GRADUS
GRADUS.KEFO.HU

ANALYSIS OF COMMERCIAL ENTERPRISES' SOLVENCY BY MEANS OF DIFFERENT BANKRUPTCY MODELS

Klaudia Dorgai [1], Veronika Fenyves [1] and Dávid Sütő [1]

[1] University of Debrecen Faculty of Economics and Business Debrecen, Hungary

Abstract

Innumerable economic organizations come into existence and operate successfully then some of them go bankrupt. A great many factors influence the operability or decline of corporations. The aim of undertakings is to maintain the liquidity i.e. the short-term solvency which is a primary condition of the long-term successful smooth operation. During the analysis, we place the main emphasis on the financial models representing the solvency.

1 Introduction

The economic crisis figured out after the international financial crisis has increasingly focused attention on the question of risk management. In recent times and nowadays, almost each enterprise, whether it is small or big, has first-hand experience about the effect of crisis and its subsequent after-effects. As an effect of the crisis, a significant number of enterprises got into a disadvantageous situation and divers of them also went bankrupt as well as many of them seriously fight for staying up [1]. The corporations and their creditors should be aware of their own and their client's solvency position because its deterioration can cause serious difficulties for both of them. The internal stakeholders should also be aware of the enterprise's financial position because it largely influences their present and future positions as well. For all the above reasons, there is an increasingly powerful demand for such solutions which help to predict the risk of bankruptcy. Different financial indicators and models can be used for the prediction. By nowadays, quite a lot financial indicators have been evolved which can be connected to this area as well. And we should also have different prediction models as well [2].

Traditionally, the route leads to the present and future estimation of management position of a corporation through analysing the annual report. By analysing the data of the publicly available annual report, we can get an insight into the property, financial and income position of any corporation. The financial indicators condense the annual report's mass of facts into such information which can be utilized for the analyses [3]. From point of view of prediction, we can consider the financial indicators as factors influencing the corporate future. Therefore, for the bankruptcy prediction, a stressed attention should be paid to the more important financial indicators expressing the solvency of a corporation. However, the financial indicators in themselves do not ensure future data since we calculate them based on the data of recent year(s). Anyway, if there are no other available information sources then we can get information about the corporate future by means of financial indicators and by application of predicting-modelling techniques [4].

2 Material and method

2.1 Data used for the analysis

The corporations analysed in our treatise perform commercial activities. The data of enterprises were downloaded from the opten information system. The companies were selected

from Debrecen and its maximum 130-kilometer circuit. This is important because the geographical position and the difference of customer demands as well as the quality of living standards can be influencing factors in the comparison of a Northern Great Plain company and a Transdanubian one. The profit of commercial enterprises, principally the retail trade ones, are strongly influenced by the market demand, the people's income position as well as buying habits. Considering the activities of the selected firms, they perform food trade. We divided the selected enterprises into two groups. Those ones belong to the first group which operate currently. I felt important to examine them in order to predict whether they will go bankrupt expectedly. The second group contains the firms in liquidation or the ones which have just been liquidated. We include these enterprises in the analysis in order to present that the weakness of a given company could have been predicted by means of bankruptcy prediction models and maybe the termination would not have been required in case of an adequate intervention.

3 Methods used for the analysis

In the framework of this treatise, among the different bankruptcy models, we present Springate's, Comerford's and Virág-Hajdu's bankruptcy models.

Altman's model predicts with 95% accuracy if an enterprise is close to bankruptcy. During its elaboration, 66 corporations were examined which also have 50% rate with regard to two possible outcomes. In our treatise, we use a modified version of Altman's model because we are not talking about non-productive enterprises. At the amount of weighted indicators, the critical value is 1.23. A result under this value indicates that the enterprise will fail most probably. A firm can be said to be stable survivor in case of a value over 2.9 while we speak about an uncertainty zone in case of intermediate values " [5].

Its formula: $Z = 6,56 * x1 + 3,26 * x2 + 6,72 * x3 + 1,05 * x4$

(x1: net working capital / all assets, x2: profit after tax / all assets, x3: result of operating (business) activities / all assets, x4: equity / liabilities)

.

Springate's model was performed during the examination of 40 corporations. Accuracy of the model is 92.5%. The critical value is 0.862 under which the enterprise will become insolvent most probably [6].

Its formula: $Z = 1,03 * x_1 + 3,07 * x_2 + 0,66 * x_3 + 0,4 * x_4$

(x_1: working capital / all assets, x_2: result of operating (business) activities / all assets, x_3: profit before tax / current liabilities, x_4: net turnover of sales / all assets)

Comerford's model is composed of 6 different indicators. The critical value of Z is 0. In case of a value under it, the enterprise has a big chance to go bankrupt [7].

