**ASSESSMENT OF BANKRUPTCY PREDICTION MODELS’ APPLICABILITY IN CROATIA**

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**Abstract:**

*The objective of this paper is to answer the question whether the use of well-known forecasting models can predict bankruptcy of companies in Croatia. The models applied are: Altman’s Z’-Score, Springate model, FP Rating model, BEX index, Kralicek’s Quicktest and Bonitest, all of them being accounting-based bankruptcy prediction models. Our hypothesis was that domestically developed models would be better predictors of bankruptcy. The analysis confirms that for most of the bankrupt companies all the models predicted bankruptcy even four years before the actual bankruptcy occurring. However, in most cases better predictors of bankruptcy were foreign models. By comparing the outcomes resulting from the application of the simple scoring models Bonitest and Quicktest we conclude that Bonitest model developed for Croatian market performs better than Kralicek’s Quicktest, the model developed on German-speaking area. In contrast, the multiple discriminant analysis models FP Rating model and BEX index developed using Croatian companies’ data show less precision when predicting bankruptcy for medium companies in Croatia than foreign models Altman’s Z’-Score and Springate model. Based on the results we believe it would be reasonable to revise the applicability of existing domestically developed models.*

**Key words:** financial statements, bankruptcy, manufacturing, bankruptcy prediction models

**JEL classification code**: M4 Accounting and Auditing

**Introduction**

Bankruptcy as the result of insolvency and over-indebtedness of a company causes multiple negative consequences to other legal entities and individuals, but also to the society as a whole. The adverse economic conditions increase the company’s risk of negative business result, thus making a possibility to foresee a bankruptcy an important area of ​​research.

Various forecasting models are being used worldwide to predict business failure and insolvency. They can provide very important information for investors, creditors, employees, the general public and the country as a whole. The information provided by these models could also be useful for the companies facing business difficulties themselves, whereas an early start of restructuring might enable the company to avoid bankruptcy at all.

The objective of our paper is to answer the question whether the use of well-known forecasting models can predict bankruptcy of companies in the Republic of Croatia, and how these models are applicable in real circumstances. The models applied are: Altman’s Z’-Score model, Springate model, Kralicek’s Quicktest, FP Rating model, BEX index and Bonitest. All these models are accounting-based bankruptcy prediction models. Accounting-based models are likely to be sample specific since to build one, the accounting ratios of a large sample of failed and non-failed firms has to be studied to estimate ratio weightings used in the model (Agarwal & Taffler, 2008, p. 1542). Altman’s model was developed using USA data, Springate model used Canadian data and Kralicek model used Austrian, German and Swiss data. Because of that we expect that the models developed on specific samples from other countries cannot give as good results for Croatian companies as domestically developed models.

The research shows that the predictive power of originally developed models usually decreases over time. Begley et al. (1996) examined Altman’s original 1968 Z-score model on the 1980’s sample and found that the model did not perform as good as when it was originated meaning that both type I (misclassifying a bankrupt firm as non-bankrupt) and type II (misclassifying a non-bankrupt firm as bankrupt) errors increased. Further they re-estimated coefficients based on 1980’s sample but by applying such a model the average of the Type I and Type II error rates was not reduced compared to original model. Grice and Ingram (2001) used original Altman’s model and on 1985-1987 sample re-estimated model. They applied both models on 1988-1991 prediction sample and found that original model’s accuracy considerably declined and that original model should not be used without re-estimation of coefficients. Important insight was that the accuracy was greater for manufacturing compared to non-manufacturing firms.

Alternative possibility to predict bankruptcy is the use of market-based models. Even though market based models are very often used by financial institutions, there is a lack of empirical literature that examines their strength compared to accounting-based models. Agarwal & Taffler (2008) have empirically tested UK-based Z-score against market based model for credit risk assessment use and found that traditional accounting-based bankruptcy risk models even dominate market models when potential bank profitability is considered. We do not use market models since we are particularly interested in small and medium enterprises that constitute around 99% of companies in Croatia and whose participation on capital market is extremely rare.

