Analysis and estimate of the enterprises bankruptcy risk

Tatsiana N. Rybak

Abstract
The amount of enterprises, which are undergoing bankruptcy, is increasing in the Republic of Belarus. Therefore, the problem of bankruptcy risk assessment is quite topical. We formed the system of bankruptcy criteria and indicators. By comparing actual indicators and standard values the bankruptcy risk of an enterprise can be evaluated. For prediction of domestic industrial enterprises bankruptcy risk we worked out a general indicator using the statistics method of discriminant analysis. List of tests for the expert bankruptcy risk evaluation was compiled. Formal and informal symptoms of bankruptcy are assessed by grades. Methods of analysis and estimate of the enterprises bankruptcy risk that we worked out are being used by the Ministry of Economics of Belarus.

Key words
Bankruptcy risk, criteria, indicators, discriminant function, tests

1 Theoretical and methodological basis of analysis and estimate of the enterprises bankruptcy risk

1.1 The essence and content of the bankruptcy risk
Bankruptcy risk is a possibility of anticipated legal bankruptcy procedure, followed by unfavourable financial consequences such as loss of resources or expecting income.
Bankruptcy risk is not equal to probable bankruptcy. The latter means the measure of appearance of risk event.
Bankruptcy risk takes place at all stages of the company’s life cycle. Its appearance is an objective inevitability of manager’s activities which is conditioned by vagueness of surroundings and insufficiency of company’s resources.
We distinguish the following levels of bankruptcy risk:
- primary risk level. This risk is not valued and consequently high enough because managers are unready to foresee risk event;
- estimated risk level. This risk is analysed and lower because of readiness of the managers to appeared risk event;
- final (acceptable) risk level. The measures for reducing of the primary risk level are worked out and implemented.

Detailed analysis of bankruptcy risk and the elaboration of measures which neutralize its negative consequences allows to make risk decisions.

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1.2 Legal foundation of the analysis and estimate of the enterprises bankruptcy risk in the Republic of Belarus

In Belarus the amount of enterprises, which are undergoing bankruptcy, is increasing (from 81 in 1998 to 1360 in 2005). In early March, 2006, there were 1070 unfinished bankruptcy cases. 92.5 percent of them were filed against private companies and individual businesses [7].

Legal regulation of bankruptcy in Belarus is provided by legislative framework which consists of the principal Law on Economic Insolvency (Bankruptcy) and more than ninety elements of law with amendments, notes and explanations to it. However, the bankruptcy procedure has not been provided with the analytical backup. Its methodical and organisational aspects are being developed.

The Ministry of Finance, the Ministry of Economics and the Ministry of Statistics and Analysis of the Republic of Belarus passed the instruction on analysis and control for financial position and solvency of individual businesses in 2004. The main object of this document is evaluation of enterprises solvency using information from financial statements.

The instruction on analysis and control for financial position and solvency of legal entities is required to be improved by including methods of bankruptcy risk assessment.

2 Methods of analysis and estimate of the enterprises bankruptcy risk

2.1 The system of bankruptcy criteria and indicators

Economic aspects of enterprise activity play a decisive role for establishing the fact of bankruptcy. Therefore, it is important to reveal criteria of enterprises’ crisis state. These criteria discover the essence of changes taking place in the enterprise activity from the point of view of the bankruptcy risk.

Unequivocal and generally acknowledged criteria are non-existent. We summarized works on prediction of bankruptcy risk by foreign and domestic economists in general and analyzed the activity of enterprises close to bankruptcy. As a result, we have systemized bankruptcy criteria for the Belarusian enterprises which includes the following groups of criteria:

- financial criteria (unprofitable business, presence of overdue liabilities, total liabilities exceeding total assets, inability to pay off current liabilities by current assets, lack of working capital, presence of overdue accounts receivable, decreasing of market value of shares and securities);
• production criteria (presence of extra raw materials and finished products, insufficient diversification of enterprise activity, violation of a steady rhythm of enterprise activity, lowering level of production power usage);
• investment criteria (short-sighted investment policy, inefficient long-term contracts);
• marketing criteria (loss of permanent clients and suppliers, unfavourable changes in the orders portfolio);
• others (labour conflicts, participation in dubious trials, etc.).

Furthermore, we have chosen absolute and relative indicators for financial criteria evaluation (table 1).

<table>
<thead>
<tr>
<th>Bankruptcy criteria</th>
<th>Absolute indicators</th>
<th>Relative indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unprofitable business</td>
<td>Gross profit</td>
<td>Profit margin</td>
</tr>
<tr>
<td></td>
<td>Net profit</td>
<td>Net profit ratio</td>
</tr>
<tr>
<td>Presence of overdue liabilities</td>
<td>Overdue liabilities</td>
<td>Overdue debt ratio</td>
</tr>
<tr>
<td>Total liabilities exceeding total assets</td>
<td>Net assets</td>
<td>Debt ratio</td>
</tr>
<tr>
<td>Inability to pay off current liabilities</td>
<td>Net cash flow</td>
<td>Current ratio</td>
</tr>
<tr>
<td>by current assets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of working capital</td>
<td>Working capital</td>
<td>Ratio of working capital provision</td>
</tr>
<tr>
<td>Presence of overdue accounts receivable</td>
<td>Overdue accounts receivable</td>
<td>Unit weight of overdue accounts receivable</td>
</tr>
<tr>
<td>Decreasing of market value of shares and</td>
<td>Market cost of shares and securities</td>
<td>Income per share</td>
</tr>
<tr>
<td>securities</td>
<td></td>
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</tr>
</tbody>
</table>

Table 1: The system of indicators for analysis the enterprises bankruptcy risk

Absolute indicators are used for the effective discovery of bankruptcy criteria, but they are not compared at different time in inflation conditions. Relative indicators are calculated at the beginning and the end of some financial years and compared with the standards.

