NATIONAL VIEW OF BANKRUPTCY MODELS

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Abstract

This paper is mainly focused on bankruptcy prediction models. Value or bankruptcy models, often called prediction models, are tools which can help analyse financial situation of a company and provide a quick answer about financial health. The most famous model worldwide is the Altman Z-Score which was first published in 1968. Now nobody is able to say how many prediction models have been constructed because financial institutions, such as banks or insurance companies, and consultant firms usually use their own models which have not been published. Collapse of the Eastern bloc brought not only political as well as economic changes. Several new countries were set up and economic conditions moved to free market economy where private companies are the most common. Private companies can go bankrupt which opens new risks and requirements. During 90's a need of detecting corporate financial health grew. It brings a wave of acceptance of foreign bankruptcy models followed later by creation own models which should respect conditions of transition countries or national economies. The aim of this paper is to find bankruptcy prediction models which were created during 90's in Central and Eastern Europe. These models are described and their differences and specifics are analysed.

Key words: bankruptcy models, prediction formulas, national view, Central and Eastern Europe

JEL Code: G30, G32, G33.

Introduction

The financial health or stability is a crucial issue for every company. Any company is able to survive in a long run because poor financial standing of a company finally results in a bankruptcy. Kapliński (2008) summarizes components on which financial standing depends – the company's financial structure, financial liquidity, solvency, the company's capability to adapt, economic sources, capability to generate profit, capability to maximise the company's market value. The company itself should know its financial situation the best because it has

all pieces of information available. On the other hand there are other partners who need to evaluate the company's situation. Among these partners we can find suppliers, customers, banks or another financial institutions, government etc.

After the collapse of the Eastern bloc new political as well as economic conditions brought a need to detect corporate financial health. First foreign approaches were taken – such as Altman or Taffler model. Second step was an adaption of the foreign model to the specific economic conditions of transition countries. The second step could be presented in the Czech Republic by the Altman formula which contained one more ratio in comparison with the original model (Kislingerová, Neumaierová 2000). The last step was the creation of national prediction approaches. This paper introduces national approaches of the Czech Republic and its neighbour countries – Poland, Slovakia and Germany. Poland, Slovakia and East Germany have gone through the same transition process as the Czech Republic.

1 Importance of Bankruptcy Models

Prediction of bankruptcy is a research topic which has inspired economists since 1960's. The most known article in this area is Altman (1968) where first Altman formula was introduced. This original model was several times revisited (Altman, Haldeman and Narayanan, 1977) and it is still used.

On the other hand the economic environment of the United States where Altman formulas were created is much more stable than the transition period of 1990's. The need of possibility to predict corporate financial distress in Central and Eastern Europe was very high in early years of transformation.

Institutions changed and did not work properly. Rendek (1998) mentioned that pressure from public authorities (such as bankruptcy proceedings) to improve economic environment was inadequate. Rendek's paper is focused on Poland and the Czech Republic. Czesany (2001) goes further and writes about the soft standards of bankruptcy mechanism in the former Czechoslovakia and the Czech Republic.

Many new companies were set up, existing companies were privatized. The entrepreneur environment was completely new and people did not have enough experience. Healthy companies existed together with fraudulent companies and ailing companies which did not exit the market because of soft bankruptcy mechanism. It is time to set up a question how to react in this environment and choose business partners. One answer could be presented by bankruptcy prediction models.

2 National approaches

2.1 Czech Republic

Since 1990's the Altman analysis has been used in the Czech Republic. As it is mentioned above the Altman formula did not provide good results at the beginning of the transition period because the economic environment was not stable and comparable with the United States. Some modification of the prediction model was needed.

The reaction came with the model consisted of 6 ratios. The original Altman formula remained unchanged but an additional ratio was added. The 6th ratio is presented by overdue debts divided by revenues. The existence of overdue debts has negative impact on operation of company and therefore this ratio has the negative sign. Overdue debts were not only a problem of the Czech Republic but also other transition countries. The formula of the modified Altman model and its evaluation can be found bellow (Kislingerová, Neumaierová 2000).

$$Z\ Score = 3.3 \times \frac{EBIT}{A} + 1 \times \frac{S}{A} + 0.6 \times \frac{E}{L} + 1.4 \times \frac{RE}{A} + 1.2 \times \frac{NWC}{A} - 1 \times \frac{OD}{R} \qquad (1)$$

where

EBIT Earnings before Interest and Tax

A Total Assets

S Sales

E Equity

L Total Liabilities

RE Retained Earnings

NWC Net Working Capital

OD Overdue Debts

R Revenues.

