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ASSESSMENT OF COMPANIES' FINANCIAL HEALTH: COMPARISON OF THE SELECTED PREDICTION MODELS *

The article is dedicated to forecasting financial health of a company by means of the selected older and more recent models of prediction, more exactly with the focus on Tamari's model, Creditworthiness Index, the IN 05 Index and the HGN Model. The research aims to confirm or reject the hypothesis of non-actuality and low level of evidential values of prediction models, which have been developed earlier and under different condition by comparing models, which are of more recent origin and have been developed in Slovakia and Czechia.

Keywords: *financial analysis; financial health of a company; predictive models.*

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ОЦІНЮВАННЯ ФІНАНСОВОГО СТАНУ КОМПАНІЇ: ПОРІВНЯННЯ ОБРАНИХ МОДЕЛЕЙ ПРОГНОЗУВАННЯ

У статті проведено прогнозування фінансового стану компанії через обрані традиційні та нові моделі прогнозування, зокрема, модель Тамарі, Індекс кредитоспроможності, Індекс IN05 і модель HGN. Порівняння моделей проведено на основі авторської гіпотези про те, що традиційні моделі нижчі за якістю і не надають актуальної оцінки ситуації в компанії, на відміну від новіших моделей прогнозування, розроблених відносно недавно в Словаччині та Чехії.

Ключові слова: *фінансовий аналіз; фінансовий стан компанії; прогностичні моделі.*
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ОЦЕНКА ФИНАНСОВОГО СОСТОЯНИЯ КОМПАНИИ: СРАВНЕНИЯ ВЫБРАННЫХ МОДЕЛЕЙ ПРОГНОЗИРОВАНИЯ

В статье проведена оценка прогнозирования финансового состояния компании при помощи избранных традиционных и новых моделей прогнозирования, в частности, модель Тамари, Индекс кредитоспособности, Индекс IN05 и модель HGN. Сравнение моделей проведено на основе авторской гипотезы о том, что традиционные модели ниже по качеству и не представляют актуальную оценку ситуации в компании, в отличие от более новых моделей прогнозирования, разработанных относительно недавно в Словакии и Чехии.

Ключевые слова: *финансовый анализ; финансовое состояние компании; прогностические модели.*

Introduction. A business company can be considered financially healthy if it has balanced goals within which positive results are being obtained. This paper is focused on assessing financial health of a company by comparing the selected models of creditworthiness and bankruptcy. The essence of solvency models is in scoring the selected ratios, basing on a chosen scale of scores one is capable to determine the level of financial health of a company. Bankruptcy models belong to mathematical and statistical methods and are more widely represented. The difference between them and credit worthy models consists in that the former employ weighting when determining

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the preferences of appropriate indicators, entering the given models thus enabling the evalation of financial situation with the prediction of company's financial situation.

The paper is dedicated to forecasting financial health of a company using the accounting reports for the period of 3 years. Having calculated the required differential and proportional indicators, the results obtained have been applied to older and more recent predictive models. In doing so, we have focused on Tamari's model and the Creditworthiness Index. Of the more recent prediction models we have chosen the IN 05 Index and the HGN model.

The research is aimed to confirm or reject the hypothesis on the outdatedness and low level of evidential value of the older prediction models when compared to the latest ones. Comparing the results obtained we assess the financial situation of the company for justification of the older predicton models, too.

Literature review on the characteristics of financial analysis. Financial analysis ensures a relation between the assumed results of managerial assessments and the real ones achieved.

Decision-making on finance have to be (Martinicova, 2006) supported by a financial analysis producing a system of indiciators, the role of which is to:

- assess the current financial situation in a company, i.e. determining it is financial health;
- assess the prospects of financial situation of future;
- prepare the supporting documentation for improving the financial situation, and decision-making regarding company-related processes.

The goal of financial analysis is a comprehensive assessment of financial situation and health of a company.

Definition of financial health of a company. Company's success obviously depends, to a significant degree, on early identification of insolvency symptoms with the creation, when possible, of reference categories, when these occur, companies and the most involved stakeholders should take constructive steps to promptly identify the lines of action. Once an insolvency situation has been identified, the company must be able to deal with it effectively and under correct timing, intervening on causal factors which are often connected with management decisions that are not correct or are not coherent with the complexity of competitive context (Giacosa et al., 2015).

