KEY FINANCIAL RATIOS TO ASSESS THE RISK OF BANKRUPTCY BASED ON SELECTED PUBLICLY TRADED COMPANIES

Conference Paper · September 2014

DOI: 10.5593/sgemsocial2014/B22/S6.049

1 author:

Izabela Emerling
Cracow University of Economics
22 PUBLICATIONS **19** CITATIONS

KEY FINANCIAL RATIOS TO ASSESS THE RISK OF BANKRUPTCY BASED ON SELECTED PUBLICLY TRADED COMPANIES

Izabela EMERLING

University of Economics in Katowice

Key words: bankruptcy, key financial ratios, risk, financial condition, systems against bankruptcy risk

Abstract:. In recent years there has been a dramatic increase in the number of reported bankruptcy of enterprises both in the country and all over the world. Bankruptcy is observed not only among companies entering the market, but more and more frequently also among the large ones. The lack of ability to predict bankruptcy is a problem of investors, but also affects the micro and macro-economic environment of declining businesses. The aim of this article is to present and analyse the theoretical and practical aspects of assessing the financial condition and early warning systems against the risk of bankruptcy. For this purpose the methods and tools of financial analysis have been employed. The main research goal of this article is to examine the prognostic value of financial indicators such as: the current liquidity ratio, quick ratio, debt ratio, receivables collection period, inventory turnover, EBIT and the value of sales revenues for investigating the risk of borrower's bankruptcy. The basic research hypothesis is: key financial ratios have a very high prognostic value when examining the risk of bankruptcy of companies listed on the Stock Exchange. Verification of the above research hypothesis is the main objective of this article.

1. Introduction

In recent years there has been a dramatic increase in the number of reported bankruptcy of enterprises both in the country and all over the world. Bankruptcy is observed not only among companies entering the market, but more and more frequently also among the large ones. The lack of ability to predict bankruptcy is a problem of investors, but also affects the micro and macro-economic environment of declining businesses.

Due to the really existing threat, it is necessary to assess economic and financial condition by means of appropriate early warning systems that reveal the situation of an investigated company. The purpose of an early warning system is to select companies whose financial situation may contribute to their bankruptcy. At the same time a company should be subjected to ratio analysis, which is an effective and fast method that allows obtaining information about the functioning of the company. Its only limitation is the fact that it is based on historical data. The company should also be subjected to environment analysis so that potential threat can be eliminated.

The aim of this article is to present and analyse the theoretical and practical aspects of assessing the financial condition and early warning systems against the risk of bankruptcy. For this purpose the methods and tools of financial analysis have been employed.

The main research goal of this article is to examine the prognostic value of financial indicators such as: the current liquidity ratio, quick ratio, debt ratio, receivables collection period, inventory turnover, EBIT and the value of sales revenues for investigating the risk of borrower's bankruptcy. The basic research hypothesis is: key financial ratios have a very high prognostic value when examining the risk of bankruptcy of companies listed on the Stock Exchange. Verification of the above research hypothesis is the main objective of this article.

2. Bankruptcy in the economic and legal aspect

In the literature, bankruptcy is defined as the last phase of a company's life due to its insolvency. [12] From the point of view of economics, the basis of bankruptcy is insolvency of a company and its inability to continue operations independently without receiving external support. Such assistance may take a form of redemption of part of the debt, extending the time for repayment of liabilities, signing a favourable agreement relating to debt restructuring, state aid, recapitalization and the acquisition of an entity by another entity [13]. As opposed to economic bankruptcy, bankruptcy in the legal aspect is determined in court. It is defined as a special type of coercion to satisfy claims which is permissible in case of insolvency of the debtor and addressed to the whole of his property. Therefore, the concept of bankruptcy from the legal point of view should be identified with legal proceedings that involve certain procedures such as filing a bankruptcy petition of a business entity and carrying out the bankruptcy proceedings [11].

In literature there are four terms most frequently used to define bankruptcy: failure, insolvency, cessation of payment of liabilities and bankruptcy [1] Bankruptcy is not a sudden process and develops over several years, which is why the process is predictable. Therefore, the earlier the pre-warning signals are detected, the greater the chances are for the management to counteract the crisis in subsequent phases [9]:

- The first phase is "crisis incubator" - this phase is imperceptible to the executives of the company. At this stage the first financial difficulties occur.
- The second phase is "financial embarrassment" - at this stage the company's management recognizes the problems related to the financial condition of the company, but due to the limited capacity of immediate response to the needs of cash, it is not able to take decisive corrective measures. If the liquidity of assets is not sufficient to meet current obligations, this phase can quickly turn into a third phase of the crisis.
- The third phase is "financial insolvency" - this phase develops with the increasing current commitments and decreasing liquidity of assets, and, in consequence, a lower ability to make current repayment of bank loans and trade credits. Enterprises which are in this phase of crisis still have a chance to overcome it, but achieving success requires determined efforts on the part of the company's board; otherwise the company enters the fourth phase of the crisis.
- The fourth phase is "total insolvency" - this phase occurs when the value of total liabilities exceeds total assets. The company in such a situation is not able to avoid bankruptcy.