Its formula: $Z = 1,44 * x1 - 1,78 * x2 + 6,06 * x3 + 0,62 * x4 - 2,56 * x5 + 0,37 * x6$

(x1: profit after tax / fixed assets, x2: debt / all fixed assets, x3: (funds + receivables) / all fixed assets, x4: current assets / current liabilities, x5: (funds + receivables) / current liabilities, x6: profit after tax / subscribed capital)

The earliest domestic bankruptcy model was elaborated by Miklós Virág and Ottó Hajdu. During their work, they examined 156 corporations which were divided between the solvent and insolvent groups fifty-fifty. The critical Z values is 2.61612; a the firm is qualified as insolvent in case of a value under the aforementioned result [8]

.Its formula: $Z = 1,3566 * x1 + 1,63397 * x2 + 3,66384 * x3 + 0,03366 * x4$

(x1: acid test ratio, x2: cash flow / all debits, x3: current assets / all assets, x4: cash flow / all assets)

This model is the first domestic indicator. Its value under 2.61612 denotes bankrupt.

4 Results

Operating enterprises and the ones in liquidation are the basis of analysis; we have examined them by means of four kinds of bankruptcy models.

4.1 Results of Altman's bankruptcy prediction model

Table 1 shows the values of operating companies which were calculated on the basis Altman's bankruptcy prediction model. The results indicated by red denote a situation being close to bankruptcy while the blue colour shows the values of the uncertainty zone. We obtained the value of indicator by means of the ratios formed from the corporate reports as well as after a multiplication by weight with an appropriate extent. In case of the operating enterprises, the risk of bankruptcy is just in some places. Its reason, in most cases, is the negative working capital i.e. the value of short-term liabilities exceeds the value of current assets.
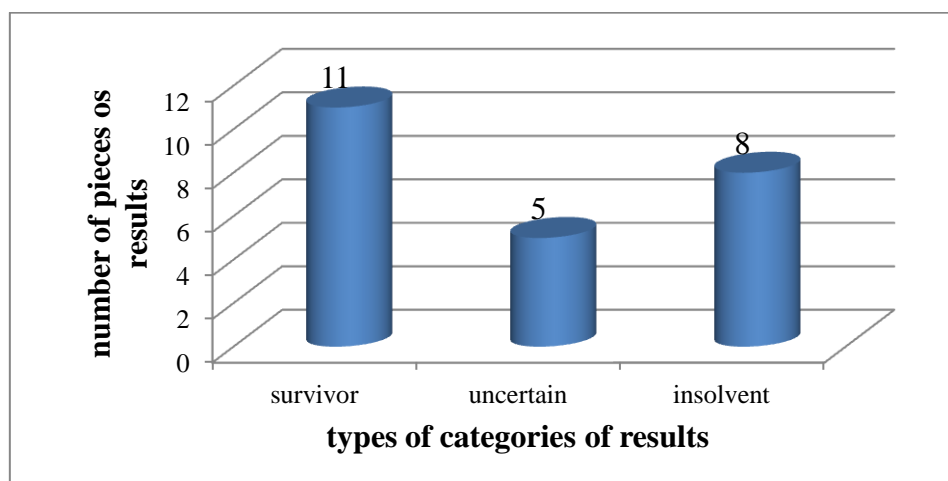

Figure 1: Distribution of operating enterprises' results between different result categories, results of the examined 4 years combined

Source: self-made calculation

We can examine the distribution of the obtained results between the different categories by seeing the index-numbers of 6 operating enterprises' 4 years together. Among the calculated 24 pcs results, 11 pcs are over the limit value which clearly refers to survival while 5 pieces are to be ranked among the uncertainty zone which does not constitute a danger to the enterprises yet. 8 pcs results denote the insolvency i.e. the situation being close to the bankruptcy, this one third of all results. Overall, it can be said that the management has nothing to fear but the result by firms should also be examined one by one. Enterprises #2 and #6 mentioned already on several occasions are explicit survivors while enterprises #3 and #5 can be criticized in the largest extent. The leverage indicator (D/E) of enterprise #3 is high enough thus there is a risk of bankruptcy. This is evidenced by Altman's bankruptcy model as well. In case of the firm #5, seeing the values of indicators needed for the model, it cannot be said the firm would be in danger nevertheless a value under the limit is obtained by weighting and strengthening each other.

