



TAX DEBT AS AN INDICATOR OF COMPANIES' DEFAULT: THE CASE OF SLOVAKIA

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Abstract

Scientific literature has proposed a number of indicators that are successful in predicted future of company's default. Our study is focused to enrich of the literature by presenting data on the potential tax liability as a warning sign of future company's default. Using the Receiver Operating Characteristic of curves and the values of Area Under Curve we measure and compare the resolution of the twelve ratio indicators that have in numerator the accounting data on income tax. From the twelve indicators, we have used three with the best-resolution as independent variables in the hazard multi-period logit model of prediction of company's default. The research was done on the data of failed and healthy companies that are included in the financial statements from 82,572 companies in the Slovak Republic for the period 2003-2012. We found that although the best ratio indicators with income tax were ranked in terms of their distinctive capabilities in the first half of selected 49 benchmark indicators, they does not include the best under this criterion. However in terms of accuracy of prediction model, fiscal indicators came through better than indicators with the best resolution. Therefore, it is not possible to say that which model is better. It depends on what criterion is evaluated. The possibility of using tax indicators is thus a matter of the required characteristics of the model.

Key words:

Bankruptcy prediction; Tax accounting variables; Ability of resolution; ROC curves; Hazard multi-period logit model

INTRODUCTION

For internal and external clients of a company, the important objective information on the financial health of the company are important in the current period. Furthermore, information is important about the likely development of the financial health of the company in the future, as well as information on the likelihood of company's default in the future. It was due to the failure of business partners during the crisis that the phenomenon of secondary insolvency has led to increased demand for qualified information and methods of prediction company's default. Efforts to correct

prediction of company's default led also in the past to the fact that the researchers on the basis of empirical research of financially healthy and failed companies constructed indicators, methods and ways of evaluation of the financial health of the company as well as the methods and models of company's default prediction. Let us brief overview of currently known indicators and models of business default prediction.

In the beginnings of examination of methods and ways prediction of company's default was most frequently applied method of the one-dimensional discriminant analysis that was represented by Beaver (1966) and Zmijewski (1983) models. The largest expansion of modeling of the financial health of firms and prediction of company's default occurred using multidimensional discriminant analysis. It is carried out for example by Altman Z-Score (Altman, 1968 and 1993) and Altman et al, (1995), Springate model (Sands et al, 1983), Fulmer model (Fulmer, 1984), Beermann test (Beerman, 1976), CH index (Chrastinová, 1998), Taffler model (Taffler & Tisshaw, 1997; Taffler, 1983), Credit Index (Kralicek, 1993), indicator IN 95 (Neumaier & Neumaierová, 1995; Kotulič et al, 2010), IN 99 (Kotulič et al, 2010), IN 01 (Kotulič et al, 2010), IN 05 (Kotulič et al, 2010), Analysis by Doucha I and II (Doucha, 1995). A similar method is represented by Tamari scoring model (1978), Quick test (27 Kralicek, 1993), and by A score (Argenti, 1976). In a further development of modeling of the probability of company's default were applied logit and probit models. This approach is represented for example by O score (Ohlson, 1980) and through Zmijewski model (Zmijewski, 1984). Shumway (1999) represents the method by its model of business failure prediction through hazard models. Separate category of models of failure prediction is represented by a nonlinear model Moody's RiskCalc, which is intended for private companies (Falkenstein & Boral, 2000). Since models based solely on market indicators are not the subject of this paper, in the literature review we do not present the models.

Models of the failure prediction of the companies work with various independent variables. The first group of the variables represent accounting variables which include independent variables of Altman model - working capital to total assets (WC/TA), retained earnings to TA (RE/TA), earnings before interest and taxes to TA (EBIT/TA), market equity to total liabilities (ME/TA), and sales to TA (S/TA) (Altman, 1993), and also the ratio indicators of the Zmijewski model – ratio of net income to total assets (NI/TA), the ratio of total liabilities to TA (TL/TA), and the ratio of current assets to current liabilities (CA/CL) (Shumway, 1999; Zmijewski, 1984). The second group of independent variables in the models of prediction of company's failures is market-driven variables and they include market size, past stock returns, or the idiosyncratic standard deviation of stock returns. Shumway later showed that the estimates of the parameters of independent variables, which were different accounting variables reveal that half of these variables has no statistical correlation with the probability of bankruptcy of companies (Shumway, 1999: 23).