- The fifth phase is "bankruptcy" - this phase involves public announcement of the company's bankruptcy.

The main symptoms informing about a difficult financial situation of the company include [3]: a decreasing amount of profits in the company and generating net losses, low liquidity ratio, increased demand for loans and emerging delays in their payment, an increase in liabilities towards public institutions and suppliers, including overdue liabilities, increased financial expenses, mainly due to interest payments (including penalty interest), acquiring resources to finance current operations by discounting securities, bills of exchange and the sale of product stocks and fixed assets at a lower price, increased freezing of investments in progress in the period, an increase in the work in progress and inventories.

3. Key financial ratios to assess the risk of bankruptcy

Ratio analysis is an effective and rapid method of assessing the financial position of a company and the results of its operations on the basis of a set of logically related indicators. Ratio analysis covers areas such as [4]: liquidity analysis, analysis of operational efficiency (efficacy), the analysis of debt (solvency), the analysis of profitability. Liquidity is understood as an ability to pay short-term liabilities on a timely basis. To settle these payments, a unit uses the possessed cash resources and components of the assets which can be relatively easily and without high costs conversed into cash. [10] In a properly functioning company adequate relationships should be maintained between particular components of these assets and short-term liabilities.

Financial liquidity is very important for every business entity, as it defines its solvency towards contractors. Financial liquidity analysis is among others based on the following ratios:

- financial liquidity current ratio,
- financial liquidity quick ratio,
- cash ratio.[9]

Current ratio shows the relationship between all the components of current assets and total short-time liabilities. This ratio provides information on the enterprise's ability to promptly pay its short-time liabilities from current assets. In general, it is assumed that if its value ranges between 1.2 and 2.0, the enterprise has a capability of fulfilling its short-term liabilities [6]. A more accurate picture of liquidity is expressed by high liquidity ratio (quick ratio), as it contains only the components of current assets that have been corrected by the level of inventories and settlements. The value of this ratio should range from 1.0 to 1.2, as such a level allows quick payment of current liabilities. Cash ratio is expressed by the ratio of solvency. For this reason its value should range from 0.1 to 0.2. Efficiency ratios, also referred to as activity ratios, provide information about the company's ability to generate net revenues from sales using the company's resources.

The cycle of stocks is a period between the purchasing of materials and raw materials and the time of finished products sale. In other words, this cycle is

equivalent to the frequency (the number of days) of renewing the inventories by an enterprise, with a specified cost [7] (or with a specified sale). The length of an inventory cycle is determined by the length of the production cycle, the period of maintaining raw material and material stocks as well as the time necessary to sell finished products [5].

Receivables turnover ratio in cycles of rotation should be 7.0 - 10.0 times a year. If the ratio is less than 7.0, it may imply that, in relation to generally accepted standards the company credits its customers for too long. Payables turnover should be adapted to the receivables turnover. The company should recover the receivables more quickly than pay its liabilities.

Profitability ratios should increase from period to period, similarly to sales revenue and profit value.

4. Discriminant analysis as a tool to assess the risk of bankruptcy

Discriminant analysis is a statistical method, which consists in classifying an object into one of two separate populations, based on the k-dimensional vector of random variables [8]. Discriminant analysis takes into account only two groups of entities: entities having a credit score and the ones that do not have it. The result ranks above or below a certain value, adopted as a boundary which separates the two above mentioned populations. The first and the most well-known application of discriminant analysis was Z score, developed by E. Altman (the so-called Z-Score model) [15]. The function presented by Altman had the following form:

$$Z= 1{,}2\cdot X1+1{,}4\cdot X2+3{,}3\cdot X3+0{,}6X4+X5$$

where:

X1 = working capital / total assets

X2 = retained profit / total assets

X3 = EBIT / total assets

X4 = market value of the share capital / total liabilities

X5 = sales revenue / total assets

A result below 1.81 indicates a high probability of bankruptcy and insolvency. A result between 1.81 and 2.99 is an indefinite area in which it is not possible to assess the future of the company. A score above 2.99 indicates a secure financial condition of the company and its solvency. The presented model was characterized by a 95% success rate. However, due to the selection of variables it could be applied only for American quoted companies. Therefore, Altman developed a second indicator (the Z'-score), which makes it possible to analyse companies from emerging markets, not necessarily present on the stock market, expressed by the following formula:

$$Z' = 0{,}717\cdot X1+0{,}847\cdot X+3{,}107\cdot X3+0{,}42\cdot X4+0{,}998\cdot X5$$

where:

