The Assessment of Client Creditworthiness Using Predictive Methods Based on Multivariate Discriminant Analysis

Anna Siekelova[1]* and Erika Spuchlakova[2]

[1,2] Department of Economics, Faculty of Operation and Economics of Transport and Communications, University of Zilina, Univerzitna 1, 010 26 Zilina, Slovak Republic

ABSTRACT

Objective – Trade credit is the most important source of external finance for many companies. It appears on every balance sheet and represents more than 50 percent of company's short-term liabilities and a third of all company's total liabilities in OECD countries. Late payment of invoices may suffer firm's solvency. The European economies are now putting the years of financial turmoil and debt crisis behind them and several macro-economic indicators are pointing towards a brighter future. The aim of this paper is to assess creditworthiness of companies.

Methodology/Technique – Assessment of client creditworthiness carried out using predictive methods based on multivariate discriminant analysis

Findings – The situation in the enterprise can be characterized as stable. An enterprise that chooses this client to provide it a trade credit should also consider supplementing the predictive models by complex financial and economic analysis and review of available. If the firm provides trade credit to more clients, it is necessary to consider that the terms of trade credits may not be the same for everyone but also it is not in the power of company to approach to each client individually.

Novelty – The study suggests that client groups can be created by using cluster analysis. Thus, the company may increase efficiency in the provision of trade credit.

Type of Paper: Review

Keywords: Trade Credit; Trade Credit Receivables; Late Payment; Predictive Model; Z Score; IN 01; Taffler Model; G Index; SAF 2002.

JEL Classification: E51, G21, G33.

_____

1. Introduction

Receivables represent an important part of current assets in the company. In extreme cases, it can account for up to 50 percent of the current assets. Receivable can be defined as the creditors entitled to get cash or contribution in kind from the debtor. There are significant differences between the accounting, legal and economic perception of the term receivable Harumova (2002).

Receivables from an accounting perception represent a substantial portion of current assets. They represent an existing entitlement of an entity arising from past events which will likely increase future economic benefits of an entity and can be reliably measured. The likelihood of economic benefits in the future must be high; otherwise, this definition did not meet the accounting definition of company's assets Daniel (2013). If the prospects of recovery decrease, the corrected value of receivables is established through the creation of allowance for doubtful accounts. In extreme cases, it can lead to write-off.

Obligation relationship is legally characterized as a legal relationship giving rise to the right of the creditor to fulfill (receivable) from the debtor and the debtor will be obliged to fulfill the commitment. Legal terminology handles the concept of commitment as a counterbalance to the notion of receivable. Claims by creditors arise on the date of issuance of the invoice for the supply of goods or services. It is therefore clear that in terms of accounts receivable may not constitute a legally enforceable right at the time of its inception.

Most of the company's receivables have the character of trade credit. It means it is a commercial loan which the lender provides to their customers on the basis of that they can pay for their purchases with a delay. Many payments are realized much later than were agreed. Basic of economic perception of receivables is in providing trade credit, what we pay attention to in the present paper. We used selected predictive methods based on multivariate discriminant analysis to assess client´s creditworthiness. If the client´s creditworthiness is high, there is likelihood that this client meets its commitments properly and on time and providing trade credit to this client is connected with low risk.

2. Trade credit and consequences of late payment in Europe

Receivables may exist in various forms in the enterprise. Each of these forms affects differently the financial position of the company. Most receivables have the character of trade credit receivables as a result of implementation of the business relationship between business partners. Operator's production cycles have different lengths. This is the reason why they have cash at different times. Providing trade credit has become a common part of business practice.

