

# REQUIREMENTS FOR MODELS PREDICTING CORPORATE FINANCIAL DISTRESS

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## Abstract

Models predicting corporate financial distress have been seriously created since 1960's and first activities started in the United States. Until now there has been developed many methods but approaches used by banks and other financial institutions have not been published because of institutional know-how. The main task of bankruptcy models is to provide a relatively quick answer if an examined corporation has high risk of bankruptcy or not. It should provide key relevant data for evaluator decision making. The economic environment is changing and therefore there is a need for creating new tools and methods predicting financial distress of evaluated entities. Using information technologies and various statistical programmes which were not available before there can be constructed plenty of models. On the other hand, these models should fulfil some requirements otherwise they will not provide reliable answers and they will not help their users in their business decision making. This paper is focused on requirements which each model predicting financial distress should meet. These requirements are collected from the relevant literature as well as they are created as author's opinion based on the critique of existing approaches. Existing models and tools are valued especially from the perspective of their users.

**Key words:** financial distress, firm's analysis, predicting models

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## Introduction

The financial viability and stability is a key issue for every company because any firm is not able to survive in the long run in the case of poor financial situation and poor performance. The models predicting financial distress should provide a relatively quick answer about corporate financial conditions. It means in other words if an examined firm has high or low risk of bankruptcy. The models predicting financial distressed are especially designed for counterparties as suppliers, customers, banks or another financial institutions, government etc. These approaches are not originally designed for the firm itself because the company has

many other pieces of information available than counterparties which work with data publicly available. The firm's bankruptcy or other type of market exiting has many consequences as economic and social especially unemployment which is further analysed by Pavelka (2011). Current legal possibilities of market exiting in the Czech Republic are described by Smrčka (2010).

Models predicting financial distressed are usually based on data publicly available especially derived from accounting statements. Unfortunately character of variables included in financial statements changes over time how the accounting rules and system are developed (detail in Strouhal, 2010). There are also other changes connected with this issue as the change of economic environment itself or change of legal framework and therefore new approaches predicting financial distressed are constructed. One branch is represented by banks and other financial institutions which rate their clients in the case of loans' decisions and now according Basel rules they need to have internal rating system of clients. Unfortunately these systems are not published because they are part of institutional know how. The second branch is represented by university models.

This paper solves which requirements should be fulfilled by models predicting financial distressed. Users expect that the model's accuracy will be very high and the used models will provide reliable answers for their decision making. This is the first requirement which should be met by every approach but there are also others which will be discussed in this paper further.

## **1 Models predicting financial distressed**

Models predicting financial distress should answer if analysed firm has high or low default risk (risk of bankruptcy etc.). Most of these models are based on the quantitative data especially accounting data and they solve a problem if *“the the firms' profile some time before the default (say  $t-k$ ), is it possible to predict which firms will actually fall into default and which will not fall into default in the period between  $t-k$  and  $t$ ”* (De Laurentis at al., 2010)?

Models are generated as a controlled description of a certain economic world. Economics is one of social sciences and observed phenomena do not have a characteristics of physical law and therefore also models predicting financial distressed do not provide results 100% reliable but they work on the probability roots. A corporation which classified as not financial viable does not have to go bankrupt and on the other hand a company classified as healthy can exit the market soon. It is caused by several reasons. If the model is used right it is

still only a simplification of a reality and some important information does not have to be taken into account or the change of conditions comes very fast and the model does not have enough time to react.

### 1.1 Key requirement

Key requirement of models predicting financial distress is the model's accuracy as high as possible. The models are used because their users believe that they provide reliable answers for their decision making. On the other hand bankruptcy models do not function as a physical law and they provide not certainty but only probability.

Models' accuracy is the issue of frequent researches. Models are investigated with the use of real data which consists of cases of defaulted and non-defaulted entities. When the defaulted entity is evaluated as an entity with high probability of default it is a right conclusion but this entity can be also classified as healthy. It represents I type of error. Adversely when the non-defaulted entity is evaluated as an entity with low probability of default it is a right conclusion but this entity can be also classified as unhealthy. It represents II type of error. Both types of misclassification are connected with additional costs but especially I type of error. is further analyzed because the consequences are more serious than in the case that we have not cooperated with the non-defaulted entity classified as unhealthy. Models' accuracy is expressed with the help of number of wrong classified cases as it is described above. Absolute numbers would lead to the smallest size of examined samples and therefore relative indicators are used. These measures of discriminant power are represented by Error I, II, overall effectiveness, ROC curves, Lorenz curves or Gini coefficients.

