightly better in 2003 when value of coefficient increased above critical limit.

### 3.3. Springate Coefficient

This coefficient is calculated using formula (3) if value of the coefficient is less than 0.862, and then company is classified as defaulted (going into bankruptcy).

Table 5 shows calculated values of Springate coefficient for “AB Pieno žvaigždės”.

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Working Capital/Total Assets</td>
<td>0.20</td>
<td>0.12</td>
<td>0.15</td>
<td>0.10</td>
</tr>
<tr>
<td>Profit Before Tax/Total Assets</td>
<td>0.09</td>
<td>0.06</td>
<td>-0.01</td>
<td>0.05</td>
</tr>
<tr>
<td>Profit Before Tax/Current Liabilities</td>
<td>0.31</td>
<td>0.22</td>
<td>-0.03</td>
<td>0.24</td>
</tr>
<tr>
<td>Sales/Total Assets</td>
<td>1.91</td>
<td>1.60</td>
<td>1.33</td>
<td>1.34</td>
</tr>
<tr>
<td>Springate Coefficient</td>
<td>1.45</td>
<td>1.08</td>
<td>0.64</td>
<td>0.96</td>
</tr>
</tbody>
</table>

The comparison of the results by Altman z index and Springate coefficient showed different signals and predictiveness of bankruptcy. For instance in 2003 probability of bankruptcy by Z index was high while Springate coefficient showed stable financial status and probability of bankruptcy was very low. Picture 6 shows comparison between “AB Pieno žvaigždės” and other companies in the sector by Springate coefficient.
The value of Springate coefficient for “AB Pieno žvaigždės” was one of the highest (higher just for “AB Rokiškio sūris”).

The main trend of the coefficient was very similar for almost all companies. The values of the coefficient were higher than critical limit for all companies and lower in 2002.

3.4. Seyfulin-Kadykov Coefficient

Seyfulin-Kadykov Coefficient is calculated by formula (4). The company’s financial situation is considered as negative if value of coefficient is less than 1.

Calculated values of the coefficient for “AB Pieno žvaigždės” are showed in Table 6.

Picture 7 shows dynamic of this coefficient graphically.

Table 6. Probability of bankruptcy for “AB Pieno žvaigždės”

<table>
<thead>
<tr>
<th>Ratio</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Working Capital</td>
<td>0.31</td>
<td>0.19</td>
<td>0.28</td>
<td>0.18</td>
</tr>
<tr>
<td>Owner’s Equity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Assets</td>
<td>1.70</td>
<td>1.46</td>
<td>1.68</td>
<td>1.45</td>
</tr>
<tr>
<td>Current Liabilities</td>
<td>1.91</td>
<td>1.60</td>
<td>1.33</td>
<td>1.34</td>
</tr>
<tr>
<td>Sales / Total Assets</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net Profit / Sales</td>
<td>0.05</td>
<td>0.04</td>
<td>-0.01</td>
<td>0.04</td>
</tr>
<tr>
<td>Gross Profit / Owner’s Equity</td>
<td>0.54</td>
<td>0.48</td>
<td>0.37</td>
<td>0.54</td>
</tr>
<tr>
<td>Seyfulin-Kadykov coefficient</td>
<td>1.51</td>
<td>1.16</td>
<td>1.20</td>
<td>1.16</td>
</tr>
</tbody>
</table>

Similarly as by Altman method company’s financial status was stable in 2000. However coefficient started to decline up to 1.16. However, the biggest difference between Seyfulin-Kadykov coefficient and Altman z index was observed in 2002 when the ratio increased instead decreasing. Over the all four years value of the coefficient was higher than required minimum level.

3.5. Accuracy Of The Methods

We will test, validate and compare accuracy of all above-mentioned methods. We have chosen sample of 45 companies and used financial statements data, which covered period from 1995–2000 [10].
Accuracy of two-factor model is showed in Table 7. The total accuracy of this method is just 62.0%. We found less first type errors however their importance are much bigger than for errors of second type.

Table 7. Classification Matrix For Two-Factor Model

<table>
<thead>
<tr>
<th>Real Status</th>
<th>Forecast</th>
<th>Total</th>
<th>Accuracy, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bankruptcy</td>
<td>20</td>
<td>27</td>
<td>74,1</td>
</tr>
<tr>
<td>Stable Status</td>
<td>89</td>
<td>219</td>
<td>59,4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>109</strong></td>
<td><strong>246</strong></td>
<td><strong>61,0</strong></td>
</tr>
</tbody>
</table>

Table 8 shows accuracy of Altman model.