At the beginning, we would like to show some conclusions drawn from the Intrum Justitia European Payment Report of 2016 about trade credit and its consequences mainly in case of non-payment. Nearly three-quarters of survey respondents believe that the risks from their companies' debtors the coming twelve months will remain stable (mainly in North Europe). It is good information but although 15 percent still believe that the risks will increase and only 11 percent believe in decreasing risk. The following picture shows consequences of late payment that were identified by survey respondents in 2016.
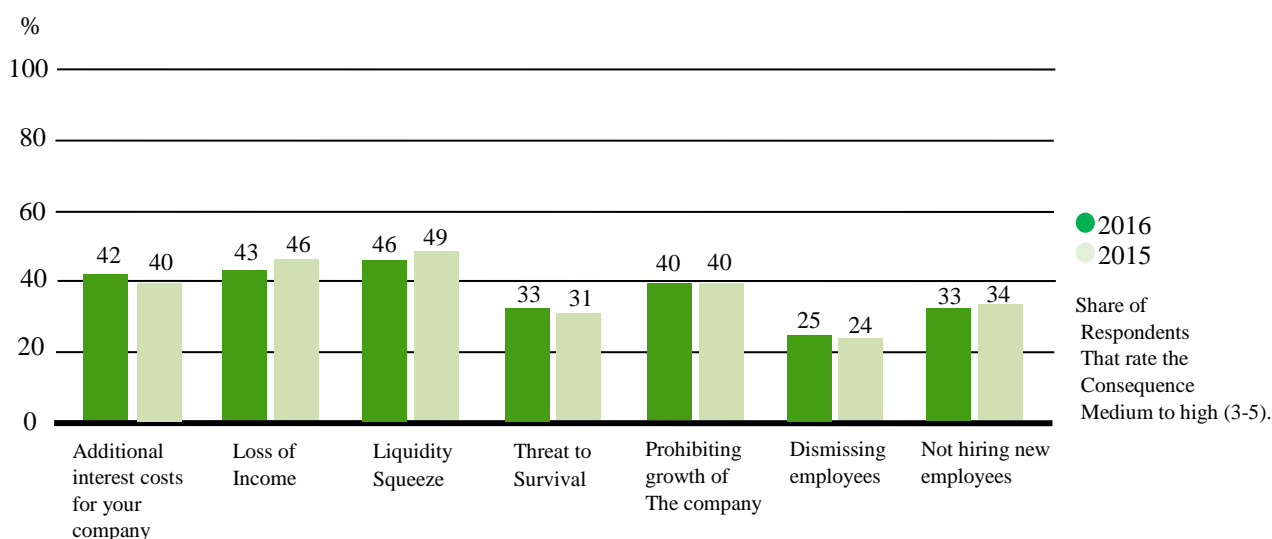

Figure 1. Consequences of late payment

Almost half of respondents identify liquidity squeeze as a consequence of late payments. More than four out of ten-mark rate additional interest costs and loss of income for their company as a mid to high consequence of late payments. And further to that 40 percent of respondents in the survey say that late payments are a reason for prohibiting the growth of their company.

The main causes of late payment of customers are their own financial difficulties, intentional late payment, administrative inefficiency and also disputes regarding good and services delivered.

Intrum Justitia study showed that 3.1 percent of the company's total revenue drags on until the company chooses to conclude that the debt is not going to be paid and therefore instead have to write it off. Converted to actual money, this indicates that as much as 289 billion euro was lost in 2015. Some countries are better than others. For example, in Denmark, the ratio was as low as 1.0 percent. However, in Greece, the corresponding share was a staggering 10.4 percent. In Slovakia, it was 5.2 percent (Intrum Justitia, 2016)

Trade credit is given to the customer as a sign of trust and fair trade relations. Providing trade credit has become a common part of business practice. As was mentioned business partner's production cycles have different lengths. This is the reason why they have cash at different times. This is the reason why it is possible providing trade credit considered as a competitive advantage. The company may provide trade credit to its customer but does not have to. Choosing a business partner for offering a trade credit is as important as the next step of effective receivables management in the company. In the present paper, we will further focus on the assessment of client creditworthiness using the selected predictive models.

3. The selected predictive methods based on multivariate discriminant analysis

Discriminant analysis is used for classifying objects into groups. Using this analysis also determine the variables that have the highest resolving power, the groups to which the object is classified. Although it is not as complex as the analysis based on logistic regression, multivariate discriminant analysis has gained its strong position in a wide range of disciplines from their first use in biological research in the 30s of the last century. It is used primarily in cases where the dependent variable is present in the form of quality. Therefore, the first step is the establishment of well-defined classification groups (usually two or more). Following their determination leads to data collection for individual objects in groups. Basic discriminant function has the form:

$$0 = a_0 + a_1 x k_1 + a_2 x k_2 + ... + a_n x k_n \tag{1}$$

Where:

k_i – values of selected indicators,

a_i – scales of selected indicators,

i = 1, 2, 3 ... n.