X1, X2, X3, X5 - the same as in the Z-score formula

X4 = value of equity / total liabilities

The index value of less than 1.23 - insolvency and bankruptcy, 2.90 - no risk of bankruptcy. [2]

However, due to the specific nature of the construction of discriminant models, using these indicators for Polish companies is difficult. Attempts to develop a model for Polish companies have been made by Gajdek J. and D. Stack [14]. It is expressed by the following formula:

$$D= 0,7732059 – 0,0856425 \cdot X1 + 0,0000774 \cdot X2 + 0,9220985 \cdot X3 + 0,6535995 \cdot X4 – 0,594687 \cdot X5$$

Where:

X1 = revenue from sales / total assets (average per year)

X2 = the liabilities turnover

X3 = ROA

X4 = ROS

X5 = the overall debt

A value below 0.45 is bankruptcy (above this boundary an enterprise is considered to be threatened with bankruptcy). The effectiveness of the presented model was estimated as 93%. The basic method for all the above mentioned methods is ratio analysis.

5. Determinants of assessing the bankruptcy risk for the examined companies

The analysis includes financial statements of 5 companies for the years 2011-2012. The study was comparative in character.

The analysis included three methods: (i) the discriminatory model proposed by J. Gajdek and D. Stos, named a discriminatory model D (iii) and a model based on financial indicators. Model ratio analysis consists of seven indicators, to which certain numerical value are assigned, indicating a deteriorating financial condition.

Table 1 Financial ratios used in the ratio analysis method

Ratio	**The warning signal occurs when:**
Current ratio	The index value drops below 1.2.
Quick ratio	The index value drops below 1,0.
Debt ratio	The index value exceeds 0.67.
Increase in receivables collection cycle	Receivables collection cycle is longer by more than 30% compared with the previous year.
An increase in inventory turnover	Inventory turnover is higher by more than 30% compared to the previous year.
A decrease in the value of EBIT	EBIT is lower by more than 50% compared to the previous year.
A decrease in sales revenue	The value of the revenue is lower by more than 30% compared to the previous year.

Source: Author’s own study based on subject literature

Values below the values in the table are considered to be a warning against the risk of bankruptcy. The occurrence of at least four warning signs proves a deteriorating condition of the company and the threat of bankruptcy in the next reporting period. The results have been presented in the table below.

Table 2. Ratio analysis for selected companies and the results

		Bioton SA		**Cormany SA**		**Sfinks SA**		**Mex Polska SA**		**Camp SA**	
Ratio		**Value (1)**	**Threat (2)**	**(1)**	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**
Current ratio	2011	1,23	Y	2,91	N	1,01	Y	13,26	N	1,22	Y
	2012	0,67	Y	4,66	N	0,73	Y	1,89	N	1,03	Y
Quick ratio	2011	0,91	N	2,26	N	0,95	Y	13,04	N	0,99	Y
	2012	0,47	Y	3,71	N	0,65	Y	1,89	N	0,85	Y
Increase in receivables collection cycle	2011	1	Y	4	Y	9	N	1	Y	2	Y
	2012	1	Y	4	Y	10	N	1	Y	3	Y
Increase in inventory turnover	2011	1	Y	3	Y	3	Y	8	N	16	N
	2012	1	Y	3	Y	3	Y	9	N	11	N
Total debt ratio	2011	0,22	N	0,20	N	1,54	Y	0,46	N	0,34	N
	2012	0,20	N	0,19	N	1,91	Y	0,44	N	0,31	N
Decrease of EBIT	2011	51571	Y	4108	Y	-18210	Y	-395	Y	-3801	Y
	2012	-16186	Y	5624	Y	-13721	Y	-1448	N	-3517	Y
Decrease in sales revenue	2011	142281	Y	41387	N	95252	N	519	N	287216	Y
	2012	133899	Y	48154	N	107172	N	1821	N	235389	Y
Total number of warning signals	**2011**	**6**		**3**		**5**		**3**		**5**	
	2012	**6**		**3**		**5**		**1**		**5**	

Source: Author's own calculations based on of the financial statements (T-YES, N-NO)

For BIOTON SA the discriminant function reached a value of -0.3097 (bankruptcy) in 2011, and in 2012 the value of -0.4518 (bankruptcy). In both of these key areas of analysis the company has very low values.

For CORMAY SA 2011 the discriminant function reached a value of 0.5434 in 2011 and 0.5859 in 2012. The company was not threatened with bankruptcy. The model indicates that the company's situation is improving.

For SPHINX SA the discriminant function in the year 2011 a value of 1.5662, and in 2012 a value of 1.6067. The company is not in danger of bankruptcy.

For MEX POLAND SA in the year 2011 the discriminant function reached a value of 0.6875, and in Z model - a value of 0.7840. The model does not indicate a threat of bankruptcy.