However, in the literature no research exists that could to examine the ability of resolution and predictive capability of models with independent variables represented by ratio indicators that could be based on accounting data on *income tax* (tax derived indicators). Therefore, in this paper, we aim to empirical data obtained from the financial statements of companies in the Slovak Republic to testing the ability of resolution of the ratio indicators based on income tax and also to determine the predictive accuracy of the model of prediction of failures of companies which act as independent variables selected ratio indicators based on tax income, which demonstrate in our research the best ability of the resolution. Our aim is testing whether and how accurate it is possible to predict the failure of companies in the Slovak Republic on the basis of accounting data on the amount of income tax of companies in one of the five years that preceding the failure of the company. The ambition is to contribute to filling gap in the empirical literature, which is concerned with the subject of the ways and methods of predicting of failure of companies and enrich the empirical literature on knowledge, whether the financial information on income tax are such independent variables, which are statistically significantly related to the probability of failure of the company in the future.

The motivation for our research is that data on corporate income taxes are available to external business clients and in particular for tax authorities. If the amount of income tax was sufficiently precise indicator of the failure of the company could be the following information useful for public authorities, in particular for the financial authority for the prediction of failure of companies, but also as a means to distinguish the real, the expected failure from an intentionally caused failure of the company.

The remainder of the paper is organized as follows: In the second part we briefly explain the background of hypothesis, intuition for this hypothesis in the particular reasons for which we consider to be appropriate to consider a resolution of the ratio indicators containing income tax. In the third section, we describe empirical methodology, explaining the process, methodology and data. In the fourth part, we present the results of testing the ability of resolution of ratio indicators containing income tax and testing of the predictive ability of the model prediction of bankruptcy as independent variables contains just such indicators. Conclusion follows, and it summarizes the results of our research.

HYPOTHESIS DEVELOPMENT

Income tax is in terms of double-entry bookkeeping for contractors a part of the cost of an entity. In case of income tax is separately charged current tax and deferred tax (Ministry of Finance of the Slovak Republic, 2002). Current income tax is charged from the tax base, which is in the meaning of the Income Tax Act determined by the trading

income of increasing or decreasing about certain amounts that fall or not fall into the income tax base. Deferred tax is charged in:

- a) Temporary differences between the accounting value of assets and liabilities showed in the balance sheet and their tax base;
- b) For the possibility to carry forward tax loss into the future;
- c) Possibility to transfer the unused tax deductions into the future periods (Ministry of Finance of the Slovak Republic, 2002).

Deferred tax is an accounting category, which displays the increasing or decreasing the tax base in future periods and will be due in the next financial periods (Gašpárová, 2004a and 2014b). Profit after income tax is one of the important own resources and thus a prerequisite for increasing its performance in future periods that may restrict the company's default in future. Profit after income tax is also one of the key performance indicators of the company.

May be mentioned the extensive review of the literature that presents research results of the relationship of income tax and corporate finances. The question of whether there is an optimal capital structure that would be a subject to the way of taxation of interests and dividends as is peculiar to so-called classical bilayer system of taxation, belongs to the most famous themes in the relationship between income tax and corporate finances. It examines whether the tax advantages in financing through debt affects the value of the company. Empirical research was undertaken and presented by Miller and Modigliani (1958 and 1963) and Miller (1977) and Miller and Schloes (1978). Following this, it examines whether the non-debt tax shields, for, example based on depreciation, are in the negative relationship to debt financing arrangement because they substitute the interests as a tax-deductible expenditure (Bradley et al, 1984). Under examination is also the fact whether the income tax has an impact on the option of organizational form and motivation to reorganization of the companies (Alford & Berger, 1998), on the dividend policy and on the form of the payment of revenues from investments into company (Allen & Michaely, 2001).

In this research, we want to verify the hypothetical assumption whether it is possible to predict the company's default through ratio indicators that are based on income tax. To clarify the intuition behind this assumption in this section, we want to show the channels through which income tax affects the return of investment of enterprise.