To the best of our knowledge there are yet no similar studies as ours. There are studies that do model testing but only of one specific model. In the literature there are also studies that try to recalculate coefficients of the existing multiple discriminant analysis models using more recent data. The authors in Croatia usually try to develop new predictions models without testing the existing ones.

**Bankruptcy models**

In the paper we apply two types of bankruptcy prediction models. Firstly we test models that were developed by the use of multiple discriminant analysis such as Z’-score, Springate, Bex index and FP Rating. Then we analyze data by simple scoring models like Kralicek Quicktest and Bonitest. One of the advantages of multiple discriminant analysis is that by the use of a small number of ratios a very informative value is received that classifies companies in different groups like for example classification of companies in the category of bankrupt or non-bankrupt (Altman, p. 10).

***Multiple discriminant analysis models***

Altman developed his Z-score model in 1968. Since Z-score is for publicly traded companies we use Z’-score that is adapted for private companies (Altman, p. 20):

Z’ = 0,717X1 + 0,847X2 + 3,107X3 + 0,420X4 + 0,998X5

where X1= working capital/total assets,

X2= retained earnings/total assets,

X3= earnings before interest and taxes/total assets,

X4= book value of equity/book value of total liabilities, and

X5= sales/total assets

The cutoff rules are as follows:

* Z'<1,23 = Zone I (no errors in bankruptcy classification)
* Z'>2,90 = Zone II (no errors in non-bankruptcy classification)
* gray area or zone of ignorance (possibility of misclassification) = 1,23 to 2,90.

Variable X2 is calculated as retained earnings/total assets. Since retained earnings in USA consist of beginning retained earnings plus net income (or minus any net losses) and minus any dividends paid to shareholders, we calculated numerator of variable X2 as retained earnings (Croatian interpretation) or previous years’ losses (losses being negative number) plus current year net profit or loss (loss being negative number).

Springate model is convenient for our study since it was developed using manufacturing sector companies and the formula is (Boritz et al., 2007, p. 146):

Z = 1,03X1 + 3,07X3 + 0,4X5 + 0,66X6,

where X6 = net profit before taxes/current liabilities. Springate's cutoff rule is that firms are categorized as failed if Z < 0,862.

BEX (Business excellence) was developed for Croatian market having in mind prognosis of business excellence for companies that participate on capital market (Belak and Aljinović Barač, 2007). Since model does not include ratios that actually depend on participation on capital market, the model is applicable to all companies and its formula is (Ibid., p. 18):

BEX = 0,388 X3 + 0,579X7 + 0,153X1 + 0,316X8

where X7 is and

X8 is .

If BEX index is higher than 1 that represents good company, values between 0 and 1 require improvements in business operations and values lower than 0 represent the company whose existence is endangered.

FP Rating model was developed using data for Croatian enterprises of different sizes and its formula is (Pervan and Filipović, 2010, p. 94):

FP RATING = -1,0937 + 2,0956X9 – 0,005X10 + 0,622X11 – 0,000005X12 + 0,1116X13

where X9 is equity ratio (equity/total assets),

X10 shows numbers of years needed to repay all the liabilities using cumulated profit over firm’s entire life plus amortization and is calculated as total liabilities/ [retained earnings or previous years’ losses (losses being negative number) + current year net profit or loss (loss being negative number) + amortization]

X11 is total revenues/total assets

X12 is average collection period calculated as

X13 is

Cutoff values for interpretation of this model are not publicly available. The authors suggest that the model is the most precise in prediction of insolvency problems of SMEs (Ibid., p. 92).

***Simple scoring models***

Kralicek Quicktest (Kralicek, 2007) is based on following ratios: equity ratio, net debt to EBITDA ratio, return on assets (X3 in previous models), and cash flow rate. Net debt to EBITDA ratio shows debt repayment duration in years. If cash is higher than total liabilities this ratio value is set to 0 and the highest individual ratio of 1 is given. What distinguishes Quicktest from other models is that it uses two ratios that are based on cash flow. The scoring system is presented in table 1.