For CAMP SA the discriminant function in 2011 reached 0.7293, and in 2012 a value of 0.7264.

The conducted analysis yielded inconclusive results. A summary of the effectiveness of particular models has been presented in Table 3.

Table 3. An anlaysis of the applied prognostic models' effectiveness

Name of company	Ratio model	Model D
BIOTON SA	Correct	Correct
CORMANY SA	Incorrect	Correct
SFINKS SA	Incorrect	Correct
MEX POLSKASA	Correct	Correct
CAMP SA	Incorrect	Correct
Number of correct indications	2/5	5/5

Source: Author's own study

6. Conclusions

The greatest prognostic value of the company's bankruptcy have been noted for profits (EBIT) and net profit. The analysed indicators of liquidity and efficiency require careful analysis. The analysis allows drawing the following conclusions:

- the primary area of determining the risk of bankruptcy is the viability of the company; making a loss is a clear signal of bankruptcy risk;
- the analysis of the borrower's liquidity does not provide clear indications regarding the risk of bankruptcy;
- debt may not reflect all of the company's obligations;

Discriminatory models are characterized by a similar predictive efficacy. Model D is characterized by very high volatility and a highly rigid dividing line between the areas of bankruptcy and financial security. It appears that also in this model it would be appropriate to include an area of indeterminacy.

Arguments developed in this article certainly do not cover the whole problem. The analysis of the predictive effectiveness of the examined models gave clear conclusions. All of the financial ratios except the profitability ratio cannot be regarded as predictions of bankruptcy. We can say that profitability is a key determinant of the financial condition of a company, which should be taken into consideration in the assessment of the company's bankruptcy risk. Accurate assessment of bankruptcy risk should be further extended to an analysis of particular sources of profitability (sales, other operating activities, financial activity) and supported by other methods.

References:

1. Altamn E.I., Hotchkiss E.*, Trudności finansowe a upadłość firmy*, CeDeWu.pl , Warszawa 2007
2. Altman E, *Revisiting credit scoring models in a Basel 2 environment*, [w:] red. M. Ong, *Credit Rating: Methodologies, Rationale, and Default Risk*, London 2002,
3. Bednarski L., *Analiza finansowa w przedsiębiorstwie*, PWE, Warszawa 2001,

4. Bielawska A., *Nowoczesne zarządzanie finansami przedsiębiorstwa*, Wydawnictwo C.H. Beck Warszawa 2009,
5. Business and Economics Journal (BEJ) ISSN 2151-6219[
6. Comerton-Forde C., Hendershott T, Jones Ch. M., Moulton P.C., and Seasholes M. S. , The Role of Market-Maker Inventories and Revenues, THE JOURNAL OF FINANCE • VOL. LXV, NO. 1 • FEBRUARY 2010 , Time Variation in Liquidity
7. Emerling I, MENEGAMENT OF INVENTORIES IN AN ENTEPRISE IN THE CNTEXT IN PRODUCTION CONTINUITY, Kwartalnik Systemy zarządzania w inżynierii produkcji, Wyd. PANOVA, NR 2 (14) **DOI 10.12914/MSPE-01-02-2014**
8. Emerling I, Jurkiewicz R, *Badanie skuteczności wskaźników finansowych do oceny zagrożenia upadłością kredytobiorcy na przykładzie wybranych spółek giełdowych,* [w:] Zeszyty Naukowe WSFiP w Bielsku-Białej nr 1(2013)
9. Korol T., *System ostrzegania przedsiębiorstw przed ryzykiem upadłości,* Wolters Kluwer Polska Sp. z o.o., Warszawa 2010
10. Kusak A., Płynność finansowa: analiza i sterowanie, Wyd. Naukowe Wydz. Zarządzania Uniwersytetu Warszawskiego, Warszawa 2006
11. Mączyńska E., *Bankructwa przedsiębiorstw wybrane aspekty instytucjonalne,* Szkoła Główna w Warszawie. Warszawa 2008,
12. Morawska S., Ekonomia i prawo upadłości przedsiębiorstw zarządzanie przedsiębiorstwem w kryzysie, Szkoła Główna Handlowa w Warszawie, Warszawa 2012,
13. Prusak B, *Ekonomiczna analiza upadłości przedsiębiorstw ujęcie międzynarodowe,* CeDeWu, Warszawa 2011,
14. Prusak B., *Jak rozpoznać potencjalnego bankruta?,* [w:] red. F. Bławat, *Prace Naukowe Katedry Ekonomii i Zarządzania Przedsiębiorstwem, t. 3,*Wydawnictwo Politechniki Gdańskiej , Gdańsk 2004,
15. Twardowski Z., Model inteligentnego systemu wczesnego ostrzegania w bankowej ocenie ryzyka kredytobiorcy, Katowice 2000,