A Proposal for a Bankruptcy Risk Detection Model – Adaptation of the Taffler Model

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Abstract

The purpose of this work is to adapt an established model on bankruptcy risk into 2021 requirements.

This paper presents a comparative analysis between Taffler model and a proposed model for bankruptcy detection and thus prevention.

The adapted model proposed by this paper is able to detect more insolvencies, this fact being tested by the predictability analysis.

This model claims to be a step forward in detection and prevention of insolvencies based on risk detection models.

Key words: Taffler insolvency model, insolvency, net assets, risk model.
J.E.L. classification: G40

1. Introduction

Bankruptcy risk models summarize in economic terms the essential categories of relevant indicators regarding the continuity of a business, the recoverability of the amounts invested by creditors and the development of the operating activity in optimal conditions. The general consideration from which to develop a bankruptcy risk model is given by the representativeness of economic indicators depending on the field of activity of the analyzed entity. In order to establish a bankruptcy risk model adapted to the current needs of the economic sector, we propose that in the early phase of this subchapter we make a brief presentation of the bankruptcy risk models enshrined in the literature on which we focused our research. ours, namely Altman, the Conan-Holder model, the Taffler model and the Robertson model, the establishment of a bankruptcy risk model being done by updating these last two models.

2. Theoretical background

The best known bankruptcy risk model belongs to the researcher Altman (1968) who synthesizes a credit-scoring bankruptcy risk model. Based on this model, Professor Altman was able to detect the risk of bankruptcy in the case of 75% of the entities that declared bankruptcy, having the capacity to determine the imminent bankruptcy two years before its occurrence. Being replicated and rethought by researchers J. Conan and M. Holder in 1978 and by many researchers to this day, the model has been successful in determining the bankruptcy of an entity. In developing a bankruptcy risk model in Romania, however, we must take into account the structure and field of activity of the entities that make up our sample. Thus, taking into account the majority share of entities operating in the field of industry on the Bucharest Stock Exchange, it is easy to understand the increased interest that investors may have in this field. We will also turn our attention to this field (industry sector), aiming to determine a bankruptcy risk model starting from an already established model that has proven its applicability in the field of industry, at the time of elaboration. The study is made by rethinking Taffler model.

In our study we used entities listed on B.V.B. from spot market which had an audit opinion other than „opinion without concerns", our study is currently focusing on 21 entities.

3. Research methodology

The Taffler model is a bankruptcy risk model determined by British researcher R.J. Taffler and V. Agarwall in 1983. The model is represented by a complex linear function to which a series of weighting coefficients are applied. The addressability of the study is the domain of the UK industry, in a market that did not know considerable export values and was facing resounding bankruptcies at that time. The Taffler model is based on the Z score technique for developing performance score analysis. With the help of this type of analysis, the performances of an enterprise are evaluated by reporting it to the other companies in the same sector of activity, generalizing the results on the entire branch of the economy. Score performance analysis groups all Z-score results in percentage terms and thus measures a relative performance on a scale from 0 to 100 units. The Taffler model is based on the following formula:

$$\mathbf{Z = c0 + c1X1 + c2X2 + c3X3 + c4X4}$$

Where:

X_1 – it is the rate of return on current assets and is calculated as the ratio of gross income to current assets. The percentage of representativeness in the model is considered by the researcher at 53%;

X_2 – is the ratio of current assets to current liabilities, translated as the general liquidity ratio. The percentage of representativeness in the model is in this case 13%;

X_3 – is the ratio between current debt and total assets and represents the current financial dependency rate, with a model representativeness of 18%;

X_4 - represents the calculated time interval in which the company can finance its operating activity based on its own assets without collecting the invoices issued. The calculation method of this index is given by the interval without credit = (fast assets - current liabilities) / daily operating expenses with the denominator represented by sales - depreciation / 365. The percentage of representativeness is in this case set at 16%.

And,

c0, c1, c2, c3, c4 represent weighting coefficients of the indicators that are calculated by a regression analysis procedure to determine the percentage of significance of that type of model in the indicator. The values of these indicators represent practically the contribution of the indicators to the representativeness of the model, taking into account the general structure of the resources available to an entity in the field of industry. Determining the ideal structure of a balance sheet, Taffler established these coefficients of representativeness that correct the weight of the X indicators in the model. The turning point between an entity that is at risk of bankruptcy and one that can continue to operate in future financial years is 2. Thus, entities with a score above 2 have a favorable financial situation, while companies with a score lower than 2 will record a financial failure in the near future.