*Table 1: Quicktest scoring (Kralicek, 2007)*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Score**  **Ratio** | | **Very good**  **(1)** | **Good**  **(2)** | **Medium**  **(3)** | **Bad**  **(4)** | **Threat of Insolvency**  **(5)** |
| Financial stability | Equity ratio = equity/total assets in % | >30 | >20 | >10 | <10 | negative |
| Net Debt To EBITDA Ratio = (Total liabilities – Cash)/Cash flow before taxation (EBITDA) | <3 | <5 | <12 | <30 | >30 |
| Profitability | ROA = EBIT/total assets in % | >15 | >12 | >8 | <8 | negative |
| Cash flow rate = cash flow/sales in % | >10 | >8 | >5 | <5 | negative |

Cash flow before taxation is calculated as profit on ordinary activities before taxation + amortization i.e it is EBITDA. After the scoring procedure the average score for financial stability and profitability as well as total final score are calculated as a simple arithmetic mean of individual scores. The final score is interpreted the same way the individual scores, with 1 representing the highest grade. The threshold value of 4 is considered to divide firms that have the highest threat of bankruptcy from the others.

BONITEST (Bešvir, 2010) was developed as a help to entrepreneurs for prompt solvency check of their business partners. It is based on ten financial ratios (explained in table 2) where each ratio gets individual grade that can take values between 1 and 5, 1 being the worst grade. Final score is calculated as a simple arithmetic mean of individual grades and if it is lower than 2,31 the company is considered to be bankruptcy threatened.

*Table 2: BONITEST – financial ratios being considered (Bešvir, 2010, p. 98)*

|  |  |
| --- | --- |
| **Formula**  **Ratio** |  |
| Liquidity | Net working capital = current assets – current liabilities |
| Short-term financial position = (current assets – inventories) – current liabilities |
| Current ratio = current assets/current liabilities |
| Quick ratio = (current assets – inventories) /current liabilities |
| Financial stability ratio = fixed assets/(equity + long-term liabilities) |
| Leverage | Debt ratio = total liabilities/total assets in % |
| Cash flow leverage ratio = total liabilities/(earnings after tax + amortization) |
| Financial strength ratio = 5 ∙ (earnings after tax + amortization + depreciation)/total liabilities |
| Profitability | Net ROA = EAT/total assets in % |
| ROE = EAT/equity in % |
| EBIT in % |
| Activity | Asset turnover ratio = Total revenues/total assets |

**Research and analysis**

The research is conducted on a sample of Croatian companies which were declared bankrupt from January 2012 till October 2013. The selected companies are medium-sized enterprises; applied criteria for determination of a company’s size are in line with the provisions of the Accounting Act. According to classification of economic activities the selected companies belong to the manufacturing sector. Our analysis encompasses the financial statements of each selected company for the period of four years before the bankruptcy was declared. We also took ten companies that operated regularly in period 2008-2011 and continued to do so in years 2012 and 2013, just for comparison. We checked and found that all of them had net income in year 2012. Forecasting models tested in the research are relevant and well-known models for the prediction of business failure developed both in the world and in Croatia. Results of testing bankruptcy prediction models on Croatian firms’ sample are shown in the table 3.

The major drawback in our research is just a limited number of companies in a sample. The real problem lies in non-availability of proper databases for unlisted Croatian companies that could be used. Therefore, considerable amount of time is spent just on data preparation meaning seeking for the names of bankrupted companies, their accounting data and corresponding non-failed companies.