Tab. 1: Evaluation of the modified Z Score

Evaluation	Z Score
Unhealthy	Z < 1.8
Grey Zone	1.8 < Z < 2.99
Healthy	2.99 < Z

Source: Kislingerová, Neumaierová (2000)

The modified Altman formula was very early replaced by a national approach. In 1995 the first IN index was created by Inka and Ivan Neumaier. Today the family of indices IN consisted of several members. The first IN 95 respects the creditors view but the following IN 99 respects the owners view. Both views were combined in IN 01. The last published index is IN 05 which respects the view of creditors as well as owners (Neumaierová, I., Neumaier I., 2005). IN indexes are prediction models which directly respect conditions of the Czech economy. The index IN 05 and its evaluation table are presented bellow.

$$IN\ \ 05 = 0.13 \times \frac{A}{L} + 0.04 \times \frac{EBIT}{I} + 3.97 \times \frac{EBIT}{A} + 0.21 \times \frac{R}{A} + 0.09 \times \frac{CA}{STL} \qquad (2)$$

where

EBIT Earnings before Interest and Tax

A Total Assets

L Total Liabilities

I Interest

R Revenues

CA Current Assets

STL Short-term Liabilities.

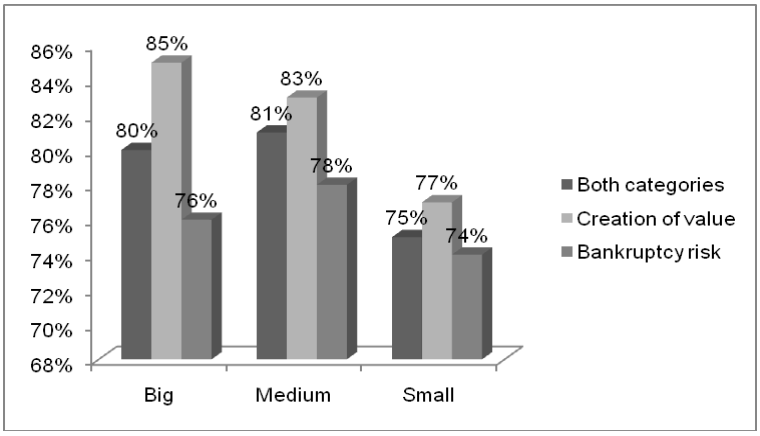
Tab. 2: Evaluation of IN 05

Evaluation	IN 05
Unhealthy	IN < 0.9
Grey Zone	0.9 < IN < 1.6
Value Creation	1.6 < IN

Source: Neumaierová, I., Neumaier I. (2005)

The family of indexes IN was applied to Czech data in 2004. The sample was divided due to the company size. The best results were reached in the group of big and medium size enterprises. Results are illustrated in the figure 1.

Fig. 1: Results of the index IN 05



Source: Neumaierová, I., Neumaier I. (2005)

Another approach can be presented by the balance analysis created by Rudolf Doucha. The wide analysis has three levels. The first level is basic and provides a quick answer. The whole analysis is based on financial ratios which use data from balance sheets and income statements and the highest level also cash flow statement. Detailed information can be found in Růčková (2008).

2.2 Slovak Republic

The economic development of the Slovak Republic is very similar to the Czech Republic because of common history until 1993 when these countries were divided. Since 1993 they have existed as independent countries.

Taking foreign approaches was also common for the Slovak economy. On the other hand Slovak researchers came with their own prediction formulas which should respect national conditions. These specific approaches are presented by Chrastinová and Gurčík. The Czech indices IN are primarily designed for industrial companies. These two Slovak models are primarily created for agriculture businesses.

Chrastinová introduced her model in 1998. This model was created with the use of Slovak data and it is introduced bellow (Chrastinová, 1998).

$$CH = 0.37 \times \frac{E}{A} + 0.25 \times \frac{E}{S} + 0.21 \times \frac{CF}{STL} - 0.1 \times \frac{STL \times 365}{CF} - 0.07 \times \frac{D}{A} \qquad (3)$$

where

E Earnings

A Total Assets

S Sales

CF Cash Flow

STL Short-term Liabilities

D Debts.

Tab. 3: Evaluation of CH-index

Evaluation	CH index
Unhealthy	CH < -5
Grey Zone	-5 < CH < 2.5
Heatlthy	2.5 < CH

Source: Chrastinová (1998)

G-index, which is named after its author L'. Gurčík, is younger than CH-index. That means that used later data but it is based on the discriminant analysis and financial statements as Ch-index. Both indices focus on agriculture companies. Formula of G-index is displayed bellow (Gurčík, 2002).

$$G = 3.412 \times \frac{RE}{A} + 2.226 \times \frac{EBT}{A} + 3.27 \times \frac{EBT}{R} + 3.149 \times \frac{CF}{A} - 2.063 \times \frac{INV}{R} \quad (4)$$

where

RE Retained Earnings

A Total Assets

EBT Earnings before Taxes

R Revenues

CF Cash Flow

INV Inventories.