We calculated average meanings of indicators using financial statistics data of bankrupts of different branches of economics for a number of reporting periods. Based on the received results we substantiated standard values of some ratios which were differentiated depending on the branches of economics. For instance, standard values of current ratio and ratio of working capital provision are shown in table 2.

Reference to actual results and standard values compared, the corporate financial position can be evaluated.
### Branches of economics

<table>
<thead>
<tr>
<th>Branches of economics</th>
<th>Current ratio</th>
<th>Ratio of working capital provision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry</td>
<td>1.7</td>
<td>0.3</td>
</tr>
<tr>
<td>Agriculture</td>
<td>1.5</td>
<td>0.2</td>
</tr>
<tr>
<td>Transport</td>
<td>1.15</td>
<td>0.15</td>
</tr>
<tr>
<td>Communication</td>
<td>1.1</td>
<td>0.15</td>
</tr>
<tr>
<td>Building</td>
<td>1.2</td>
<td>0.15</td>
</tr>
<tr>
<td>Trade and public catering</td>
<td>1.0</td>
<td>0.10</td>
</tr>
<tr>
<td>Logistics</td>
<td>1.1</td>
<td>0.15</td>
</tr>
<tr>
<td>Utility service</td>
<td>1.1</td>
<td>0.10</td>
</tr>
<tr>
<td>Science</td>
<td>1.15</td>
<td>0.20</td>
</tr>
</tbody>
</table>

*Table 2: Standard values of current ratio and ratio of working capital provision*

For discovery of production, investing, marketing and other criteria the analysis of manufacture and sales of products, investment projects and marketing activities are conducted using not only financial statements, but also corporate accounting and management documention.

#### 2.2 The discriminant function for bankruptcy risk prediction

The discriminant functions for bankruptcy risk prediction were offered by Altman [1], Taffler [5], Beaver [3] and others. But they are not acceptable for the Belarusian enterprises because of different conditions of management in highly developed countries, as compared to this country. Besides, the mentioned functions did not take into consideration sectoral peculiarities of enterprises activity.

For prediction of domestic industrial enterprises bankruptcy risk, we have worked out a general indicator using the statistics method of discriminant analysis.

In general, discriminant analysis derives the linear combination of discriminating (independent) variables from discriminant function that takes the following form:

\[
Z = \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_n x_n + c, \tag{1}
\]

where \(Z\) – discriminant score, \(\beta_1, \beta_2, \ldots, \beta_n\) - discriminant coefficients, \(x_1, x_2, \ldots, x_n\) – discriminating variables, \(c\) – constant.

The main purpose of discriminant analysis is to predict group membership based on a linear combination of the interval variables.

We opted two groups from the totality of 130 industrial enterprises. The first one included enterprises which became bankrupts. The second one included those enterprises which had stable financial position. Then we studied the difference between financial indexes of bankrupt and non-bankrupt enterprises. The data comprised the annual financial statements of selected Belarusian bankrupt enterprises and their non-bankrupt mates. Each failure occurred between 1999 and 2005. The selections consisted mainly of small and medium-sized enterprises. The lack of larger enterprises was explained by the fact that the number of enterprises which close to bankrupt was very small in Belarus.

The set of variables for the discriminant function was chosen using backward elimination. At first a lot of variables were included in the model. Then the indicators failing to significantly contribute to the process of enterprises grouping were rejected at each step.

Coefficients and constant of discrimination have been calculated using methods of discriminant analysis.

The equation of discriminant function which we worked out is the following:
where $x_1$ – specific gravity of overdue accounts receivable in sum total of accounts receivable; $x_2$ – current ratio; $x_3$ - debt ratio; $x_4$ – overdue debt ratio.

The probability of bankruptcy is predicted according to the assessment of the discriminant function. If $Z \geq 9.4$ the probability of industrial enterprise bankruptcy is high. If $Z < 9.4$ the probability of its bankruptcy is low.

### 2.3 List of tests for the expert bankruptcy risk evaluation

List of tests for the expert bankruptcy risk evaluation have been compiled. Employees of an enterprise are interviewed. Style and basic principles of management, corporate organisational structure, personnel policy, book-keeping, preparation of financial and management statements are studied. Formal and informal symptoms of bankruptcy, such as authoritarian style of management, lack of internal auditing, unqualified cashmanagement, forging of accounting documents and others, are revealed and assessed by grades. The level of probable bankruptcy (low, average or high) is determined by the sum of grades.

### 3 Conclusion

Methods of analysis and estimate of the enterprises bankruptcy risk such as the system of bankruptcy criteria and indicators, the discriminant function and list of tests that we worked out are being used by the Ministry of Economics of the Republic of Belarus for monitoring of enterprises’ financial position. Besides, they can be used by anticrisis managers while deciding on measures for companies sanation and by auditors for making expert opinion on bankruptcy probability of enterprises being audited.

### Reference


### Summary

The amount of enterprises, which are undergoing bankruptcy, is increasing in the Republic of Belarus. Timely risk assessment can foresee and prevent the legal bankruptcy of enterprises.
We formed the system of bankruptcy criteria and indicators. By comparing actual indicators and standard values the bankruptcy risk of an enterprise can be evaluated. For prediction of domestic industrial enterprises bankruptcy risk, we worked out a general indicator using the statistics method of discriminant analysis. List of tests for the expert bankruptcy risk evaluation was compiled. Formal and informal symptoms of bankruptcy are assessed by grades. The level of the bankruptcy probability is determined by the sum of grades.

Methods of analysis and estimate of the enterprises bankruptcy risk that we worked out are being used by the Ministry of Economics of Belarus.