Summarized, the model is presented in the following form:

$$\mathbf{Z\_scor\_Taffler = 3.20 + 12.18*X1 + 2.50*X2 - 10.68*X3 + 0.029*X4}$$

The applicability of the Taffler model materialized according to Table no. 1:

Table no. 1. Applicability of Taffler model on the sample – 21 entities - 2020

Sector	Taffler
Industry	1,41
Industry	2,07
Industry	2,74
Industry	3,60
Industry	3,76
Industry	3,88
Industry	4,24
Industry	4,30
Industry	4,40
Industry	4,65
Industry	4,74
Industry	4,75
Industry	4,94
Industry	5,17
Industry	5,18
Industry	5,35
Industry	5,76
Industry	5,88
Industry	6,18
Industry	6,36
Industry	6,63

Source: own processing

Under this model, a single entity presents an imminent risk of bankruptcy in the following financial years. Applying the inflection criterion of this model (2), an entity that enjoys an unqualified opinion in 2020 but has an associated risk of fraud will go bankrupt in the coming years, thus exiting the Stock Exchange.

Since the main purpose of Z-score models, implicitly or explicitly, is to predict future events, the only valid test of their performance is to measure their ability to predict ex ante. This verification is not always possible, and when it is, ex ante risk models may be erroneous. This may be due to a significant number of companies failing financially and for which a forecast of financial performance is not possible, the name of this type of impossibility to determine the risk of bankruptcy in the literature being grade I errors.

However, more often than not, the percentage of firms classified as likely to cause potential failures and which do not fail (classified as type II errors) from a financial point of view question the operation and usefulness of the model in question. In addition, statistical evidence is needed for such models to work better than simple alternative strategies (eg previous year's losses). Testing only the models based on how well the bankrupt companies are classified is not the same as the true ex ante prediction tests, limitations of the study always existing in these types of analysis. Financial risk models, although statistically transpose the main problems that may arise in an entity based on financial indicators, are limited to ideal situations and may not include in their analysis the change of economic, political, social factors , demographic or cultural.

The limitations in this area are obvious and testing the functionality of the model can be done only by applying (in the future of the company) the same ideal situations. For example, if during three financial years, the entity projected to go bankrupt does not enter, but enters others on which there were no indications of insolvency, it does not necessarily mean that the applicability of the model is low, but all endogenous or exogenous factors of the companies must be analyzed. concerned.

No one could prevent the Covid-19 pandemic and no one was prepared for such a major economic downturn in such a short time. If the application of this model had taken place in 2017, certainly its relevance in 2020 would not have been the same. Therefore, a viable but not perfect bankruptcy risk model can be established.

4. A proposal for a bankruptcy risk detection model - adaptation of the Taffler model

The Taffler model deals with assets and liabilities for a maximum period of one year, and the explanation is simple. The legislation dealing with insolvency and bankruptcy has undergone many changes over the period, with countless updates, retransactions and reinterpretations in European bankruptcy law. Since 2000, the European Commission has been discussing the approach of insolvency and bankruptcy law taking into account the criterion of granting a second chance to the debtor in default and thus prioritizing this principle over the principle of debt recovery by creditors. In the legislative past, the notion of insolvency did not exist at such an elaborate level as that dealt with by current legislation, so trading partners with outstanding debts to a company were favored in obtaining the amounts of money owed as soon as possible, and the declaration of insolvency by a debtor. it translated into a much faster liquidation procedure, so that the interest was no longer to save a debtor who was unable to pay, but to liquidate him as soon as possible. The creditors in this case were more interested in current assets (which could quickly turn into liquidity), in the short-term repayment of short-term debts (for the most accurate calculation of the company's assets), long-term loans being very difficult to grant in period of the 1980s, and often their impact on the balance sheet either did not exist or was negligible.

By understanding this principle, we can also understand how to develop the Taffler model. However, the legislation on insolvency and bankruptcy has changed from one extreme to another. At present, the share of long-term loans far exceeds that of consumer loans, and the latter are becoming negligible compared to the situation a few decades ago. The adaptation of the Taffler model took into account the application of a reasoning that deals mainly with debt and asset weights in 2020. The analysis of the main groups of indicators showed a majority share, on the one hand, of fixed assets to the detriment of current assets (63% compared to current assets). 37%) and a majority share of long-term loans to the detriment of short-term loans (with a share of between 80% and 90% of these types of loans).

Thus, it is necessary for our analysis to focus on treating balance sheet groups with higher shares in the annual financial statements, in order to estimate as accurately as possible the risk of bankruptcy. The weighting coefficients calculated by Taffler are indicators of the relevance of the balance sheet groups. Basically, economic theory sets certain limits on the share of current assets, the share of debt in capital, resources, equity and balance sheet debt. Determining, based on economic theory, an ideal balance sheet model for an industry entity, Taffler calculated these indicators, also called weighting coefficients. The Taffler model is based on the two-by-two classification of the risk of bankruptcy. This classification criterion takes into account an analysis on 3 consecutive financial years in which the evolutions of the indicators that are part of this Z-score function were observed. Based on developments in current assets, current debt, debt repayment and debt recovery, the model included a grading in two risk units of companies, so that those below the threshold of 2 presenting a risk of imminent bankruptcy, and those over 2, no.