Table 1: Values of operating enterprises calculated on the basis of Altman's model, between 2010 and 2013

Enterprise	2010	2011	2012	2013
1.	2,20	3,24	4,53	1,15
2.	13,61	17,73	89,65	11,42
3.	-1,24	-2,28	-2,56	1,57
4.	4,97	7,43	3,02	-2,42
5.	2,41	0,93	-0,28	0,72
6.	8,88	3,26	2,71	1,58

Source: self-made calculation

We have calculated the values of indicator in case of the enterprises in liquidation as well. Much more red values can be seen in Table 2, which denote a risk of bankruptcy. Last 3 years of the examination show cessation everywhere. The largest decline can be observed in case of enterprise #8 since every indicators of the model is negative during the examined period, these ones bring a high enough result with a negative sign, by strengthening each other. There is an interesting thing that, in case of enterprise #7, a label #ZERODIVISIOR! can be seen in the year before liquidation. Its reason is that the enterprise has no debt, the liability side of its balance sheet is exclusively composed of the amount of equity.

Table 2: Values of enterprises in liquidation calculated on the basis of Altman's model, during 4 years before the liquidation

Enterprise	x-4	x-3	x-2	x-1
7.	1,60	0,99	-13,83	#ZERODIVISIOR!
8	-11,56	-26,91	-122,89	-23 787,39
9.	7,35	-0,84	-5,23	-78,93
10.	1,32	0,89	-29,05	-219,26
11.	1,49	-24,11	-35,69	-84,98
12.	-4,45	-10,92	-12,76	-10,77

Source: self-made calculation

This would mean that the firm is capital intensive but, if we examine the liability side of balance sheet, we can see that all invested assets were sold, conversely the facility of operation is missing. The corporation has no stock anymore which would be essential due to the commercial nature. This already denotes the total decline.

5 Results of Springate's bankruptcy model

If the value Z determined and calculated on the basis of the model is under 0.862 then the enterprise will go bankrupt while the bankrupt of the firm cannot be expected in case of a value over the limit. Table 3 and 4 contain the obtained values in case of the operating enterprises as well as the ones in liquidation separately.

Table 3: Values of operating models calculated on the basis of Springate's model, between 2010 and 2013

Enterprise	2010	2011	2012	2013
1.	2,05	2,33	2,14	1,39
2.	3,51	3,28	-1,00	3,45
3.	3,24	3,66	3,11	4,50
4.	1,68	22,82	1,97	-0,83
5.	1,32	1,11	1,01	1,32
6.	4,48	1,15	2,17	1,32

Source: self-made calculation

In Table 3, the model shows results under the critical values two times in case of the operating enterprises. In both cases, the given enterprise has reach negative results with regard to both the result of operating (business) activities and profit before tax.

Table 4: Values of enterprises in liquidation calculated on the basis of Springate's model, during 4 years before the liquidation

Enterprise	x-4	x-3	x-2	x-1
7.	4,23	3,87	1,73	#ZERODIVISIOR!
8	-1,23	-2,74	-12,95	-1 432,77
9.	4,81	1,64	3,86	-5,21
10.	3,83	2,75	-1,55	-20,24
11.	3,49	-1,29	-1,87	-6,49
12.	0,41	-0,67	-0,74	-0,17

Source: self-made table

During the examination of corporations in liquidation, it can be said that the results denote an explicit bankrupt already in case of every firms in the year before liquidation. The only exception, where a label #ZERODIVISIOR! appears, was formed because enterprise #7 has no current liabilities being in the denominator.
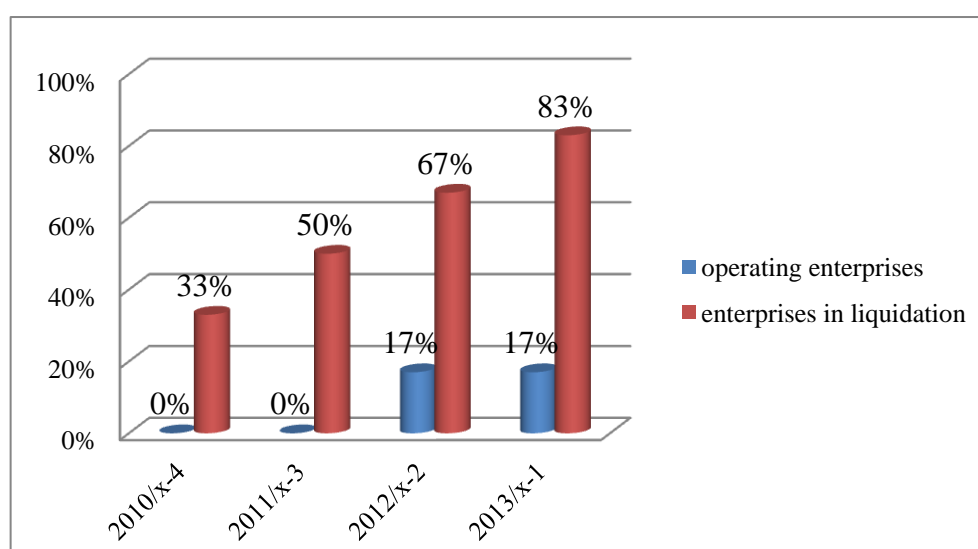
Figure 2: Based on Springate's model, rate of enterprises being close to bankruptcy with regard to all examined enterprises