*Table 3: Results of testing bankruptcy prediction models on Croatian firms sample*

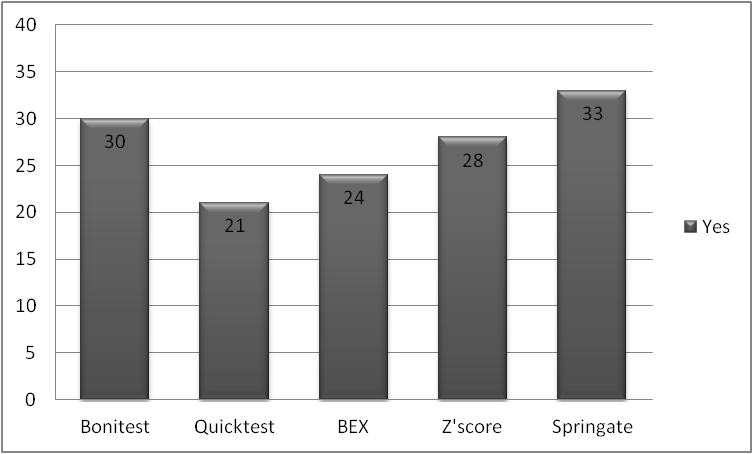
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Bonitest | | | | Kralicek Quicktest | | | | BEX indeks | | | | Altman's Z' score | | | | Springate | | | |
| **Sample of firms declared bankrupt in year 2012 or 2013** | 2008 | 2009 | 2010 | 2011 | 2008 | 2009 | 2010 | 2011 | 2008 | 2009 | 2010 | 2011 | 2008 | 2009 | 2010 | 2011 | 2008 | 2009 | 2010 | 2011 |
| ADRIACHEM d.d. "u stečaju" Kaštel Sućurac | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| BETEX PROIZVODNJA d.o.o. "u stečaju" Belica | No | Yes | No | No | No | No | No | No | No | No | No | No | No | Yes | Yes | Yes | No | Yes | Yes | Yes |
| BILOKALNIK-DRVO d.o.o."u stečaju" Koprivnica | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| DI Geli d.o.o. u stečaju Đakovo | Yes | No | No | No | No | No | No | No | Yes | Yes | Yes | No | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes |
| MIN d. o. o. - u stečaju Zagreb | No | No | No | Yes | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No |
| MIO d.d. u stečaju Osijek | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| PRERADA DRVETA d.d. u stečaju Darda | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| SLAVONIJA MK d.d. "u stečaju" Osijek | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| STS Metal d.d. - u stečaju Zagreb | Yes | Yes | Yes | Yes | No | No | No | No | No | No | No | No | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| UNIVERZAL d.o.o. - u stečaju Zagreb | No | Yes | Yes | Yes | No | No | Yes | Yes | No | No | Yes | Yes | No | No | No | No | No | No | Yes | Yes |
| **Sample of firms that operate regularly in years 2012 and 2013** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| COMPROM PLUS d.o.o. Varaždin | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No |
| Čakovečki mlinovi,d.d. Čakovec | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No |
| DIV d.o.o. Samobor | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | Yes | No | No |
| GUMIIMPEX - GRP d.d. Varaždin | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No |
| HEMPEL d. o. o. Umag | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No |
| KNAUF INSULATION d.o.o. Novi Marof | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No |
| KONČAR - ELEKTROINDUSTRIJA, d.d. Zagreb | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No |
| NEVA d.o.o. Rakitje | No | No | No | No | No | No | No | Yes | No | No | No | Yes | No | No | Yes | Yes | No | Yes | No | Yes |
| TELEGRA d.o.o. Sveta Nedjelja | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | Yes |
| WAM PRODUCT, d.o.o. Breznički Hum | Yes | No | No | No | Yes | No | No | No | Yes | No | No | No | Yes | Yes | No | No | Yes | Yes | No | No |

Explanation: Yes – model predicts bankruptcy, No – model predicts continuation of business activity

The table 3 proves that for most of the bankrupt companies models predicted bankruptcy even four years before the actual bankruptcy occurring. There are some variations in accuracy of different models. The model that shows the best results when predicting the bankruptcy is Springate.

The total frequency of bankruptcy prediction per model for ten firms that went bankrupt in years 2012 or 2013 is shown on Figure 1. The higher is the result the greater overall prediction accuracy of the model. The maximum result is forty (four years period, ten firms in the sample).

*Figure 1: Total frequency of bankruptcy prediction for the period 2008-2011 for ten firms bankrupt in 2012 or 2013*



If we look simple scoring models, the one developed for Croatian market (Bonitest) shows significantly better results compared to Quicktest.