Income tax, in this the profit tax on dividends also from the interests affects rate of return on shareholders' investments into the equity of the company, therefore, the return on equity (ROE below). ROE is ratio indicator, which is one of the most important indicators, which are used in fundamental financial analysis of a company. We assume that the return on investments and overall financial situation of the company affects the company's default in the future. If income tax through several channels affects return of investments measured by ROE indicator and financial



situation, then we conclude that the income tax also affects the failure of the company in the future.

For explanation of the main channels through which income tax affects ROE, and implicitly also the financial situation of the company, we use DuPont system of decomposition of ROE, which has been for a long time applied for fundamental financial analysis of a company. ROE is affected by profitability, which is measured by profit margin (*PM*), operating efficiency, which is measured by asset turnover (*AT*), and financial leverage, which is measured by the equity multiplier (*EqM*). Then ROE is calculated using the formula (Groppelli & Nikbakht, 2000):

$$ROE = PM * AT * EqM \quad (1)$$

The aim of fundamental financial analysis is to identify the sources of success or company's default that is measured by ROE. For it is used DuPont system of ROE decomposition by that

$$ROE = \frac{NP}{S} * \frac{S}{A} * \frac{A}{E} \quad (2)$$

where *NP* is net profit; *S* is sales; *A* is assets; *E* is equity. Expression (2) after adjustment has the form

$$ROE = \frac{NP}{E} \quad (3)$$

The ROE indicator can be further by decomposition also decomposed as this (Zane, 2004: 458):

$$ROE = \frac{NI}{EBT} * \frac{EBT}{EBIT} * \frac{EBIT}{S} * \frac{S}{A} * \frac{A}{E} \quad (4)$$

where *NI* is net income, i.e. income after income tax; *EBT* is pretax profit; *EBIT* states for earnings before interest and taxes.

From DuPont decomposition of ROE, formula is clear that the return on equity has a direct impact to the tax burden. We measure it through the ratio *NI/EBT*, therefore, as a share of income after taxation (net income, *NI*) to the income of company before taxation (*EBT*). The higher of the income tax, the lower the net income (*NI*) and the lower the share of net income to income of company before taxation.

Income of the company after taxation is allocated at the decision of the General Assembly into the reserve fund and statutory fund, for the redemption of shares for shareholders, the remuneration of members of statutory bodies, to an increasing of the basic capital or to account of undivided profit (Hudecová, 2013: 100). The channel, that has an effect of income tax on the financial situation and performance of the company is an income after taxation by income tax (net income); it is one of the important own

source of financing when it is not distributed among the partners, because it serves for increasing of the basic capital and equity. The higher income tax and the tax burden, the smaller is the net income which remains in the company for financing of its needs from its own resources and from undivided earnings from former periods. Net income as its own source of financing of the needs of the company has an indirect effect on the increasing of assets, which has in accordance with DuPont decomposition also affect the level of ROE.

Withholding tax levied from interests on their payments to creditors increases the cost of foreign capital and has an impact on another compositional element in calculating of ROE - the interest burden of the company, which is in decomposition of ROE (Altman, 1968) expressed by the ratio of EBT/EBIT.

Another channel by that an income tax impacts to the financial situation in the company to financing from its own resources, which is also retained profit, is the income tax levied at taxation of profit shares that are paid to the partners or shareholders. It is an effect of taxation of dividends. In the case that paid and received dividends are not burdened by the income tax, the company has a higher motivation to the distribution of profit after taxation and less motivation to detention of the profit after taxation as its own source of financing.

Assessment of income tax in terms of its impact on the financial situation of the company may also be expressed as follows:

1. Higher tax due means that it had been assessed from a higher tax base. As the tax base is assessed by modifications of profit, deductible and non-deductible items, it can be concluded that the higher the tax due, the higher profit and therefore also performance of the company was higher. It can be in terms of a company's health assessed positively as a sign that the company does not send signals of probable bankruptcy.
2. The higher the tax due from income, the lower is the income of the company after taxation (net income), which is own source of financing of needs of the company and its assets. From this point of view, the higher tax due generates, the higher risk that the company will not have sufficient own financing sources, solvency, liquidity or financing of equity investments. It means that the company probably will use other means – the outside sources of financing, although during period of crisis they have the reduced availability.