Source: self-made figure

Figure 2 makes transparent that how many percent of 6 pcs operating and 6 pcs firms in liquidation are in bankruptcy situation. Based on the rate of the model's end result, it can be said that the value denoting bankruptcy is negligible in case of the operating companies while, in case of the enterprises in liquidation, there are more and more index-numbers denoting the insolvency during the years. The model seems to be reliable since it signs the insolvency more and more surely in case of the firms in liquidation, verging towards the year of liquidation. Due to the label #ZERODIVISIOR, enterprise # 7 will not be solvent either later thus its rate of 83% formed due to numerical data of the last year can be said as 100%.

6 Results of Virág-Hajdu's bankruptcy model

Table 3 contains the values obtained after carrying out the Hungarian bankruptcy model [8] worked out by Miklós Virág as well as Ottó Miklós and Hajdu Ottó referring to the operating enterprises while Table 4 contains these values referring to the firms in liquidation. The cash flow i.e. the value of funds changing is needed for the formula. Due to the lack of cash flow statement, at the first step, we had to determine its amount in such way that we subtracted the opening valuation of the current year (which is the same as the closing valuation of the previous year) from the closing funds valuation of the current year. We used the calculated values during the calculation of indicator.

Table 5: Values of operating enterprises calculated on the basis of models of Miklós Virág and Ottó Hajdu, between 2010 and 2013

Enterprise	2010	2011	2012	2013
1.	2,20	3,00	7,98	1,10
2.	15,06	11,31	35,76	25,62
3.	1,12	1,21	0,97	1,37
4.	5,28	3,05	2,85	2,69
5.	2,97	2,30	1,87	2,40
6.	7,44	4,17	5,48	2,70

Source: self-made calculation

We examine the values of Table 3 and 4 together since they show roughly similar results. It should basically be handled with doubt since the enterprises belonging to two groups completely differ from each other. It can be said about the model that its reliability is low in case of the examined commercial companies. In my opinion, its reason is to be searched in the cash flow i.e. the funds changing which is a constituting element of two indicators. The firms possess small-scale funds which arise from their activities.

Table 6: Values of enterprises in liquidation calculated on the basis of models of Miklós Virág and Ottó Hajdu, during 4 years before the liquidation

7.	4,43	4,08	3,97	#ZERODIVISIOR!
8	4,14	3,77	3,41	-2,84
9.	5,00	0,40	0,71	0,47
10.	2,50	4,60	2,88	3,25
11.	5,06	3,65	3,90	3,72
12.	1,47	-0,05	0,04	-0,01
7.	4,43	4,08	3,97	#ZERODIVISIOR!

Source: self-made calculation

The high values of Table 6 are due to the result of the rate indicator of current assets/all assets. This deforms the end result of model since it is expected in case of the commercial enterprises that the current assets of operation should represent a larger extent within all assets.

7 Results of Comerford's bankruptcy model

In case of operating enterprises, the values calculated by means of Comerford's model mostly indicate the danger of bankruptcy (except enterprise #6). In 2010 and 2011, it makes later payment problems probable in case of 3 firms in each year. Their number already rises to 5 by 2012 then regressed again to the last year of the period examined. This is presented by Table 7.

Result of the model predicts the danger of insolvency confidently enough the something is presumably wrong in case of the corporations. In my opinion, its reason is to be searched in the scope of activity. In the indices of model, the invested assets as well as the value of funds and receivables have significant role. Since the analysed firms perform commercial activities thus the value of stocks has the largest proportion within the current assets which is utilized by none of the members of indicator separately.

Table 7: Values of operating enterprises calculated on the basis of Comerford's model, between 2010 and 2013

Enterprise	2010	2011	2012	2013
1.	-1,32	-0,70	-0,64	-0,62
2.	2,15	6,50	-1,54	27,55
3.	-1,98	-2,31	-1,87	1,34
4.	-1,06	1,79	-1,30	-10,61
5.	0,30	-0,15	-0,66	-0,24
6.	21,43	4,93	13,04	0,84

Source: self-made table

In case of the firms in liquidation, the Comerford analysis predicted the insolvency for 3 corporations since the obtained values have negative signs. Label #ZERODIVISIOR! can be seen in most places which is resulted by value '0' of invested assets being in the denominator of indicators of the model. We cannot estimate it directly but it can indirectly be said that the invested

assets are required for the operation, these can be interpreted as facility of the operation. Without this, the status being close to bankruptcy and the danger of bankruptcy exist.