Financial health of a company is analyzed for the purpose of defining the actual situation so as to determine the origin and the causes of experienced variances. The analysis is aimed to eliminate them and thereby improve the financial health of a company (Dluhosova, 2008). Prediction of company financial health is the object of studies conducted by many authors. F. Kalouda (2006) defines financial health with the help of concrete ratios providing a cross-sectional view on liquidity and profitability. According to J. Valach (2001), a company is considered to be financially healthy, when it is in a given period of time is prospectively capable of meaningful existence.

British authors often consider a company healthy, when it is capable of economizing its assets to an extent, which corresponds to the risk, the company is taking during this period of time while ensuring solvency. Financial health is ensured with the help of financial analysis tools (Kubenka and Kralova, 2013).

Methodology. To define an all-round financial health of a company, one has to use financial statements, fundamental for further analyses (Kislingerova et al., 2010). Prediction of financial situation of companies plays an important role in financial management and the basic tools of financial prediction are the models of solvency and bankruptcy, which may be of older or newer origin.

Putting forward a hypothesis. For the purpose of confirming (rejecting) a statement, with regard to the fact that older prediction models are outdated and offer low level of evidential value regarding financial health of a company, we have developed the prediction models. Subsequently the following hypothesis was determined: Let us assume that older models of prediction do not provide the same level of evidence as new prediction models. The given hypothesis will be verified by this research. The obtained results are based on the data of transportation company.

The models applied to prognosing financial health of a company and their indicators. Our research will be based on financial statements and accounting documents for the three-year period (2012–2014). The all-round analysis involved calculations of differential data and financial ratios for the selected models of solvency and bankruptcy. Comparing the results obtained, we will be able to assess the financial situation of a company and at the same time to verify the older prediction models. The following 4 prediction models are in focus:

1. Tamari's model (TM) has 6 indicators, by means of which we can predict the development of financial situation in an analyzed company. The first 3 indicators are focused on the evaluation of financial situation and the remaining 3 – on assessing operational aspects (Ruckova, 2007).

2. The Creditworthiness Index (CI) is rated among the prediction models of bankruptcy. It is equation has 6 indicators arranged as follows:

$$CI = 1.5x_1 + 0.08x_2 + 10x_3 + 5x_4 + 0.3x_5 + 0.1x_6. \quad (1)$$

K. Zalai et al. (2010) reported that the larger is the value of CI, the better is the financial situation of a company. The results obtained are assessed by the scale of 7 intervals of evaluation.

3. The Index IN 05 is the updated model of IN 01 Index. The equation for IN 05 consists of 5 indicators arranged as follows:

$$IN\,05 = 0.13A + 0.04B + 3.97C + 0.21D + 0.09E. \quad (2)$$

Based on the results obtained, companies are divided into 3 groups. The first group is made up of solvent companies, in the second group we have companies with high probability of going bankrupt. The third group is made up of the companies in the grey zone, for their future development remain unknown to us.

4. The HGN Model was introduced in 2014 and is based on the database of financial indicators of 233 Slovak companies. This model was developed by selecting the indicators of efficiency and intensity. E. Hyranek, M. Grell and L. Nagy (2014) stated that a simple summary of the selected indicators in separate groups provides a logical result, as homogenous indicators added neither contradict nor exclude one another.

The first two of the four models investigated are rated among the older prediction models, whereas IN 05 and HGN can be classified among newer models of prediction. Summarized in Table 1 are the selected 4 prediction models along with

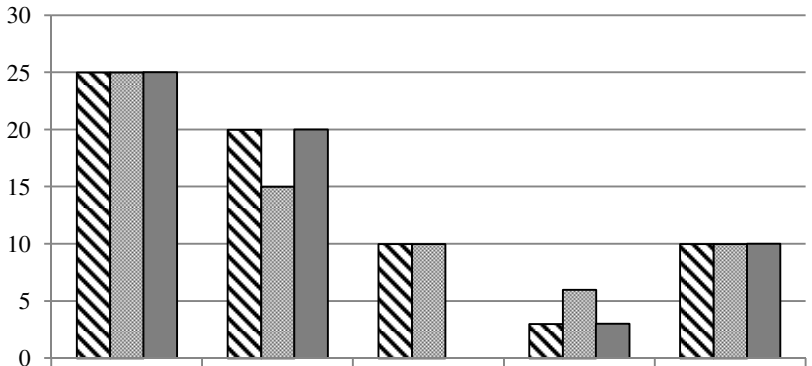
the indicators, which have been taken into consideration when applied in this research.