Models with higher accuracy should be preferred among others but De Laurentis et al. (2010) stress *“that 'risk' models must be part of a larger framework where, on one hand, their limits are perfectly understood and managed in order to avoid their dogmatic use, and, on the other hand, their formalization is not wasted by procedures characterized by excessive discretionary elements”*. Models are very often used dogmatically; their users do not know many of their limitations and even they do not use the models right. Especially from these reasons additional requirements appear which are discussed further.

### 1.2 Variables

Each model is based on data usually publicly available especially derived from accounting statements. These data can be called in our sense variables which have several limitations for

users. Among limitations there are issues as well defined variables, absolute value of variables, objectivity of variables or availability of variables.

Users should fully understand the model predicting financial distressed but sometimes the literature does not contain a clear definition of all used variables and therefore the users can make a mistake very easily. It is very often the case of the variable short-term liabilities which can contain all short-term capital (chargeable or cost-free) or only trade payables. Indebtedness is other example because the company can use a high proportion of leasing which is not included in the Czech balance sheet compared with international standards and it creates a hidden corporate debt. Other difficulty comes with the variable revenues which can consists of all types of revenues (operational, financial, extraordinary) as in the case of IN05 or only core operational revenues (as sales of goods, products and services) which is more common. Many used ratio variables can have almost unlimited values as profitability and the model still functions but there could be also variables whose value has to be limited otherwise the model would not provide reliable answers. Authors are aware of their models' limitation but the users do not use original sources or they overlook these recommendations. It is a frequent example of wrong manipulation with IN05 originally introduced by Neumaierová (2005). IN05 is based on five ratios and one of them is interest coverage whose value can lead to infinite values in the case of very low chargeable indebtedness. In the case of extremely high values Neumaierová recommends limitation of interest coverage to 9 otherwise the value of index would be overweighed by this indicator.

Another difficulty appears when models predicting financial distress are based on absolute values of used variables, mostly value of total assets or total turnover represented by sales or their corresponding logarithm. It works with an assumption that some entities are just too big to fail but it punishes small or medium size entities directly without evaluating their current financial conditions. The model itself should include a recommendation or serious remark that it was primarily constructed for certain size of entities and if the value is put into the formula in thousands or millions. This type of models is not transferable without any modification among countries using different currencies which have incomparable purchasing power.

The used variables should be objective as much as possible otherwise the final result would depend on the subjectivity of the evaluator. It is a reason why general models do not use many qualitative variables as quality of management, level of innovations, customer satisfaction etc. De Laurentis at al. (2010) characterize it as follows. *“Internal rating has to be as 'objective' as possible, in the sense that different teams of analysts – who are tackling*

*the same circumstances, with the same level of information, applying the same methodology, in the same system of rules and procedures – have to arrive at a similar rating, accepting only minor misalignments.”*

Majority of predicting models uses basic variables which are mostly derived from accounting statements. The models could use nonstandard variables as change in physical volumes sold or quantitative variables described above but these variables are not always available or it is difficult to measure them. The models which would be based on the nonstandard variables whose values cannot be obtained (easily) will not be used for predicting corporate financial distress widely because they do not provide enough comfort for their users.

### **1.3 Model's focus**

Models predicting financial distress are constructed using data of defaulted and non-defaulted entities which usually have many common features as size, analyzed period, belonging to industry branch, regional scope etc. These characteristics should be known first and secondly they should be accepted by users. Overlooking these characteristics can lead to poor results although the model itself works right and provides accurate results.

The issue of absolute indicators which represent the size of company has been already discussed. Serious problem is connected with industry branch. Most of models are designed for manufacturing. Entities operating in manufacturing have many common characteristics and manufacturing is an important sector of many national economies. Companies belonging to transport, trade, services, financial sector etc. are different and also their financial results significantly differ compared with manufacturing. It can be demonstrated in the case of trade companies. They usually have higher turnover, more stocks, lower proportion of tangible assets, higher proportion of short-term liabilities, lower profit margin in the case of non-luxury goods etc. But even manufacturing itself is not homogenous because some branches are more capital-intensive, other demand more stocks or energetic entities often function with negative net working capital in the long run period without any difficulties. Specific economic sector is also agriculture which was investigated by models predicting financial distress (detail in Čámská, 2013). The recommendation can be that the models should be applied to industry branches from which they were derived originally and users should take fully into account this prudent principle otherwise the results do not have to be reliable.

