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The estimation of the going concern ability of quoted companies, using duration models

Ioan-Bogdan Robu*, Christiana Brigitte Balanb, Elisabeta Jaba

Abstract

The objective of this paper is to estimate the survival time of the companies, that is, the going concern ability of the companies to continue their activity, within a predictable time horizon, without becoming insolvent or bankrupt. The going concern ability is expressed through the survival time to insolvency/bankruptcy. In the study, we use duration models (the Kaplan-Meier estimator) to assess the general status of the company and to signal its financial difficulty, by the combined effect of the economic and financial indicators (the financial leverage and the general solvency ratio). The analysis is detailed by activity field and structural ratios. The results of the study show that the activity field (industry, commerce, services) and the level of the structural ratios of the balance assets and liabilities (normal/high) influence the survival time of the companies quoted in the Bucharest Stock Exchange in the period 2004-2008.

Keywords: Going concern, financial leverage, general solvency ratio, duration models;

1. Introduction

When evaluating the going concern ability, managers must measure the result subsequent to the events or conditions that are inherently uncertain, according to the degree of uncertainty associated to them, the availability of the information at the moment of the judgment, the dimension and complexity of the company, the nature and status of its activity, as well as the extent to which it is affected by external factors (Hayes et al., 2005).

In the general evaluation of the company’s ability to continue its activity within a predictable time horizon, a series of economic-financial indicators are taken into account, among which: financial leverage, general solvency, economic profitability, general liquidity, and financial autonomy (Alexander and Nobes, 2007).

2. Research methodology

In the paper, the going concern ability is evaluated through the time of survival to insolvency/bankruptcy, using the aggregated effect of financial leverage and general solvency ratio.

This study aims to characterize a company’s status based on duration models, by various levels, defined in the literature, of the financial leverage, the general solvency ratio, and the structural ratios. Thus, we determine the moment when a company can no longer continue its activity.

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Keywords: Going concern, financial leverage, general solvency ratio, duration models;
2.1. Literature review

The going concern ability is of special interest in the literature. A series of papers present the history of this phenomenon (Omar, 2008), its causes (Penman, 2007) and the typology of the companies it affects (Webb, 1991). Other studies analyse the risk of insolvency (Jaba and Robu, 2011) using regression analysis (Harrington and Nelson, 1986), discriminant analysis (Ambrose and Seward, 1988), logistic regression (Carson and Hoyt, 2000), and neural networks or decision trees (Brockett et al., 1994).

2.2. Population and sample

The target population are the companies quoted in BSE during the fiscal years 2004-2008. From this population, a sample of 80 quoted companies was selected. The reason for including the fiscal year 2004 concerns the IFRS 1 recommendations related to re-drawing the reported financial statements in order to insure the comparability with the financial statements corresponding to the fiscal year 2005. The terminus of the analyzed period is the end of the fiscal year 2008, a moment corresponding to the beginning of the global economic-financial crisis that emphasized the occurrence of insolvency risk among Romanian quoted companies.

2.3. Variables and data source

In order to evaluate the studied phenomenon, we used output variables, signal indicators of insolvency, and input variables (independent variables), the structural ratios by levels defined in the literature (Penman, 2007). The variables are presented synthetically in Table 1.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Label</th>
<th>Expression</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>LF</td>
<td>Financial leverage</td>
<td>Total liabilities/ Shareholders’ equity</td>
<td>1 – LF normal ∈ (-∞; 0.5)</td>
</tr>
<tr>
<td>Rsg</td>
<td>General solvency ratio</td>
<td>Total assets/ Total liabilities</td>
<td>2 – LF high ∈ [0.5; +∞)</td>
</tr>
<tr>
<td>D_LF</td>
<td>LF dummy variable</td>
<td>LF ≥ 2 (\Rightarrow) D_LF = 1; LF &lt; 2 (\Rightarrow) D_LF = 0</td>
<td></td>
</tr>
<tr>
<td>D_Rsg</td>
<td>Rsg dummy variable</td>
<td>Rsg ≤ 1.66 (\Rightarrow) D_Rsg = 1; Rsg &gt; 1.66 (\Rightarrow) D_Rsg = 0</td>
<td></td>
</tr>
<tr>
<td>Status</td>
<td>Company’s status at the end of the period</td>
<td>D_Rsg x D_LF (Cumulative effect of Rsg and LF)</td>
<td></td>
</tr>
<tr>
<td>Duration</td>
<td>Survival time to insolvency</td>
<td>Number of years between 2004 and the year of insolvency/bankruptcy</td>
<td></td>
</tr>
</tbody>
</table>

The data are obtained from the financial statements of BSE quoted companies, corresponding to the fiscal years in the period 2004-2008, available at http://www.bvb.ro.