Table 1. **The selected prediction models and their indicators,** *authors' compilation based on* (Zalai et al., 2010; Hyranek et al. 2014)

Older prediction model – Tamari's model – calculation of indicators			
1.	**Ta =**		Owner's equity / Foreign equity
2.	**Tb1 =**		Development of net profit in an absolute sum
	Tb2 =		Net profit / Equity
3.	**Tc =**		Liquidity of the 2nd level
4.	**Td =**		Costs of own production, production costs / Average state of semi-products and finished goods, costing made on the basis of own costs
5.	**Te =**		Net turnover / Average state of receivables
6.	**Tf =**		Own costs, production costs / Net working capital
Older prediction model – Creditworthiness Index – calculation of indicators			
1.	**CI x_1 =**		Cash flow / Foreign equity
2.	**CI x_2 =**		Total equity / Foreign equity
3.	**CI x_3 =**		EBIT / Total equity
4.	**CI x_4 =**		EBIT / Total output
5.	**CI x_5 =**		Inventory/ Total assets
6.	**CI x_6 =**		Total output / Total equity
Newer prediction model – IN 05 Index – calculation of indicators			
1.	**A =**		Assets / Foreign equity
2.	**B =**		EBIT / Cost-related interests
3.	**C =**		EBIT / Total assets
4.	**D =**		Turnover / Total assets
5.	**E =**		Current assets / Current liabilities
Newer prediction model – HGN model – calculation of indicators			
1.	**Indicators of efficiency**	**A =**	Profitability of owner's equity = Net profit / Owner's equity
2.		**B =**	Cash flow per turnover = (Net profit + Depreciation) / Turnover
3.		**C =**	Turnover of the total equity = Turnover / Total equity
4.	**Indicators of intensity**	**D =**	Restriction of short-term receivables = = Short-term receivables / Turnover
5.		**E =**	Instalment payment period for foreign sources = = (Liabilities + Accrual of liabilities) / (net profit + depreciation)
6.		**F =**	Cost-benefit of operation = Costs of economic activities / Turnover

Comparing the selected prediction models. Predictions models are based on various indicators however bear some similar traits, with the majority of data taken from the final statements of companies. For the purpose of comparing the prediction models of companies' financial health, from the older models we have selected Tamari's model and the Creditworthiness Index. Of newer models developed in Slovakia and Czechia we have selected IN 05 Index and HGN Model.

Assessment of company's financial health – Tamari's model. In this prediction model, financial and economic levels are expressed by the Tamari's risk index based on the calculated indicators and summarized scores, consisting of 3 levels. The index is considered high with scores over 60 points, medium – in the interval from 30 to 60 points, low – with scores less than 30. The development of the score-based assessment for separate indicators of Tamari's risk index is illustrated in Figure l.



	Ta	Tb1	Tc	Te	Tf
2012 TM = 68	25	20	10	3	10
2013 TM = 66	25	15	10	6	10
2014 TM = 58	25	20	0	3	10

Figure 1. **Calculation of indicators for Tamari's model,** *authors'*

Assigning points in Tamari's risk index leades us to the statement that over the years of 2012 and 2013 the financial situation in the investigated company appeared to be stable and balanced with prospects of further development, as the sum of points is higher than 60. This point-based assessment is the result of indicators, particularly *Ta* and *Tb*. The company achieved the medium index of Tamari's assessment for the year 2014, when the greatest share of this worsening was recorded at the indicator *Tc*, termed as the liquidity of the 2nd level.

In 2014 the company had short-term financial assets and short-term receivables from business activities as well, and this negatively affected the current liquidity. Prediction of the company's financial health for the year 2014 is uncertain, consequently we recommend raising more short-term financial assets, which will directly result in improved liquidity of the 2nd and 3rd levels.

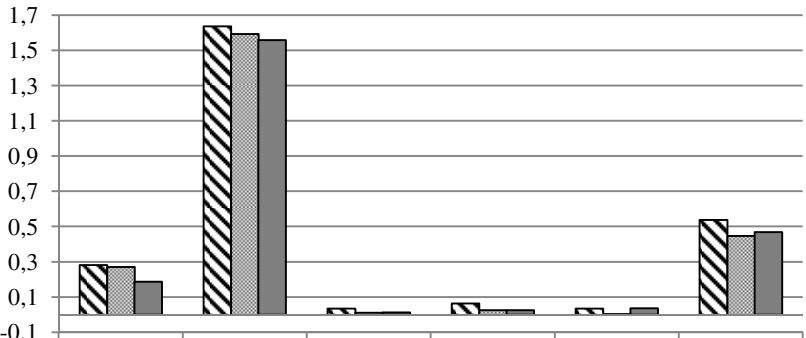
Assessment of financial health of a company – the Creditworthiness Index. Creditworthy models are used to assess current financial situation of a firm using one aggregate indicator and these models combine the selected ratios (Kubenka and Boleckova, 2015).

