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PROFITABILITY RATIO AS A TOOL FOR BANKRUPTCY PREDICTION

Empirical
study

Keywords

*Corporate finance,
Risk,
Failure,
Financial ratio,
Financial analysis,
Classification accuracy*

JEL Classification

G32, G33, M21

Abstract

The current study evaluates the potential of the profitability ratio in predicting corporate bankruptcy. The research is focused on Romanian companies, with the targeted event being represented by the manifestation of bankruptcy 2 years after the date of the financial statements of reference. All tests were conducted over 2 paired samples of 1176 Romanian companies. The methodology employed in evaluating the potential of the profitability ratio was based on the Area Under the ROC Curve (0.663) and the general accuracy ensured by the ratio (62.6% out-of-sample accuracy). The results confirm the practical utility of the profitability ratio in the prediction of bankruptcy and thus validate the need for further research focused on developing a methodology of analysis.

Introduction

The current research sets out to test whether the profitability ratio is an useful predictor of the bankruptcy state for Romanian companies. Previous research (Brindescu-Olariu, 2015a, Brindescu-Olariu, 2015b, Brindescu-Olariu, 2014a, Brindescu-Olariu, 2014b) conducted over the same population has proven the usefulness of the autonomy ratio, debt ratio, equity working capital and labour productivity in the assessment of the bankruptcy risk.

In the past, the bankruptcy phenomenon was not an important issue within the Romanian economy. After 2007, the yearly bankruptcy frequency started to increase, reaching a peak of approximately 3% in 2013 at national level. The cash flow problems generated by the economic crisis or the development of a culture for filing for bankruptcy with the entrance in the European Union might count among the causes of this increase. However, the current research was not focused on the causes of bankruptcy, but on its prediction. The hypothesis of the research is that the profitability ratio is negatively correlated to the bankruptcy risk and thus can represent useful tools for its assessment. As profit is the main factor for cash generation, high profitability ratios are expected to have a positive impact on cash-flows and thus contribute to avoiding payment difficulties and bankruptcy in particular. High profits lead to an increase of the equity and thus, are associated with high autonomy ratios and high equity working capitals, which were proven to be negatively correlated to the bankruptcy risk. If the research would prove the usefulness of the profitability ratio in the prediction of bankruptcy, it could be continued with the development of a methodology of analysis for the assessment of the bankruptcy risk.

1. Population and methodology

The population and methodology are similar to those involved in Brindescu-Olariu (2016). The population of interest consisted of all the companies within the Romanian economy, but only data for the companies from the Timis County was available. Therefore, the target population was limited to the companies from Timis County. No research was performed to verify whether the characteristics of the companies from Timis County are significantly different from those of the companies from the rest of the country. As a consequence, the conclusion of the research cannot be considered as applicable to all Romanian companies without prior testing. Nevertheless, no previous studies in this field have found such significant differences, so it is expected that the conclusions would be validated by tests at national level.

The research targets the bankruptcy risk within 2 years from the date of the financial statements

taken as reference. For the testing of the profitability ratio as a possible bankruptcy predictor, 2 paired samples were built. Thus, each of the 588 companies from Timis County that went bankrupt in the period 2011 – 2012 was associated with a company that continued its activity in normal circumstances, from the same economic field, with the closest turnover in the year of reference for the financial statements included in the analysis.

The source of the data was represented by the online publications of the Ministry of Public Finances of Romania.

The group of 1176 companies (588 pairs) was split in two. The pairs from 2010 were used for the in-sample determination of the cut-off value (858 companies = 429 pairs). The pairs from 2009 were used for out-of-sample testing (318 companies = 159 pairs).

The profitability ratio was calculated as follows:

$$\text{Profitability ratio} = \frac{\text{Net profits}}{\text{Sales}} \times 100\%$$

Mathematically, there is no superior or inferior limit to the value of the profitability ratio. It was speculated that the higher the profitability ratio, the easier it should be for the company to pay its debt on time.

The data was processed by using the SPSS software. The state of the company two years from the date of the financial statements of reference was defined as the dependent variable, a binary variable that can take the following values:

- 1, for the companies that went bankrupt 2 years after the date of the financial statements of reference;
- 0, for the companies that continued their activity under normal conditions at least until the end of 2012.

Initially, the performance of the profitability ratio as a predictor of bankruptcy was tested through the Area Under the ROC Curve over the paired sample of 2010. Graphically reflecting the relationship between the sensitivity and the specificity for all possible cut-off values (van Erkel, Pattynama, 1998), the ROC Curve isolates the classification performance of a classifier with no connection to a specific cut-off value, which makes it one of the most viable solutions for measuring the classification performance (Hanley, McNeil, 1982, Faragei and Reiser, 2002). The area under the ROC Curve (AUC) can take values between 0 and 1 (Skalska and Freylich, 2006), with an AUC of 1 corresponding to a perfect accuracy.