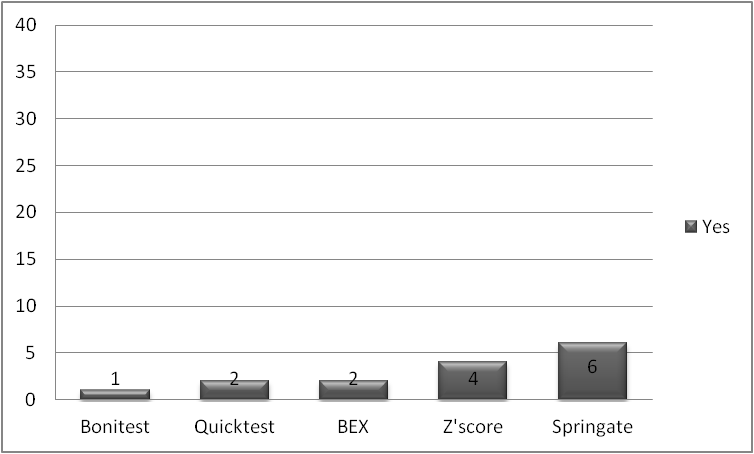
When multiple discriminant analysis models are considered Springate has the highest predictability power. Although developed for Croatian market, BEX index has the lowest accuracy of prediction among three considered models. BEX might not be suitable for bankruptcy prediction of firms in our sample because of two reasons. Firstly, it was developed on a sample of firms listed on Zagreb Stock Exchange which are primarily big firms. Secondly, the impact of a variable X7 is not clear for the firms that have current year loss and negative shareholder equity. If variable X7 is calculated for such a firm, there is a positive effect on BEX index which is totally incorrect. Therefore, for such companies in our sample we set this variable to be 0. We see problem with our approach related to companies that have net income current year and negative shareholder equity. The variable X7 correctly has negative effect on BEX index but such a company is actually better than the one that has both current year loss and negative shareholder equity for whom the effect of variable X7 on index is 0. The possible solution would be to define for such a situation that the resulting number should be set to be negative number. We could not find any explanation of the authors in the literature on what would be proper procedure to deal with such circumstances.

We also wanted to test the second model built for Croatian companies and this is FP Rating. Since the cutoff values for FP Rating are not publicly available, we tried comparing rankings of firms in particular year relative to use of different models including FP Rating. We find no regularity in rankings for the same company in a particular year by using different models (see Appendix). But comparing the results and looking at the formula of the FP Rating model it can be concluded that lower the value of FP score greater the possibility of bankruptcy. If we take 0 (arbitrarily taken, the real cutoff value could be some positive value of total score) as a cutoff value for highly probable bankruptcy, total frequency of bankruptcy prediction for the period 2008-2011 for ten bankrupt firms would be 22 out of 40 observations (10 firms x 4 years).

What we find problematic with FP Rating is the definition of the variable X10 that shows the number of years needed to repay all the liabilities using cumulated profit over firm’s entire life plus amortization and is calculated as total liabilities/ [retained earnings or previous years’ losses + current year net profit or loss + amortization]. The effect of this variable on FP value is ambiguous meaning that for a firm that has negative denominator (obviously worse firm) the effect on FP value is positive (in model formula in front of the variable X10 is negative sign). Setting the variable X10 to be 0 if denominator is lower than 0 is not the solution because in this case the effect on FP value for this firm would be 0, and for a better firm with positive denominator the effect on FP value would be negative. Searching the literature we could not find any explanation of the authors on how to deal with such a situation.

The total frequency of bankruptcy prediction per model for ten firms that operate regularly in years 2012 and 2013 is shown on Figure 2. The maximum result is forty (four years period, ten firms in the sample). It can be seen that models basically do not predict bankruptcy for this sample of companies, which we consider to be correct. The predicted bankruptcy refers to two companies that faced real problems, but actions taken in the meantime have made the companies survive.