Table 8: Values of enterprises in liquidation calculated on the basis of Comerford's model, during 4 years before the liquidation

Enterprise	x-4	x-3	x-2	x-1
7.	161,89	194,96	#ZERODIVISIOR!	#ZERODIVISIOR!
8	125,77	#ZERODIVISIOR!	#ZERODIVISIOR!	#ZERODIVISIOR!
9.	20,74	-2,06	-3,19	-23,27
10.	-4,85	9,39	-37,29	-404,85
11.	#ZERODIVISIOR!	#ZERODIVISIOR!	#ZERODIVISIOR!	#ZERODIVISIOR!
12.	-2,45	-3,01	-3,28	-2,82

Source: self-made table

Three values are extremely high which lead to the conclusion that we speak about an enterprise operating successfully but this is not a correct statement because the management of corporation is not stable. In my opinion, the reason of these 3 extremely high values is that the indicators debt/(invested assets) and (funds + receivables)/(invested assets) used in the model and the ones having the largest weight deform the result. This is a consequence of the low value of the invested assets being in the denominator which can be traced back to the commercial nature of the enterprise.

The most serious value can be observed in case of the enterprise #10 in the year before the liquidation. Its reason resides in two main factors which are the values of rows 'profit after tax' and 'current liabilities. By examining the mentioned corporation in more detail, it can be said that the corporation has a negative result with regard to both the result of operating (business) activities and the profit before as well as after tax as well. In the balance sheet, the equity has also negative sign which means that the enterprise produces (balance sheet result) and accumulates (cumulative reserves) larger losses during the years than its original equity (subscribed capital). The current liability is pretty high, this is a multiple of all sources as a result of which the firm can be said to be indebted. Value of the financial ratio indicator is 0.03 which means that the firm could almost absolutely not pay its current liabilities in a negligible measure immediately.

8 Conclusions, proposals

Based on the available methods and the examinations performed, it can be said that the insolvency of enterprises can be predicted with a large reliability based on the freely available reports. The bankruptcy has high costs so the interest of economic companies is to recognize the danger in time. The using of bankruptcy models may be important for the management of a given economic company or the creditors, suppliers and customers being in connection with the corporation. The known models can properly predict the existence of problem. The results should be handled carefully because we can obtain inaccurate values due to the industry-specific features. By examining the results of bankruptcy models, it can be said that Altman's and Springate's models show an almost similar distribution between the solvent enterprises and the insolvent ones. In case of the examined companies, these two models ensure an adequate prediction with large certainty. Among the operating enterprises, Altman's model places one to a position being close to bankruptcy while Springate's model places none but the results of both models unequivocally show bankruptcy in case of the enterprises in liquidation. However, the other two models did not bring correct results. These ones sign bankruptcy and position not being close to bankruptcy in almost same rate. The examined corporations are such firms performing activities which possess large stock. However, the models do not take the different industry-specific features into consideration.

References

[1]   Rozsa A. – Talas D. (2012): Competitiveness Analysis of Leading Companies in Hungarian Dairy Industry by Liquidity Indicators. Annals of Faculty of Economics. 1. évf. 1. sz. pp. 759-764

[2]   Chorafas, D.N. (2002): Liabilities, Liquidity, and Cash Management. Balancing Financial Risks. John Wiley & Sons, Inc.

[3]   Kristóf T.(2005): A csődelőrejelzés sokváltozós statisztikai módszerei és empirikus vizsgálata. Statisztikai Szemle. 83. évf. 9. sz. pp. 841-864.

[4]   Lábas I. - Bács Z. (2015): Management Control System in the University of Debrecen PROCEDIA ECONOMICS AND FINANCE 32C: pp. 408-415. (2015)

[5]   Altman E. I. (1968): Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. The Journal of Finance. Vol. 23. No. 4. pp. 589-609.

[6]   Springate, G.L.V. (1978): Predicting the Possibility of Failure in a Canadian Firm

[7]   Deakin E.B. (1972): A Discriminant analysis of predictors of business failure. Journal of Accounting Research

[8]   Virág M: – Kristóf T. – Fiáth A. – Varsányi J. (2013): Pénzügyi elemzés, csődelőrejelzés, válságkezelés. Kossuth Kiadó, Budapest, 301 p.