It takes into account the whole set of characteristics common to the rated entities as well as their interactions.

Company before closing the deal makes a decision whether and under what conditions trade credit will be provided. The company may find information about the financial situation and payment discipline customers based on previous experience with the customer, based on information from other business partners that provided trade credit to this client in the, based on the results of the rating agencies, from the Commercial Bulletin public registers of defaulters or from financial statements register. You can find if an entrepreneur was succeeded in the accounting period or if company noticed greater losses in recent years that could indicate its current insolvency. Thus, it is possible to determine its creditworthiness. Predicting the financial situation is part of a complex financial-economic analysis. It is based on selected predictive models. Kliestik and Majerova (2015) The following subsection determines creditworthiness of business partner based on the selected predictive models.

4. Business partner creditworthiness determination based on the selected predictive models

The following subsections aim is the prediction of the financial health of the selected company (potential client) using the selected predictive models and a comprehensive interpretation of the results achieved by each model.

Table 1. Results of selected predictive models.

Predictive model	2008	2009	2010	2011	2012	2013	2014	2015
Z-Score	3.96	3.37	3.45	2.88	2.51	2.52	2.86	2.78
ZT	0.96	0.83	0.84	0.59	0.48	0.51	0.58	0.54
S	2.41	2.00	1.97	1.15	0.89	0.93	1.16	1.11
IN 01	2.20	1.73	1.86	1.35	1.14	1.14	1.39	1.40
G index	3.39	2.49	2.59	1.00	1.01	1.16	1.57	1.46
SAF 2002	2.08	1.62	1.17	1.38	0.86	0.93	1.15	1.09

The first used model was Altman model. It is one of the best known and most widely used models in the world. It was established by using multivariate discriminant analysis in the mid-60s of last century. The aim was to differentiate thriving businesses from businesses towards bankruptcy. In 1983, it was introduced the variant of this model suitable for businesses that are not publicly traded on a stock exchange and it is the same used for the application in this contribution. If the value of Z-score is greater than 2.99, we can talk about a good financial situation. Cisko and Kliestik (2013) Potential client these results reached in the years 2008 - 2010. In 2011, the value of Z-score decreased and the client can be classified into a gray zone, under which it is impossible to clearly talk about good or bad financial situation. Since 2013, we need to highlight positive developments of the score, only in the last year, we can see a slight decrease. The disadvantage of using this model is primarily the fact that the specificities of the country in which it was generated were taken into account during its construction (i.e. the United States) It is appropriate to the results of this model complement by other models (Adamko, Kliestik, & Birtus, 2014)

Another used model was Taffler model. Based on its results, we can conclude that the potential client has a low probability of bankruptcy (ZT ≥ 0.3) (Svabova and Durica, 2016)

Next, we used Canadian index created by Gordon L.V. Springate, 1978, known as Springate model. Breakpoints of Springate model is 0.862 if a company has lower scores they are considered at risk of bankruptcy and vice versa (Kliestik, Majerova & Lyakin, 2015) As can be seen from the obtained value company reached higher value throughout the period. Testing after the completion of the model showed up to 92.5% success rate prediction.

Most models arising in connection with predicting the financial situation have been developed in terms of countries that do not reflect the specifics of transforming Slovak economy. The authors of the Index IN 01, which is also known as a property-creditor model, are the Czech husbands. The model was designed for the Czech Republic, and thus its use for Slovak businesses is more suitable than using other models assembled for foreign companies. Applies that if its value of index is greater than 1.77 (2008, 2010), a company creates value; if the value is greater than 0.75 but less or equal to 1.77, a company is in a gray zone; if the value of index is equal or less than 0.75, the company is close to bankruptcy. Selected the company is in the gray zone but far enough away from the lower limit of 0.75 most of the period.