*Figure 2: Total frequency of bankruptcy prediction for the period 2008-2011 for ten firms that operate regularly in years 2012 and 2013*

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**Conclusion**

In our paper we assessed the applicability of different bankruptcy prediction models on a sample of medium size Croatian companies from manufacturing sector. We took ten firms that went bankrupt either in year 2012 or 2013. For comparison we also took ten firms that operated regularly in the period 2008-2011 and continued to do so in year 2012 and 2013. For most of the bankrupt companies models predicted bankruptcy even four years before the actual bankruptcy occurred.

Simple scoring model Bonitest developed for Croatian market performs better than Quicktest developed for German-speaking area. Possible reason for that is the fact that it is more elaborate meaning it uses quite more ratios in scoring procedure. But it makes rating procedure more complicated.

The multiple discriminant analysis models developed using Croatian companies’ data show less precision when predicting bankruptcy for medium companies in Croatia than foreign models. BEX index shows worse results compared to models developed for US or Canadian markets. Possible reason is the fact that the model was built by the use of big companies’ data. Secondly, the impact of one variable in the model is not clear. FP Rating has the same problem with one variable of the model.

There is an opinion that applying models developed in one, sometimes much earlier period to samples in other periods may introduce measurement errors into analysis. One of the reasons may be changed business conditions including legislation. As business conditions have changed since foreign models which we applied were originally developed, it is reasonable to assume that their precision has lowered. The possibility of further research is in re-estimation of coefficients in all the models and comparison of the results of original and re-estimated models. If the re-estimated models prove not to work satisfactory the new models using different variables should be developed. Except for simple scoring models, our research has shown that older multiple discriminant analysis models developed on foreign markets’ samples perform better than recently developed domestically built ones. Based on the results we believe it would be reasonable to revise the applicability of existing domestically developed models and maybe even to develop new models using modern statistical methods.