EMPIRICAL METHODOLOGY

Procedure

When assessing the distinctive ability of the ratio indicators that include income tax and during testing of the predictive ability of the bankruptcy model with the independent variables based on income tax we proceeded in two stages. The first stage



of the research that preceded our analysis described in this paper was done by Faltus in his earlier research (2014). He for the failed (defaulted) company indicated such company, which in the relevant year showed lower total assets than total liabilities. Faltus chosen 49 ratio indicators of the financial analysis, as they were indicated for example by Groppelli and Nikbakht (2000: 444-445) and he identified their distinctive ability, default detection and zero prediction horizon. These 49 indicators is a set of indicators, by which in the second stage of matching a resolution of ratio indicators based on income tax - therefore we indicate them hereinafter as the benchmark indicators.

To the results of the first stage (Faltus, 2014) are followed by a second stage of research, the results of which we present in this paper, and we divided the second stage into two phases. In the first phase we verify resolution of the twelve ratio indicators that include income tax. The aims are two: firstly, to test the resolution of these distinctive indicators, and compare it with the resolution of three benchmark indicators with the absolute best resolution, and secondly, to choose three ratio indicators based on income tax that have the best resolution and use them in the second phase as independent variables in the hazard model of prediction of company's default in the Slovak Republic. Twelve ratio indicators based on income tax we construct the following: in the numerator of the indicator is income tax in any of its accounting manifestations:

- 1) Total income tax;
- 2) Tax due from income;
- 3) Deferred income tax; or
- 4) Deferred tax claim and deferred tax obligation.

Into the denominator, we insert one of the three of accounting indicators, namely own capital (equity), revenue from sales or total assets.

Ability of ratio indicators based on income tax to distinguish between firms that failed in the prediction horizon and firms that stay healthy and survived, we measure by the size of the area under curves Receiver Operating Characteristic – we indicate as AUC ROC (12). We proceed by calculating of the AUC ROC for prediction horizons of 1-5 years, 1-5 unfailing years and detection of first year of default (zero prediction horizon). We compare these values with values of the AUC ROC that have reached benchmark indicators in the first stage of research (Faltus, 2014).

The results of the first phase we will use in the second phase of research. Its aim is to estimate the parameters of independent variables of hazard model of prediction company's default and identify its prediction accuracy. In hazard model of prediction company's default as independent variables, we use three ratio indicators based on income tax, which show the best ability of resolution.

Methodology

In the first phase we for determination of the predictive ability of indicators based on income tax used the method Receiver Operating Characteristic curves (ROC). It is a method that is used for evaluation of the resolution of the various tests in the analysis of survival (survival analysis) and to compare them not only in financial science, but also in medicine, astrology and other research areas (Gonen, 2007). Details on the method of ROC curves, are presented for example in Metz (1978), Pepe (2004) and Zhou et al, (2011).

For each of the twelve indicators based on income tax, we constructed an ROC curve. It is a set of points whose coordinates on the x-axis is 1 - specificity and on the axis y is the value of the indicator of sensitivity. ROC curve shows the cumulative number of correctly determined values for the prediction of company's' default and the cumulative number of incorrectly determined values for different values so-called cut-off values (Wilson, 2013). The values can be either 0 or 1 whereas they may be positive or negative. When we have values of the resolution of each of the twelve ratio indicators and their representation through individual ROC curves, we can compare each of their resolution. Comparison we do through comparison method of values that represent the size of area under individual ROC curves, it is comparison of the values of the Area Under Curve (below AUC). The size of the area under the ROC curve we calculate by using the formula for calculating the Gini coefficient. We will use these formulas:

$$AUC = \frac{1}{2}(G + 1) \quad (5)$$

$$G = \frac{B}{A+B} \quad (6)$$

where *AUC* is area under ROC curve; *G* is Gini coefficient. The larger area under the ROC curve, the better specific ratio indicator distinguishes between companies that have failed in the prediction horizon and of the healthy companies. Figure 1 illustratively depicts the ROC curve (panel A) and the area bounded by the curve (panel B).