Between the basic models that can be used with a high success rate in predicting the financial health of Slovak enterprises, we can include also the index CH and G index. The author of CH index is Chrastinova. This index was used to predict the health of agricultural enterprises because it takes account some of their specificities. In our work, we focus more on the use of G index, designed by Gurčík. This index falls below creditworthy models that were created by using discriminant analysis as well as Altman model. In case if the result of G index is equal or greater than 1.8, the company is financially stable and bankruptcy is unlikely; if

the value is in the range of -0.6 to 1.8, the company is average. Gurčík (2002) Despite the significant deterioration in the financial situation in 2011 the company is still characterized as average and a value of G index rises.

Last predictive model is in our conditions not very known model by Japanese Professor Cindy Yoshiko Shirata, who is the recognized expert in the area of predicting the financial situation. The at-risk bankruptcy level is value of 0.7, which surveyed enterprise does not reach, its value is higher (Bartosova, Hraskova & Paliderova, 2014)

5. Conclusion

The situation in the enterprise can be characterized as stable. An enterprise that chooses this client to provide it a trade credit should also consider supplementing the predictive models by complex financial and economic analysis and review of available If the firm provides trade credit to more clients, it is necessary to consider that the terms of trade credits may not be the same for everyone but also it is not in the power of company to approach to each client individually. Based on results of the financial and economic analysis, as well as additional information about the financial stability of the client's company can proceed to the creation of client's groups. Every group will have the specific conditions for providing trade credit. Client groups can be created by using cluster analysis. Thus, the company may increase efficiency in the provision of trade credit.

Acknowledgements

References

Adamko, P., Kliestik, T. &Birtus, M. (2014) *History of Credit Risk Models*, In: 2nd International Conference on Economics and Social Science (ICESS), Advances in Education Research, Vol. 61 (pp. 148-153), Shenzhen: China.

Bartosova, V., Hraskova, D. & Paliderova, M. (2014) *Basic Rules and Methodological Framework of the Financial Analysis of the Group of Companies in the Slovak Republic*, In: 2nd International Conference on Economics and Social Science (ICESS), Advances in Education Research, Vol. 61(pp. 86-91) Shenzhen, China.

Cisko, S. & Kliestik, T. (2013). *Financny Manazment Podniku II* [Enterprise Financial Management II]. Zilina: EDIS Publishing.

Daniel, P. (2013). *Sprava a vymahanie pohladavok* [Administration and debt recovery]. Bratislava: Iura Edition.

Gurčík, Ľ. (2002). G-index–metóda predikcie finančného stavu poľnohospodárskych podnikov[G-index-method prediction of the financial status of farms]. *Agricultural economics*, *48*(8), 373-378.

Harumova, A. (2002). *Ohodnocovanie Pohľadávok* [Valuation of receivables]. Bratislava: Iura Edition.

Intrum Justitia, (2016), European Payment Report 2016 Available at: <https://www.intrum.com/globalassets-/countries/norway/documents/2016/european-payment-report-europa-2016.pdf [Accessed 10 August 2016].

Kliestik, T. & Majerova, J. (2015) *Selected issues of selection of significant variables in the prediction models*, In: 10th International Scientific Conference Financial management of Firms and Financial Institutions, (pp. 537-543), Czech republic: Ostrava.

Kliestik, T., Majerova, J. & Lyakin, N. A. (2015) *Metamorphoses and Semantics of Corporate Failures as a Basal Assumption of a Well-founded Prediction of a Corporate Financial Health*, In: 3rd International Conference on Economics and Social Science (ICESS 2015), Advances in Education Research, Vol. 86 (pp. 150 – 154).

Springate Gordon, L. V. (1978). Predicting the Possibility of Failure in a Canadian Firm/Gordon LV Springate. *Simon Fraser University*, *164*.

Svabova, L. & Durica, M. (2016). Korelacna analyza prediktorov po uzitych v bankrotnych predikcnych modeloch na Slovensku [Correlation analysis predictors for use in a bankruptcy prediction model in Slovakia]. *Ekonomicko-manazerske spektrum, 10* (1), 2-11.