2.4. Method

Empirical studies on survival time of companies use duration models, especially the Kaplan-Meier estimator and the Cox model. Gharbi (1995) apply the mortality table and the Kaplan-Meier estimator in order to explain the survival time of companies according to a series of variables such as the number of employees, the company’s main activity, and its legal form.
In this paper, in order to evaluate the risk of insolvency/bankruptcy, we use the survival function, $S(t)$, respectively the Kaplan-Meier estimator, $\hat{S}(t)$. The survival function of companies subject to the risk of insolvency presents the probability for a company to survive moment $t$, that is, the probability that the insolvency/bankruptcy has not occurred until moment $t$: $S(t) = P(T > t) = 1 - F(t) = \int_{t}^{\infty} f(x)dx$ where: $T$ – the survival time (positive random variable, $T \geq 0$), the time until insolvency/bankruptcy occurs; $t$ – a specified value for $T$.

The Kaplan-Meier estimator, $\hat{S}(t)$, can be defined, at various moments in time, $t_i$, by the formula:

$$\hat{S}(t_i) = \prod_{i \in (t_{i-1}, t_i]} (1 - \hat{m}_i),$$

where: $\hat{m}_i$ – the probability to become insolvent/bankrupt at moment $t_i$; $(1 - \hat{m}_i)$ – the probability to survive.

The survival function can be presented graphically using the survival curve. The survival curve is represented in a system of two rectangular axes; the moments $t_i$ (years) are represented on the horizontal axis, while the probabilities to survive at the moments $t_i$ when insolvency/bankruptcy occurs are represented on the vertical axis.

The probability to survive the risk of insolvency/bankruptcy is estimated by groups of companies, differentiated according to activity field and levels of balance sheet ratios. The survival functions are compared for the studied groups, and the differences between them are tested using the Log-Rank statistic test,

$$U = \sum_{i}(O_i - E_i),$$

where: $O_i$ – the number of observed events (bankruptcies; companies subject to the risk of insolvency/bankruptcy); $E_i$ – the number of estimated events (companies subject to the risk of insolvency/bankruptcy).

The data are analysed using the statistical software SPSS 19.0.

### 3. Results and discussions

The application of duration models on the sample of companies allows estimating the survival function of the companies subject to the risk of insolvency/bankruptcy by activity field (industry, commerce, services).

The analysis of the mean survival time by activity field offers useful information regarding the survival time of the analyzed companies (Table 2).

<table>
<thead>
<tr>
<th>Activity field</th>
<th>Number of companies</th>
<th>Number of insolvencies</th>
<th>Surviving companies</th>
<th>Mean survival time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of companies</td>
<td>Percent</td>
<td>Std. Error</td>
<td>95% Confidence Interval</td>
</tr>
<tr>
<td>Industry</td>
<td>40</td>
<td>30</td>
<td>75.0%</td>
<td>3,275</td>
</tr>
<tr>
<td>Commerce</td>
<td>22</td>
<td>15</td>
<td>68.2%</td>
<td>3,091</td>
</tr>
<tr>
<td>Services</td>
<td>18</td>
<td>11</td>
<td>61.1%</td>
<td>2,944</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>56</td>
<td>70.0%</td>
<td>3,150</td>
</tr>
</tbody>
</table>

Companies in industry have the highest mean survival time (3.28 years, that is approximately 3 years and 3 months), while companies in the field of services have the shortest survival time (2.94 years) compared to the other two categories of companies. We can draw the conclusion that companies that provide services are more exposed to the risk of insolvency/bankruptcy than companies in industry and commerce, based on the financial statements reported according to IFRS.