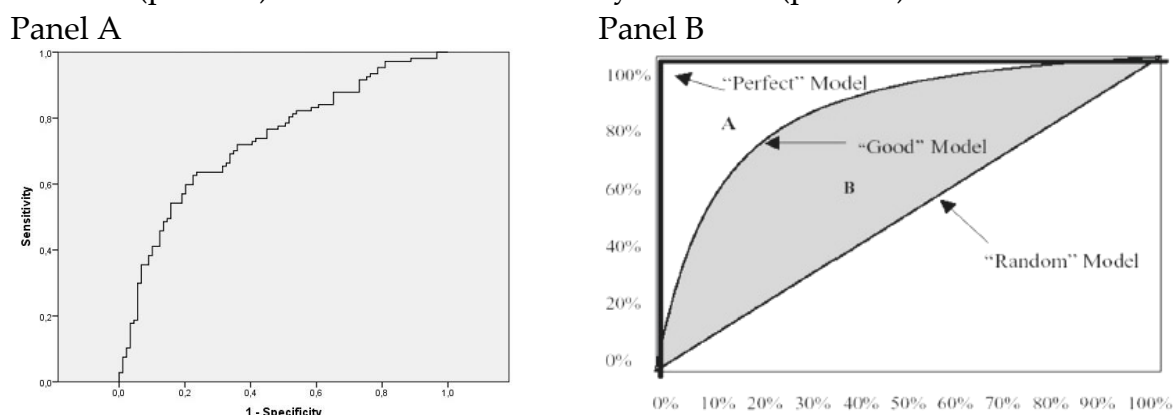


FIGURE 1. RECEIVER OPERATING CURVE (ROC) AND AREA UNDER CURVE (AUC)

Source: Panel A: own processing; Panel B: (Wilson, 2013: 44)



In the *second* phase, we estimated the parameters of the independent variables in the model of prediction of company's default and its predictive ability. Historically the several approaches were developed to modeling of prediction of company's default. The first group consists of models based on discriminant analysis and static logit model. Their representative is the Altman model (Altman, 1968). Using of the logit models for prediction of default are subject of criticism because they have a static character. The advantage of hazard models is that in contrast of the logit models they take into account the time before the company's default. According to the Shumway, hazard models take into account that the risk of bankruptcy of the company is changed over time and its financial health is a function of its most recent financial data and age of the firm. Shumway also states three reasons for favoring of hazard models of prediction of default:

- 1) Static models are failing for make provision of individual periods in which the company faces to the risk of default;
- 2) Hazard models include covariates that varies with time;
- 3) Hazard models have better prediction capability because they use a lot more data (Shumway, 1999: 2).

Therefore the second group of prediction models is represented by the hazard models. Method hazard multi-period logit model we use for estimation of parameters of three independent variables and through likelihood ratios we estimate predictive ability of the whole model. For this model, on the base of the criterion AUC ROC (an average of all the prediction horizons) we selected three variables, X1, X2, X3, which are represented by those indicators based on income tax that we selected in the first phase from the original twelve indicators. Due to variable choice based on maximum AUC ROC, the model is also referred to as the compromise model (Faltus, 2014; Shumway, 1999). Further we tested the accuracy of the model for prediction horizons 0 up to 5.

Data

The estimation of the predictive ability of indicators based on income tax we performed on the example of enterprises in the Slovak Republic for the period 2003-2012. We started from the accounting information contained in the financial statements of enterprises in the Slovak Republic. The data source is a commercial database called Albertina, and the producer is a company Bisnode, edition from August 2013. Our research uses data from the accounts of 82,572 companies. In the relevant years, there are also missing data. Quotient of available accounting statements for each of the years is: in year 2003 is available 0.5 % of financial statements, in year 2004 it is 3.1 %, in year 2005 it is 8.1 %, in year 2006 it is 11.5 %, in year 2007 it is 13.6 %, in year 2008 it is 14.4 %, in year 2009 it is 17.6 %, in year 2010 it is 18.1 %, in year 2011 it is 11.3 % and in year 2012 it is 1.8 %.