*Appendix: Rankings of the firms within specified model in a particular year*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **2008** | | | | | | **2009** | | | | | | **2010** | | | | | | **2011** | | | | | |
| **Sample of firms declared bankrupt in year 2012 or 2013** | Bonitest | Quicktest | FP Rating | BEX | Z' score | Springate | Bonitest | Quicktest | FP Rating | BEX | Z' score | Springate | Bonitest | Quicktest | FP Rating | BEX | Z' score | Springate | Bonitest | Quicktest | FP Rating | BEX | Z' score | Spring. |
| ADRIACHEM d.d. "u stečaju" Kaštel Sućurac | 4 | 3 | 4 | 3 | 1 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 1 | 3 | 3 | 4 | 2 | 4 | 1 | 1 | 3 | 1 | 2 | 3 |
| BETEX PROIZVODNJA d.o.o. "u stečaju" Belica | 10 | 10 | 9 | 10 | 8 | 8 | 7 | 9 | 6 | 8 | 6 | 6 | 10 | 9 | 7 | 8 | 6 | 8 | 9 | 8 | 7 | 8 | 7 | 7 |
| BILOKALNIK-DRVO d.o.o. "u stečaju" Koprivnica | 1 | 1 | 2 | 2 | 3 | 1 | 1 | 2 | 2 | 4 | 4 | 4 | 1 | 1 | 2 | 2 | 3 | 2 | 1 | 1 | 2 | 2 | 3 | 2 |
| DI Geli d.o.o. u stečaju Đakovo | 7 | 5 | 7 | 5 | 6 | 6 | 9 | 6 | 8 | 6 | 7 | 7 | 9 | 7 | 8 | 7 | 7 | 7 | 10 | 10 | 9 | 9 | 8 | 9 |
| MIN d. o. o. - u stečaju Zagreb | 9 | 8 | 8 | 9 | 9 | 10 | 10 | 9 | 9 | 9 | 10 | 10 | 9 | 9 | 10 | 10 | 10 | 10 | 8 | 7 | 8 | 10 | 10 | 10 |
| MIO d.d. u stečaju Osijek | 1 | 1 | 1 | 4 | 2 | 4 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 4 | 1 | 1 |
| PRERADA DRVETA d.d. u stečaju Darda | 3 | 7 | 3 | 6 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 6 | 5 | 5 | 1 | 1 | 4 | 5 | 5 | 5 |
| SLAVONIJA MK d.d. "u stečaju" Osijek | 5 | 4 | 5 | 1 | 4 | 2 | 5 | 5 | 4 | 1 | 3 | 2 | 1 | 4 | 4 | 1 | 4 | 3 | 1 | 1 | 5 | 3 | 4 | 4 |
| STS Metal d.d. - u stečaju Zagreb | 6 | 9 | 6 | 8 | 7 | 7 | 7 | 10 | 7 | 10 | 8 | 8 | 7 | 10 | 6 | 9 | 8 | 9 | 7 | 9 | 6 | 7 | 6 | 8 |
| UNIVERZAL d.o.o. - u stečaju Zagreb | 8 | 7 | 10 | 7 | 10 | 9 | 8 | 7 | 10 | 7 | 9 | 9 | 6 | 6 | 9 | 5 | 9 | 6 | 7 | 6 | 10 | 6 | 9 | 6 |
| **Sample of firms that operate regularly in years 2012 and 2013** | | | | | | | | | | | | | | | | | | | | | | | | |
| COMPROM PLUS d.o.o. Varaždin | 4 | 10 | 6 | 7 | 4 | 4 | 8 | 10 | 9 | 9 | 7 | 8 | 8 | 10 | 9 | 9 | 9 | 9 | 5 | 10 | 10 | 9 | 8 | 9 |
| Čakovečki mlinovi,d.d. Čakovec | 7 | 4 | 8 | 4 | 9 | 6 | 5 | 6 | 7 | 5 | 9 | 4 | 4 | 4 | 6 | 4 | 8 | 4 | 9 | 5 | 8 | 5 | 9 | 7 |
| DIV d.o.o. Samobor | 5 | 10 | 2 | 6 | 3 | 3 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 4 | 1 | 5 | 2 | 1 | 6 | 10 | 3 | 6 | 3 | 4 |
| GUMIIMPEX - GRP d.d. Varaždin | 6 | 10 | 7 | 9 | 5 | 7 | 10 | 10 | 6 | 8 | 5 | 7 | 8 | 10 | 5 | 7 | 4 | 5 | 9 | 10 | 4 | 8 | 4 | 5 |
| HEMPEL d. o. o. Umag | 10 | 10 | 9 | 5 | 7 | 8 | 10 | 7 | 8 | 6 | 8 | 9 | 10 | 10 | 8 | 6 | 6 | 7 | 9 | 6 | 9 | 4 | 7 | 8 |
| KNAUF INSULATION d.o.o. Novi Marof | 8 | 10 | 10 | 8 | 8 | 9 | 6 | 3 | 10 | 2 | 6 | 6 | 6 | 6 | 10 | 3 | 5 | 6 | 2 | 2 | 2 | 3 | 2 | 3 |
| KONČAR - ELEKTROINDUSTRIJA, d.d. Zagreb | 2 | 3 | 3 | 3 | 10 | 5 | 4 | 6 | 4 | 10 | 10 | 10 | 2 | 4 | 3 | 10 | 10 | 10 | 4 | 3 | 6 | 10 | 10 | 10 |
| NEVA d.o.o. Rakitje | 3 | 2 | 4 | 2 | 2 | 2 | 3 | 1 | 2 | 3 | 2 | 2 | 1 | 1 | 4 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 |
| TELEGRA d.o.o. Sveta Nedjelja | 10 | 10 | 5 | 10 | 6 | 10 | 8 | 10 | 3 | 7 | 4 | 5 | 5 | 6 | 2 | 2 | 3 | 2 | 3 | 5 | 5 | 2 | 5 | 2 |
| WAM PRODUCT, d.o.o. Breznički Hum | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 6 | 5 | 4 | 1 | 1 | 10 | 10 | 7 | 8 | 7 | 8 | 10 | 10 | 7 | 7 | 6 | 6 |

Explanation: 1 is the worst rank (the value of a final score that is most indicative of bankruptcy), 10 is the best rank

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