The estimated survival function for the sample of 80 companies is presented graphically through the survival curve (Figure 1). In the first two years, the smallest survival probability corresponds to companies in commerce, while in the last three years we can notice a low survival probability for the companies that provide services.

The differences in the survival probabilities for the three groups of companies differentiated according to their activity field are tested using the Log-Rank test statistic. By comparing the Sig. value (0.577) with the risk $\alpha$ (0.05), we can state that there are no significant differences between the survival functions for the three groups of companies differentiated according to their activity field. For all three categories of companies, during the analyzed period, the probability to survive is over 50%.

In order to analyze the influence of the structural ratios on the survival of the companies, we estimated the survival function of the companies subject to the risk of insolvency/bankruptcy on categories of companies differentiated according to the level of the structural ratios of the balance assets and liabilities.
The analysis of the mean survival time by groups of companies and of the values of the Log Rank homogeneity test (Sig. value) allows us to draw some conclusions.

Companies with a high level of the fixed assets ratio have, on average, a higher survival time (3.5 years) than companies with a normal level of this structural ratio (2.63 years), in the conditions in which these assets are operational investments (purchases of new equipment, openings of new departments).

The probability to survive of companies with a high level of the fixed assets ratio significantly differs from the probability to survive of companies with a normal level of the fixed assets ratio (the Log Rank test is equal to 7.724 and the correspondent Sig. value is 0.005).

The mean survival time of the companies with a normal level of RAC (3.52 years) is higher and significantly differs from the mean survival time of the companies with a high level of RAC (2.65 years). This short survival time (2.65 years) for the companies with a high RAC comes from the impossibility to sell the resulting finished products (unmarketable), or from uncollected debts of the customers. Cumulated, these factors contribute significantly to the occurrence of the risk of insolvency/bankruptcy.

Companies with a high level of RIT have a mean survival time higher than that of companies with a normal level of RIT, in the conditions in which the placement of external resources is compensated by assets dedicated to the operational activity. The probability to survive does not differ significantly between the two categories of companies differentiated according to the term indebtedness ratio (the Log Rank test is equal to 0.144 and the Sig. value is of 0.705).

The probability to survive is significantly different between the two categories of companies differentiated according to the level of current resources ratio (RRC) because of the impossibility to pay the debts due in less than one year.

The mean survival time for companies with a high level of the global financial autonomy ratio (RAF) (3.46 years) is higher than the mean survival time of the companies with a normal RAF level (1.8 years). The probabilities to survive for the two categories of companies differ significantly from one another, in this case companies that rely exclusively on funds from their own resources being less subject to the risk of insolvency/bankruptcy, compared to those with an average RAF (which also rely on funds from external resources, credits).

**Conclusions**

The application of IFRS requires companies to perform their activity on a period of time long enough, without stopping their activity or significantly reducing it, and without becoming bankrupt, liquid, or insolvent.

In order to evaluate the status of a company and its ability to continue its activity, it is not enough to independently analyze the economic-financial indicators (for example, financial leverage and the general solvency ratio) but it may be more appropriate to use these two indicators together. By applying this reasoning we analysed...
the survival time on a sample of companies quoted in the Bucharest Stock Exchange, for the period 2004-2008, and we identified the insolvency or bankruptcy status of a company. The survival time is different among companies with activities in commerce, industry, and services, as well as by levels of the structural ratios.

Based on survival models, stakeholders gain an overview on the company, on its performance, as well as on the influencing factors.

The results obtained allow us to state that, in the context of applying IFRS, in order to comply with the going concern ability, the determining factors identified in the study must be taken into account. Therefore, according to the company’s field of activity, managers should insure equilibrium between the external resources attracted and the shareholders’ equity. Moreover, in order not to become bankrupt or insolvent, the company’s operational activity must be supported by operational investments (production lines, raw materials, new equipments), whose source is represented either by external or by internal resources. This study shows that even funding based on current resources is beneficial for the company. In this respect, the acquisition of raw materials, as well as the other expenses whose purpose is to obtain finite products or to provide services to the final consumers, significantly contributes to insuring continuity.

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