EMPIRICAL RESULTS

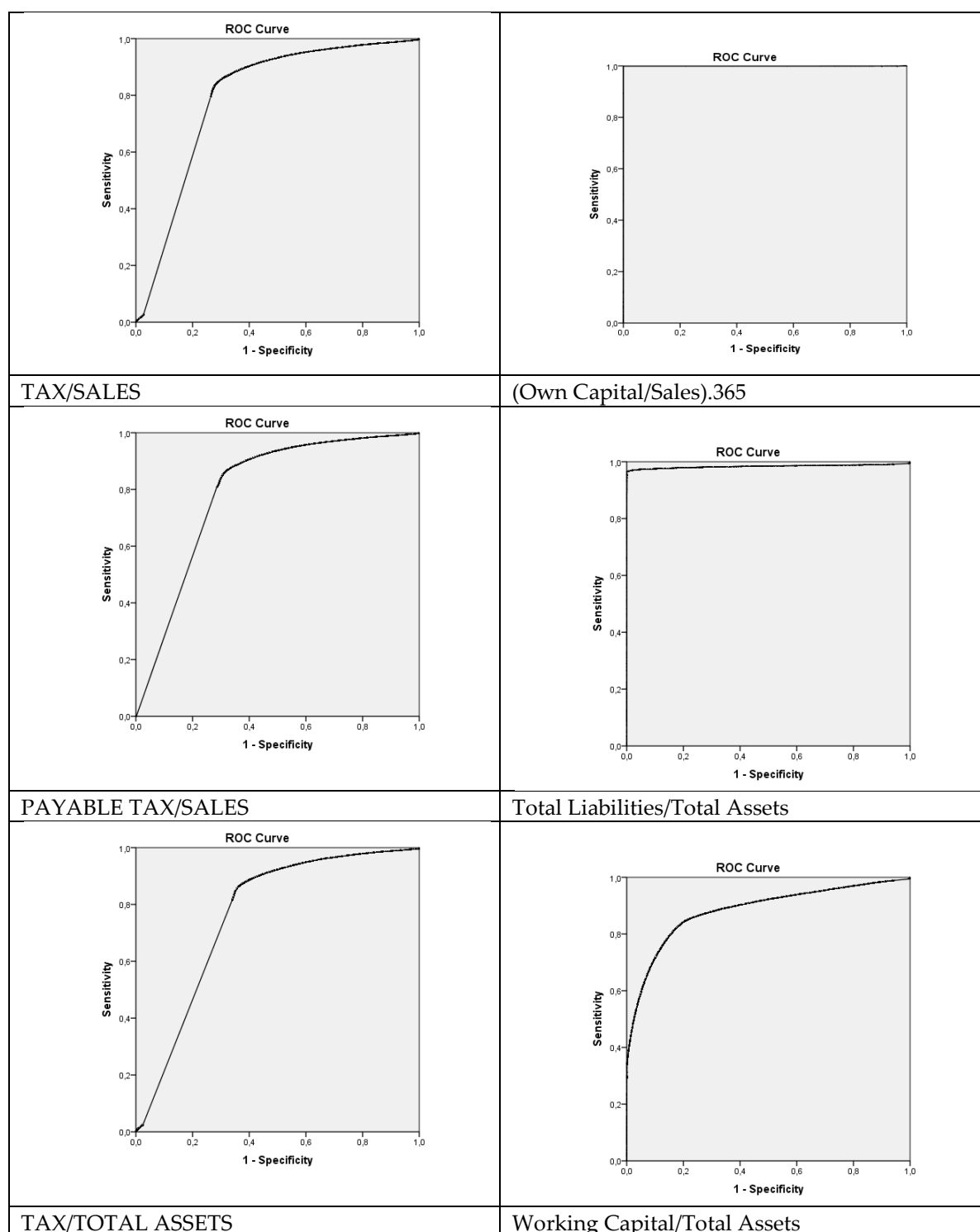


FIGURE 2: RECEIVER OPERATING CURVES (ROC) AND AREAS UNDER CURVES (AUC) FOR BEST INDIVIDUAL INDICATORS;

Figure 2 and Table 1 presents the results of the first phase of our research. Specifically, Figure 2 shows in the three panels under themselves ROC curves of the three indicators based on income tax with the best resolution in average of all the prediction horizons for default detection (zero prediction horizon). In the three panels on the right are showed ROC curves of the three indicators for comparison with the best



resolution of all for default detection (zero prediction horizon), so as they were found in previous research by Faltus (2014). The best indicator is own capital/sales.