Kabat's multidimensional discrimination analysis applied for 2013 is currently the most frequently used procedure for classifying companies into profitable or not profitable in terms of their future prospects. The assessment scale for the Creditworthiness Index is within (-3 to 3 and more), showing that is the larger the final value, the more secure is financial and economic future and company's prospects.

The resulting values of the indicators and the Creditworthiness Index overall for separate years are summarized in Figure 2.

In our case the highest value of the Creditworthiness Index (CI) is 1.29 for the year 2012, we can state that the financial and economic situation in this business unit is good. The resulting value in 2012 was most affected by the indicators x_3 and x_4, affectindg the EBT, x_3 and x_4 yield the index at 10 and 5, consequently the resulting

figure is obtaining higher weight indicators in the discriminating function that affects the overall result.



	CI x1 (1,5)	CI x2 (0,8)	CI x3 (10)	CI x4 (5)	CI x5 (0,3)	CI x6 (0,1)
2012 CI = 1,29	0,2836	1,6373	0,0351	0,0651	0,0360	0,5395
2013 CI = 0,84	0,2720	1,5939	0,0123	0,0275	0,0047	0,4486
2014 CI = 0,70	0,1864	1,5573	0,0121	0,0257	0,0365	0,4685

Figure 2. **Calculation of indicators for the Creditworthiness Index,** *authors'*

In 2013 and 2014 the resulting value of CI is lower than it was in 2012, which means that the financial and economic situation and the development of the investigated company was accompanied by certain problems. If the company wants to improve its assessment by CI towards good or very good, more attention is to be paid particularly to the indicators which are instrumental in increasing profit.

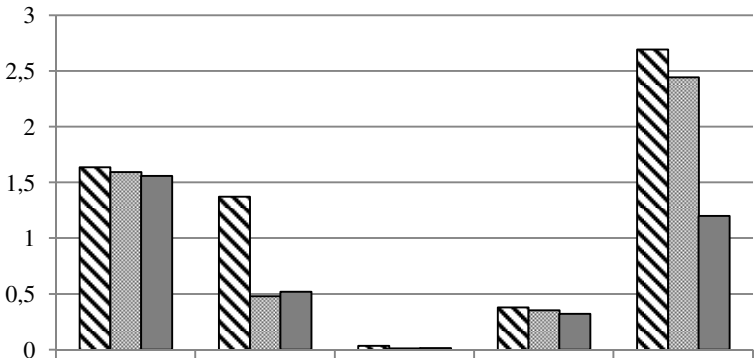
Assessment of the financial health of a company – the IN 05 Index. The third model, which belongs to newer prediction models evaluating financial health of companies and is known as the IN 05 Index. The results are divided into 3 groups:

- Company's generating the value of IN 05 Index > 1.6.
- Company is the grey one, IN 05 falls between 0.9 and 1.6.
- Company is generating no value, the resulting value of the IN 05 Index < 0.9.

The authors of IN 05 state it was created and tested on the data from mainly medium and large industrial firms, so for these company it will have the best explanatory power (Kubenka and Boleckova, 2015).

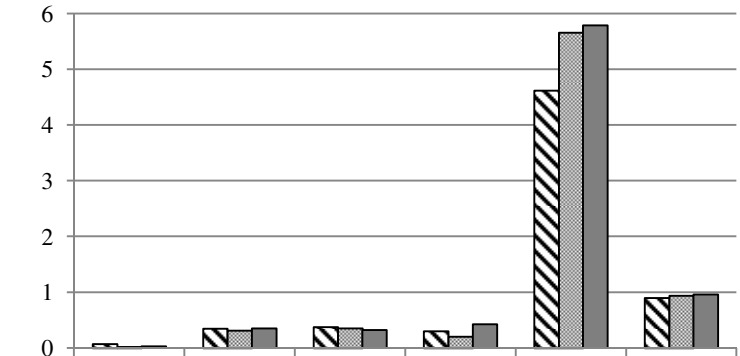
The results achieved by the company during 2013 and 2014 allocate it into the third group, since no value is generated by the company. But the 2012 results asign the company into the grey zone, it is rather difficult to determine which direction the company was going to take.