Table 8. Classification Matrix For Altman Model

<table>
<thead>
<tr>
<th>Real Status</th>
<th>Forecast</th>
<th>Total</th>
<th>Accuracy, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bankruptcy</td>
<td>22</td>
<td>27</td>
<td>81,5</td>
</tr>
<tr>
<td>Stable Status</td>
<td>82</td>
<td>219</td>
<td>62,6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>104</strong></td>
<td><strong>246</strong></td>
<td><strong>64,6</strong></td>
</tr>
</tbody>
</table>

Accuracy of Altman model – 64.6% and showed less Ist and IInd type errors in comparison with two-factor model.

Table 8 shows accuracy of Springate model. Despite it accuracy of Springate model is less. However, frequency of Ist type errors is much lower and predictiveness of bankruptcy was 92.6%.

Table 9. Classification Matrix For Springate Model

<table>
<thead>
<tr>
<th>Real Status</th>
<th>Forecast</th>
<th>Total</th>
<th>Accuracy, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bankruptcy</td>
<td>25</td>
<td>27</td>
<td>92,6</td>
</tr>
<tr>
<td>Stable Status</td>
<td>94</td>
<td>219</td>
<td>57,1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>119</strong></td>
<td><strong>246</strong></td>
<td><strong>61,0</strong></td>
</tr>
</tbody>
</table>

Table 10 shows results of Seyfulin-Kadykov model accuracy.

The model developed by two Russian scientists showed lower accuracy ratios; also, I^st and II^nd type errors were more frequent.
As we can see the highest total accuracy % has Altman Z score, but had much higher Ist type errors frequency.

Summarizing this research we would like to make following conclusions:

- The highest level of predictiveness and accuracy ratios obtained using Altman model (64.6%) and the lowest Seyfilin-Kadykov (58.9%).
- The lowest frequency of Ist type errors observed in Springate model and the lowest level of IInd type errors observed using Altman model (z score).
- Considering “Errors Price Index” the highest level of accuracy and predictiveness was achieved using Springate.

From the all mentioned in this research methods the biggest popularity in Lithuania has Altman model (Z score). Z score also, uses audit and consultancy companies. However, these days in the developed economy countries financial companies, banks, audit and consultancy companies are using more sophisticated and advanced scoring, internal rating and prediction models.

The results of this initial research showed that all four analyzed methods aren’t good enough for Lithuanian market and requires additional efforts for building and developing new more sophisticated, adjusted for market specific and more predictive models.

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Santrauka
Tyrimo metu buvo nagrinėjami: dviejų faktorių modelis, Altmano indeksas Z (kreditinio pajėgumo indeksas), Springeito koeficientas, Sajfulino ir Kadykovo koeficientas. Metodų tikslumui įvertinti buvo naudojama klasifikavimo matrica.

Tyrimas parodė, jog:
- dviejų faktorių modelio, pagrįsto dviejų rodiklių dinamika, pagalba negalima patikimai įvertinti įmonės perspektyvos;
- didžiausią įtaką Altmano koeficiento dinamikai turi įmonės turto grąžos dinamika;
- lyginant Springeito ir Altmano koeficientus pastebėjome prieštaravimą: kai pagal Altmano modelį įmonėi grėsė bankrotas, pagal Springeito modelį bankroto tikimybės nebuvo;
- Sajfulino ir Kadykovo metodo taikymas parodė, kad per visą analizavimą laikotarpį tyrimos bendrovės buvo ties saugumo riba.

Skaiciuojant metodų tikslumo lygi, naudojant 45 Lietuvos įmonių finansinius duomenis už 1995–2000 metus buvo nustatyta, kad:
- dviejų faktorių metodo tikslumo vidurkis – 61 proc.;
- Altmano modelio – 64,6 proc.;
- Springeito modelio – 61 proc.;
- Sajfulino ir Kadykovo – 58,9 proc.

Atlikus keturių modelių tikslumo analizę galime teigti, kad modeliai nėra pakankamai patikimi Lietuvos įmonių bankroto diagnostikai, todėl prasminga ieškoti patikimesnių būdų šiai problemai spręsti.

Raktasidžiai: Dviejų faktorių modelis (two factor models), Altmano indeksas (Altman model), Springeito koeficientas (Springate coefficient), Sajfulino ir Kadykovo koeficientas (Seyfulin-Kodakov coefficient), bendras metodo tikslumas (The total accuracy), „Klaidų kainos“ įvertinimo metodas (“Errors Price Index”).