In the Table 1 in columns 1 up to 3 are values of AUC ROC for the three indicators based on income tax. We show the values for the three of the twelve ratio indicators based on income tax that achieve the highest value of AUC ROC in average from all prediction horizons. In columns 4 up to 6 there are values of AUC ROC for the three benchmark indicators with the highest AUC ROC in default detection. The variations in values of the AUC ROC for prediction horizons of 0 up to 5 years on the one hand, and the detection of the first year of default (zero prediction horizon) and for the prediction horizons 1 to 5 unfailing years on the other hand, are negligible (most 0.2). Therefore, in Table 1 the values of the AUC ROC are referred for the first option only. For the values of AUC ROC in each year of prediction horizon is also showed the number of observations from which we have done the calculation, whereas the number is specified as the ratio of positive /negative.

TABLE 1. AUC ROC VALUES FOR SELECTED INDICATORS OF COMPANY'S DEFAULT PREDICTION

PH (yrs.)	1 tax/ sales (S) N, positive/neg.	2 payable tax/ sales (S) N, positive/neg.	3 tax/ total assets (S) N, positive/neg.	4 (own capital/ sales). 365 (S) N, positive/neg.	5 total liabilities/ tot. assets (L) N, positive/neg.	6 working capital/ total assets (S) N, positive/neg.
0	0.793 46918/226110	0.794 46918/226110	0.76 54884/254731	0.999 46918/226110	0.983 55008/253838	0.884 54880/254684
1	0.767 34829/167491	0.765 34829/167491	0.741 41067/186660	0.901 34829/167491	0.897 41020/186028	0.813 41062/186630
2	0.744 23065/117513	0.739 23065/117513	0.725 27150/129415	0.843 23065/117513	0.839 27042/128938	0.763 27149/129396
3	0.725 14982/80498	0.718 14982/80498	0.711 17642/88058	0.805 14982/80498	0.8 17557/87666	0.727 17641/88048
4	0.71 9002/51830	0.701 9002/51830	0.698 10563/56315	0.779 9002/51830	0.776 10510/56036	0.704 10563/56307
5	0.695 4886/30725	0.685 4886/30725	0.683 5687/33243	0.764 4886/30725	0.759 5651/33064	0.685 5687/33236

Notes: N – number of observations; PH – prediction horizon; L – larger values of the test result variable indicate stronger evidence for a positive actual state; S – smaller values of the test result variable indicate stronger evidence for a positive actual state. The positive actual state is 1 (default).

Source: authors' calculations

Indicators, which included deferred tax or deferred tax claim and deferred tax obligation don't reached value of AUC ROC greater than 0.55. In contradistinction to all other tested indicators, each of them presented with increasing predictive period more or less pronounced trend of the improved resolution ability.

In the second phase, we estimated the bankruptcy model by hazard method multi-period logit model with using three indicators based on income tax that we identified in the first phase. Whereas that between the indicators tax/sales and payable tax/sales is the high measure of collinearity, the variable payable tax/sales for purpose of estimation of the model we replaced by the indicator with the fourth best-resolution ability, specifically by indicator of payable tax/own capital. The number of observations included into the regression is 270,815, including 46,757 defaults. The estimated model including the coefficients that we estimated by logistic regression has this form and parameter values:

$$y = \frac{1}{1 + e^{-(0.812 - 0.004 \cdot X_1 + 3.689 \cdot X_2 - 86.45 \cdot X_3)}} \quad (7)$$

where: $X_1 = \text{tax/sales}$; $X_2 = \text{tax/total assets}$; $X_3 = \text{payable tax/own capital}$. The positive sign of the coefficient indicates the relationship, which shows that the higher the value of the variable, the higher probability of default, and vice versa. The model's accuracy is measured by the likelihood ratio (LR). LR value for the estimated model is 65 572.888. Resolution ability of the model for prediction horizons of 0 up to 5 years is shown in Table 3.

