

Economic Thermometer

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In this modern era of fast-paced economic changes, it is extremely important to evaluate what condition companies are in, i.e. to what extent they are exposed to the risk of bankruptcy. Based on a study of 500 companies in Poland, the Institute of Economics has developed a precise tool for estimating both the bankruptcy danger faced by companies, and their developmental potential

The speed and complexity of the economic changes now underway, on both the global and local scales, represent one of the fundamental problems for contemporary companies. Such transformations do have an increasing number of beneficiaries, yet they also take a rising toll of "victims." This makes the ability to swiftly identify the developmental potential of companies and the dangers they face a crucial factor in optimizing company management.

The question of how to predict company bankruptcy rose to particular prominence during the great world economic crisis in the late 1920s and early 1930s. The first attempts at developing an early-warning model were made by A. Fitzpatrick, back in 1932. Nevertheless, significant headway was only made in the 1960s, with the research of E.I. Altman. This US researcher was the first to develop functions for estimating the danger that a given company will become insolvent, utilizing a method based on discriminative statistical analysis.

Although early-warning models were until recently not very widely employed in Poland, their expanded use in practice has lately been encouraged by certain research work addressing this issue, such as the discriminate-model-oriented research that has been underway since 1997 at the Institute of Economics, Polish Academy of Sciences.

A diagnosis tool

The discriminative statistical analysis used in this research requires that the entities being considered be

classified into one of several disjoint, completely distinct groups, called "populations." In our case, the two populations consist of robust, unthreatened companies on the one hand, and companies that are insolvent or face the threat of insolvency on the other. The question of which of these two sets a given entity (company) belongs to can be answered by calculating the value of the model's discriminate function, plugging in figures that reflect the entity's characteristics, and by then comparing the outcome to some limit value.

Although the development of a discriminate model for early bankruptcy warning requires that a vast amount of information about companies be processed, the resulting model consists of a relatively simple formula for calculating a certain ratio. This output ratio represents the synthesis of a relatively small number of financial ratios (this being one of the most important reasons why models of this type have become very useful and attractive), plus a set of statistically calculated weights that express the relative import of each of these financial ratios in identifying a company's condition and developmental potential. The output ratio is therefore a tool that can be used to assess the overall status of a given company - acting as a kind of economic thermometer, enabling us to register the overall state of health of a given "patient."

Seven proposed models can identify symptoms of bankruptcy danger faced by companies with 90% accuracy

In order to lay the groundwork for these models, the Institute of Economics carried out a fundamental analysis of the condition of Poland's 500 largest companies. The estimations made therein gave rise to seven models, each employing a different number of financial ratios (ranging from 4 to 12). The choice of function can therefore be tailored to match the type of company and the availability of data.

The financial ratios used include: rate of income growth, operational return on assets, return on net income, compound gross return on assets, the equity to current assets ratio and the capital mix. Other employed ratios are: debt payment capacity, the capacity to cover financial costs, current liquidity and asset liquidity, asset productivity, and the relative size of assets. In each of the seven selected models (with names ranging from A to G), each of the ratios is assigned a weight - a statistically defined



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Using one of seven proposed models for assessing a company's "state of health" and establishing special teams to specialize in neutralizing business threats can help diminish the risk of bankruptcy

parameter that helps define the model. The discriminative function used in each of the models (the "Z function") calculates the sum of the products of two series: the variables X (representing the ratios that characterize the condition of the company) multiplied by the statistically derived parameters of the model, W (representing the weights of these ratios). This is shown in the following formula:

$$Z = w_1 * x_1 + w_2 * x_2 + \dots + w_n * x_n + w_0$$

For instance, in model G, which is most frequently used to assess a company's condition and which employs four financial ratios, the weights are set as follows: for the operational return on assets - 9.498, for the equity to current assets ratio - 3.566, for debt payment capacity - 2.903, and for current liquidity - 0.452. Each model also includes a final constant weight, denoted w_0 , which for model G is 1.498. Details on the full set of financial ratios and parameter values can be found in the full version of this article, available online at www.pan.pl/academia.

A company is recognized as facing a threat of bankruptcy when the value of the discriminative function is less than zero ($Z < 0$). Verification tests using the models have shown that they correctly (with 90% accuracy) identify symptoms of insolvency danger, with considerable advance warning (some 3-4 years prior to bankruptcy, as a rule).

Training "Business sappers"

Research has shown that early-warning models are still not used very widely in practice in Poland. It can be

no coincidence, therefore, that bankruptcies have broad and severe consequences when they do occur - not only for a given company's owners, employees, and business partners, but also for the Polish state and for the state budget, especially since Poland's bankruptcy-related infrastructure (courts, research, information, etc.) is underdeveloped. Aside from the use of the kind of models discussed here, such infrastructure should also come to include special teams or individuals that specialize in seeking out and neutralizing business threats (representing a sort of "business sapper" profession). Another element of such infrastructure should consist of special teams or institutions that specialize in gathering information and knowledge that fosters business development. Such teams, representing a kind of "information minesweepers," should become an inherent part of early-warning systems. ■

Further reading:

Supporting materials online: www.pan.pl/academia
 Altman, E.I. (2001). *Bankruptcy, Credit Risk and High Yield Junk Bonds*. Oxford: Blackwell Publisher.
 Hadasik D. (1998). *Company Bankruptcy in Poland and Prediction Methods* [in Polish]. Poznań: AE.
 Mączyńska E. (2004). *Special Report - Early Warning Systems* [in Polish]. *Nowe Życie Gospodarcze*, nr 12.
 Mączyńska E., Kuciński K. (eds) (2005). *The Threat of Bankruptcy* [in Polish]. Warsaw: SGH.