In a second step, the general classification accuracy was determined for the 2010 sample, together with the optimal cut-off value, through the inspection of the coordinates of the 2010 ROC Curve. The optimal cut-off value of the profitability ratio for the 2010 sample was used for out-of-sample tests (over the 2009 sample). As the 2009 sample is

paired, the „by chance” accuracy is 50% (by classifying all 318 companies as bankrupt, the analyst would be correct in 50% of the cases). The profitability ratio will be considered a useful classifier if it would allow for an out-of-sample general accuracy at least 25% higher than the „by chance” accuracy (Chung, K., Tan, S., Holdsworth, D., 2008).

3. Results

Within both samples, more than 50% of the companies registered negative profitability ratio. This aspect is in accordance with the statistics over the entire population from Timis County.

The Area Under the ROC Curve specific to the profitability ratio over the 2010 paired sample was of 0.663, which suggests a relatively poor, but valid classification accuracy (Tazhibi, Bashardoost and Ahmadi, 2011). The dynamics of the AUC shows stability in the classification performance of the profitability ratio over the 2009 – 2010 period (figure 1).

Based on the coordinating points of the ROC Curve for 2010, an optimal cut-off value was determined (profitability ratio = -9.92%). By classifying all the companies from the 2010 paired sample that registered profitability ratios lower than -9.92% as bankrupt and all the companies from the 2010 paired sample that registered profitability ratios higher than -9.92% as non-bankrupt, the general classification accuracy would be of 63.3% (as shown in figure 2).

Thus, the in-sample general accuracy is positioned above the 62.5% benchmark. Out of sample accuracy tests were performed over the 2009 paired sample, using the cut-off value from 2010. The general accuracy over the 2009 sample was of 62.6% (above the 62.5% benchmark as well).

Conclusions

The Areas Under the ROC Curve for both paired samples show that the profitability ratio can be used as a tool for the assessment of the bankruptcy risk. This conclusion is also sustained by an out-of-sample general classification accuracy of 62.6%. The results of the study confirm that companies with high profitability ratios show lower bankruptcy risks. High profitability ratios increase net cash flows, with positive effects on the payment capacity of the company. High levels of the profitability ratio are a basis for the generation of large profits, which automatically increase of the equity of the company (and remain part of the equity until a decision of distribution is taken). The increase of equity sustains an increase of the working capital, a factor that was proven by researches from all over the world to be closely related to the bankruptcy risk (negative correlation). On the other hand, negative profitability ratios (which characterize more than

half of the Romanian companies) involve the registration of losses. Such losses diminish the net cash flows, with negative impact on the payment capacity of the company. From the perspective of the balance sheet, losses diminish the equity and thus lead to reductions of the working capital, autonomy ratio and solvency ratio.

The research proves the potential of the profitability ratio in the prediction of bankruptcy and underlines the need for determining an optimal cut-off value through research over the entire population (or a sample with the same structure).

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Figures and tables:

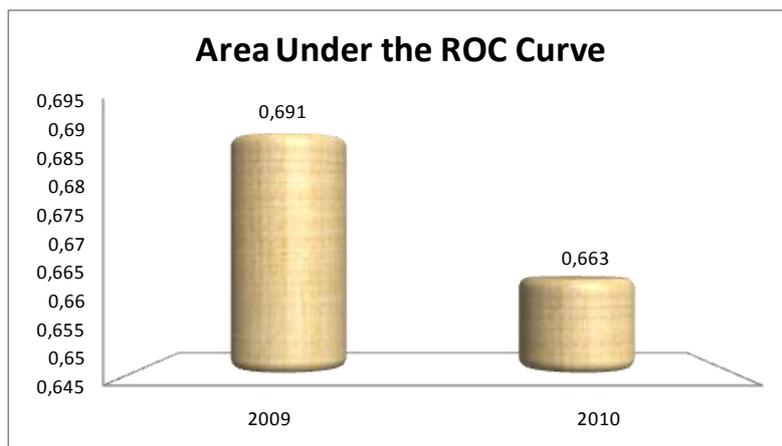


Figure 1. Area Under the ROC Curve over the 2 paired samples – profitability ratio

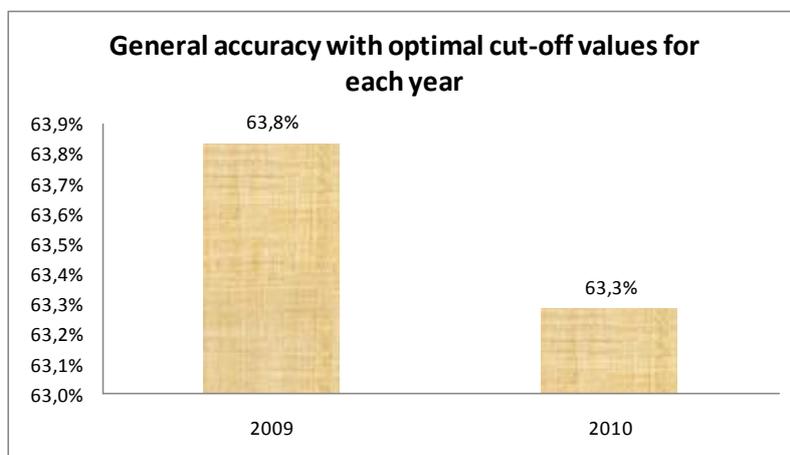


Figure 2. General accuracy with optimal cut-off values for each year