TABLE 2. VARIANCE INFLATION FACTORS

Indicator	Variance Inflation Factor (VIF)
tax/sales	1.000
tax/total assets	1.008
payable tax/own capital	1.008

TABLE 3. AUC ROC OF THE MODEL FOR PREDICTION HORIZONS

Prediction horizon (years)	AUC ROC	Number of observations (positive/negative)
0	0.871	46757/224058
1	0.791	34552/166019
2	0.745	22813/116419
3	0.713	14804/79687
4	0.689	8880/51259
5	0.672	4812/30372

CONCLUSION

Prediction of company's default through scientific methods has gained a well-deserved interest of external clients in undertaking, financial managers, bankers and public administration institutions in the time of financial crisis, but also in subsequent periods. The subject of our research was testing of the resolution ability of the financial indicators with incorporated elements of income tax and testing of the predictive ability of the prediction model of bankruptcy on data of Slovak companies for the time period 2003-2012. In our research, we proceeded in two phases.



In the first phase we through ROC curves and the areas under these curves tested the resolution ability of the ratio indicators based on accounting data, namely on the income tax and its accounting variants. In the empirical literature, results are about the resolution ability of the accounting variables there lacking empirical analysis of the resolution ability of the accounting variables containing income tax. Therefore, we decided in this research at least partially fill this gap by an empirical research of data about default (failed) and healthy companies in the Slovak Republic. We had constructed twelve ratio indicators that have in the numerator the total income tax, the payable tax, deferred tax or deferred tax claim and deferred tax obligation, and in the denominator they have either sales, total assets or own capital. We found that the ratio indicators including deferred tax and deferred tax claim and deferred tax obligation in combination with sales, total assets or own capital have very little ability to distinguish between default and unfailing companies. While comparing of the ability of the indicators containing the income tax to distinguish between default (failed) and healthy companies, we found that the best ratio indicators that containing in the numerator the income tax are placed between all 49 benchmark indicators on the eighteenth, nineteenth and twenty-second place (default detection, zero prediction horizon). On this basis, we concluded that the ratio indicators that containing accounting data about the income tax are not suitable indicators for prediction of company's default in the Slovak Republic.

In the second stage, we estimated the hazard multi-period logit model for prediction of Slovak company's default. In our model, we had chosen three financial variables as independent variables that showed the best resolution ability in the first phase of the research. We had selected the three best indicators based on income tax detected by the AUC ROC method in average from the all prediction periods, but from the econometric reasons, we had exchanged variable payable tax/sales for variable payable tax/own capital. The resolution ability of the hazard multi-period logit model with the three independent variables we were measured by means of AUC ROC, while this statistics reached in the prediction horizon of the year zero the value 0.871 only. For comparison with the results of our previous research, the model constructed by the same method from overall the three best benchmark indicators, it has the value of this statistics 0.996, while the fact of collinearity problem we solved so that the third best overall benchmark indicator we replaced by the fourth in the order (Faltus, 2014).

The accuracy of prediction of company's default through hazard multi-period logit model, we measured through statistics likelihood ratio. We found that in the accuracy of the prediction, the model of prediction of default reaches better results with the accounting variables that contain in the numerator the data about the income tax. This model has likelihood ratio 65,572. Conversely, model of company's default, which estimates the probability of default of companies with three independent variables

that have the best overall resolution ability, has accuracy of prediction measured through likelihood ratio equal to only 15,434 (Faltus, 2014). From a comparison of both models we can deduce conclusion that the resolution ability and accuracy of prediction of hazard multi-period logit model may not be proportionally dependent. Therefore, it is not possible to say that which model is better. It depends on what criterion is evaluated. The possibility of using tax indicators is thus a matter of the required characteristics of the model.

As a whole we can evaluate that our empirical research has confirmed the results of previous empirical research according to which the estimates through hazard models with accounting variables, for example, that have been made with Altman (1968) and Zmijewski (1984) variables, reveal that half of these variables has no statistical correlation with the probability of company's bankruptcy (Shumway: 23).

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