Tab. 4: Evaluation of G-index

Evaluation	G index
Unhealthy	G < -0.6
Grey Zone	-0.6 < G < 1.8
Heatlthy	1.8 < G

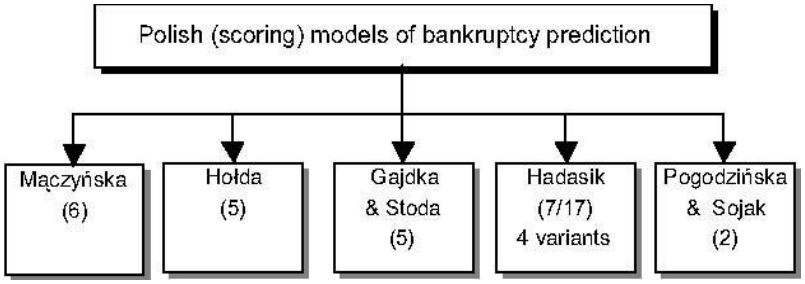
Source: Gurčík (2002)

2.3 Poland

Comparable economic development of Poland has resulted in the creation of several bankruptcy models. Polish models of bankruptcy prediction were summarized in Kapliński

(2008). Unfortunately the paper does not contain any Polish formula. His summarizing figure is displayed bellow.

Fig. 2: The most popular Polish methods of bankruptcy prediction



Source: Kapliński (2008)

This paper will present two Polish models – one created by Hołda and second by Gajdka and Stoda. Most of Polish models are based on the tool of discriminant analysis. Following Hołda's model is described in Prusak.

$$Holda = 0.605 + 0{,}681 \times \frac{CA}{STL} - 0.0196 \times \frac{D}{A} + 0.00969 \times \frac{EAT}{A} + 0.000672 \times \frac{STL}{C_{INV}} + 0.157 \times \frac{R}{A} \quad (5)$$

where

CA Current Assets

STL Short-term Liabilities

EBIT Earnings before Interest and Tax

D Debts

A Total Assets

EAT Earnings after Tax

C_{INV} Costs of inventories

R Revenues.

Hołda preferred the Altman style with three zones – healthy, grey and unhealthy. Grey zone is limited to values (-0.3; 0.1). On the other hand Gajdka and Stoda present only border point and they do not have any grey zone (Prusak). The border point of the model (6) is 0.45.

$$GaS = 0.7732059 - 0{,}0856425 \times \frac{S}{A} 0.00074 \times \frac{STL \times 365}{C_P} + 0.9220985 \times \frac{EAT}{A} + 0.6535995 \times \frac{EBIT}{S} - 0.594687 \times \frac{D}{A} \quad (6)$$

where

S Sales

A Total Assets

STL Short-term Liabilities

C_p Costs of Production

EAT Earnings after Tax

EBIT Earnings before Interest and Tax

D Debts.

This topic is still actual in Poland how the paper Predicting Insolvency of Forwarding Enterprises (Juszczyk, 2010) proves. New economic conditions of markets lead to a need of testing current models and creating new one.

2.4 Germany

The Bonita index is mainly used in the German speaking countries. This model is presented as a supplement in the paper because Germany thanks to unification went through different processes. On the other hand without Bonita index the text about bankruptcy prediction models in Central Europe would be incomplete. BI formula and evaluation table are written bellow (Synek).

$$BI = 1.5 \times \frac{CF}{D} + 0.08 \times \frac{A}{D} + 10 \times \frac{EBIT}{A} + 5 \times \frac{EBIT}{R} + 0.3 \times \frac{INV}{R} + 0.1 \times \frac{R}{A} \qquad (7)$$

where

CF Cash Flow (Earning plus Amortization)

D Debts

A Total Assets

EBIT Earnings Before Interest and Tax

R Revenues

INV Inventories.

Tab. 5: Evaluation of Bonita index

Evaluation	Bonita index
Unhealthy	BI <0
Grey Zone	0<G<1
Value Creation	1<G

Source: Synek

2.5 Comparison of indices

All discussed models were created during 1990's or during early 2000's. Presented prediction formulas follow the example of the Altman model first introduced in 1968 which means that the discriminant analysis was used for their creation. The formulas should have general applicability except Slovak models which were created and tested with the help of agriculture businesses.

All approaches are based on financial statements and did not ask additional data. One exception is the modified Altman formula with overdue debts which directly reacts on the situation during 1990's in the Czech Republic when the companies were not able or did not want to pay their short-term liabilities.

Polish models as only one from the presented group contain constant in their formula. From the mathematical point of view it is not a mistake on the other hand the reason for the constant is not based on the economic environment and corporate functioning. There is always the possibility to omit the constant and changed boundaries of evaluation.

Formula size is comparable because all models use between 5 and 6 financial ratios. On the other hand number of digits is more detailed in the case of Polish models. It does not look like an advantage because models should be easy and quick used.

Conclusion

This paper presented several bankruptcy prediction models which have been created in Europe mainly during the transition period. The topic of bankruptcy prediction is still discussed and solved. It is interesting go back to history, compare national approaches which has not been done yet. The next step of the research will be model's testing and discussing their accuracy.

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