University researchers discuss more than belonging to industry branches the regional scope. There are many disagreements that models created in one country can be or cannot be

used in other countries as well. This topic will be still controversial and will be solved again and again. On one hand there are approaches created in developed economies as USA or Great Britain which are implemented in other countries as well and on the other hand there are national minor models. National approaches in the central Europe are included in Čámská (2012). The regional area can affect models' results but from author's opinion the industry branch itself is more serious. It could be assumed that belonging to the comparable industry branch is matter of course but users make this mistake very often and they do not take into account this models' limitation they just apply the models generally.

#### **1.4 User friendly**

Models predicting financial distress designed for ordinary use have to be user friendly. If the models are too complicated they will not be used from reasons as that users will not be able to use or use them correctly or they will be shy to use them. It is mentioned that models predicting financial distress should fulfil KISS principle which means keep it simple stupid. It sounds inappropriately in the research paper but it has to be taken into account for why and whom these models were created. They should provide a relatively quick answer about corporate financial conditions and it is assumed that users do not have any special skills and knowledge.

The models must function transparent and reliable. If the user sees too complicated formula the user do not have enough trust in the gained results. It is even proved in the banking sector which needs own internal scoring systems according Basel rules. Employees of internal rating department apply the latest findings and approaches in this field but at the end they have to communicate their formulas, models and approaches with managers at the top level and also other employees who will use it on every day basis for clients' scoring. Approaches which seem transparent and easily interpretable are preferred. It is a reason why multiple discriminant analysis or logistic regression are such a favourite tools for creating models predicting financial distress. Even nowadays there are described more complicated and sometimes more accurate methods as decision trees, neural networks, rough set approach etc.

#### **Conclusion**

This paper was focused on the models predicting corporate financial distress but not from the traditional point of view of creating new model or testing accuracy and explaining power of already existing models. This contribution described which requirements should be fulfilled

by a good model predicting financial distress for its users. On the first place there is the highest accuracy but there are also other points which should be taken into account otherwise the user will use it incorrectly. These points are included in subchapters connected with variables, models' focus or friendly use.

It is necessary still keep in mind that the models predicting financial distress will always have their limitations because they are only a controlled description of real economic mechanics and they work on the probabilistic rules and their results are not physical law because we are in the area of social sciences. On the other hand these models are applied to majority of ordinary cases and decisions and their results are reliable and trustworthy.

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## References

- Čámská, D. (2013). *Predicting financial distress of companies in the agricultural sector*. In Eglite, A. (Eds.), *International Scientific Conference on Economic Science for Rural Development at Latvia Univ Agr* (pp. 257-262). Jelgava: Latvia Univ Agriculture.
- Čámská, D. (2012). *National view of bankruptcy models*. In Loster, T., Pavelka T. (Eds.), *6th International Days of Statistics and Economics at VŠE* (pp. 268-278). Slaný: Melandrium.
- De Laurentis, G., Maino, R., & Molteni, L. (2010). *Developing, validating and using internal ratings: methodologies and case studies*. Singapore: John Wiley & Sons.
- Neumaierová, I. (2005). *Index IN05*. In Červinek, P. (Eds.), *Evropské finanční systémy* (pp. 143-148). Brno: Masarykova univerzita.
- Pavelka, T. (2011). *Long term unemployment in the Czech Republic in comparison with the other countries of the European union*. In Pavelka, T. (Eds.), *International Days of Statistics and Economics at VŠE* (pp. 481-489). Slaný: Melandrium.
- Smrčka, L. (2010). *The Rescue Principle in Czech Bankruptcy Law as It Exist Now and in the Future*. In *Marketing and Management Sciences. Proceedings of the International Conference on ICMMS 2008 at Athens* (pp. 121-127). Great Britain: World Scientific Publishing.

Strouhal, J. (2010). *Current Measurement Trends in Financial Reporting: From Historical Costs towards Fair Value Concept (and Back?)*. In *Communication and Management in Technological Innovation and Academic Globalization* (27 pp.), Puerto de la Cruz.

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