Assessment of the financial health of a company – the HGN model. The HGN model is the fourth model consisting of the indicators of efficiency and those of intensity. The difference obtained by substracting one group from the other group of indicators leads to a single figure, and from verification calculations we arrive at the intervals of optimal HGN. Specifically the interval of (0.5189 to 4.2659) and the interval of (-6.4547 to -0.8423) have been established, which provide evidence of the optimum final values. Calculation of indicators of efficiency and intensity is illustrated in Figure 4.



	A (0,13)	B (0,04)	C (3,97)	D (0,21)	E (0,21)
2012 IN 05 = 0,9627	1,6373	1,3732	0,0351	0,3806	2,6935
2013 IN 05 = 0,7698	1,5939	0,48	0,0123	0,3552	2,4444
2014 IN 05 = 0,6462	1,5573	0,5179	0,0121	0,3201	1,1977

Figure 3. **Calculation of indicators for IN 05 Index,** *authors'*



	A	B	C	D	E	F
2012 HGN = -5,0183	0,0739	0,3476	0,3806	0,3015	4,6177	0,9011
2013 HGN = -6,1114	0,0211	0,3122	0,3552	0,203	5,6588	0,9381
2014 HGN = -6,4738	0,0271	0,3468	0,3201	0,4259	5,7846	0,9572

Figure 4. **Calculation of indicators – HGN model,** *authors'*

By assessing the financial development basing on the HGN Model we can state that the investigated company during 2012 and 2013 was within the optimal intervals, but in 2014 the situation was less favourable. The greatest share in negative development during 2014 was due to the indicator of intensity, more exactly the offsetting of short-term receivables. Positive development of financial health in 2014 was the due to efficiency indicators, whereas those related to intensity forced the company in the same year into to the group of companies facing unfavourable prospects. Optimization of short-term receivables could be achieved by reducing the volume of short-term receivables or increasing the turnover.

Comparison of older and newer models of financial health prediction. When assessing the financial health of companies, comparison of the selected prediction models

resulted in the rejection of the hypothesis about low evidential value of older types of prediction models and also the one of them being outdated, as the results have turned out to be almost identical with those obtained via newer prediction models. From the assessment it follows that older prediction models are not fading in terms of their evidential values and their use is justified. The results of comparing older prediction models with those of newer origin are summarized in Table 2.

Table 2. **Comparison of the results of old and new models of financial health prediction,** *authors'*

	Older prediction models			
	Tamari's model	**Prediction of financial health**	**Creditworthiness Index**	**Prediction of financial health**
2012	68	equilibrium, stable	1.29	good
2013	66	equilibrium, stable	0.84	some problems
2014	58	Insecure	0.7	some problems
	Newer prediction models			
	IN 05 Index	**Prediction of financial health**	**HGN model**	**Prediction of financial health**
2012	0.9627	grey zone	-5.0183	optimum
2013	0.7698	the company creates no values	-6.1114	optimum
2014	0.6462	the company creates no values	-6.4738	unfavorable

Conclusion. This research is an attempt to assess financial health of a company applying two older and two newer prediction models. The older ones were represented by Tamari's model and that the Creditworthiness Index. As newer models the IN 05 Index and the HGN model were chosen. Applying Tamari's model of prediction for assessing company's performance during the period of 2012 and 2013 showed stability, but the year 2014 brought financial uncertainties. The resulting value of the Creditworthiness Index over the period of 2013 and 2014 was lower than in 2012, which means that financial situation and company development in the 2013 and 2014 was accompanied by certain problems. Applying a newer model, such as the IN 05 Index allows us stating that the company in 2013 and 2014 was not generating any value and in 2012 it belonged to the grey zone. Assessing the financial development on the basis of HGN model, we can state that in the period of 2012 and 2013 the investigated company was within the optimum intervals. Judging by the resulting values of the HGN model, the year 2014 was less favourable, consequently the company should focus on its turnover affects.

Basing on the results of company's financial health assessment we can state that the use of all the tools for predicting financial health of the company is justified. The application of earlier prediction models is justified too, because the resulting values are similar to the outcomes of the newer models.

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