The model we propose focuses on dealing in particular with long-term debt, total assets and fixed assets. Thus, respecting the same procedure for classifying the risk of bankruptcy, we concluded that the index of 2 is no longer representative in determining the risk of bankruptcy, the share of long-term debts and fixed assets being much higher in the case of the 21 entities observed than at the time of the study. Taking into account these observations, we came to the conclusion that the rating of 4 in 4 risk units becomes much more representative in establishing the insolvency criteria, our model being based on the application of this type of rating. The determination of this value took into account the value of total assets, total liabilities, fixed assets and long-term debt, the evolution of these balance sheet groups, the evolution of the number of insolvent companies in the market, the reasons for declaring insolvency by debtors already analyzed, the number of insolvencies. impact (detailed in Chapter I), the evolution of the number of companies registered at the National Office for Trade Register, the audit reports, as well as the application of a predictability test, to which we will return.

Although the model was developed 37 years ago, economic theory in terms of economic and financial analysis has not undergone substantial changes in terms of setting significance thresholds and relevance thresholds. Thus, our calculations for determining new weighting coefficients did not show significant differences, these being of the order of tens of hundredths. As a result, the model

we propose is based on the application of the same weighting coefficients, the difference appearing on the variables, as follows:

$$\mathbf{Z = c0 + c1X1 + c2X2 + c3X3 + c4X4}$$

Where:

X_1 – it is the rate of return on total assets and is calculated as the ratio of gross income to total assets. The percentage of representativeness in the model is considered 53%;

X_2 – is the ratio of fixed assets to long-term debt. The percentage of representativeness in the model is in this case 13%;

X_3 – is the ratio between total debt and total assets, with a model representation of 18%;

X_4 – represents the calculated time interval in which the company can finance its operating activity based on its own assets without collecting the invoices issued. The calculation method of this index is given by the interval without credit = (fast assets - current liabilities) / daily operating expenses with the denominator represented by sales - PBT - depreciation / 365. The percentage of representativeness is in this case set at 16%.

The research results led to the following conclusions, according to Table no. 2:

Table no. 2. The applicability of the proposed model on the sample – 21 entities- 2020

Sector	Taffler	Proposed model
Industry	2,07	3,46
Industry	1,41	3,58
Industry	2,74	3,72
Industry	3,60	4,23
Industry	4,24	4,41
Industry	4,30	4,45
Industry	3,88	4,48
Industry	4,40	4,51
Industry	5,17	4,66
Industry	4,94	4,66
Industry	4,74	4,70
Industry	4,65	4,71
Industry	5,35	4,77
Industry	3,76	4,88
Industry	5,18	4,89
Industry	5,76	4,93
Industry	5,88	5,13
Industry	6,18	5,15
Industry	6,36	5,61
Industry	4,75	10,73
Industry	6,63	10,81

Source: own processing

Applying the proposed model to the same sampled category shows, following the 4-by-4 grading detailed above, that the relevance of the model is higher if long-term liabilities to short-term liabilities and total assets to short-term assets are taken into account. The proposed model shows an imminent bankruptcy in the case of 3 companies in the field of industry, compared to only one in the case of the Taffler model. However, the comparability of these two models shows the obvious limitations of such a prediction of a financial nature due to the impossibility of determining in an acceptable manner the evolution of the consumer market and society over a given period of time.

5. Findings

In order to develop a bankruptcy risk model updated to current consumer market requirements based on an existing and viable model at the time of its development, it is necessary to analyze the predictability of the model. To perform the predictability test, we built a sample of 20 economic entities that declared insolvency in 2020. The test was performed using the financial information of the entities in 2018, with two financial years preceding the state of insolvency, according to Taffler analysis. The sample of 20 economic entities was formed taking into account the preliminary analysis of entities with an associated risk of fraud in the industry, considering that 20 insolvent economic entities may be able to ensure the representativeness of the model, taking into account the number of previously analyzed entities (21 entities).

Thus, the predictability analysis of the proposed model built on the Taffler model is presented in Table number 3.

Table no. 3. Predictability analysis on Taffler model vs proposed model

	Taffler	Proposed
Entity	*3.2+12.18*(EBITDA/current assets)+2.5*current assets/current debts+10.68*current debts/total assets+0,029*no days*	*3.2+12.18*(EBIDTA/total assets)+2.5*current assets/current debts+10.68*total debts/total assets+0,029*no days*
x1	2.65	3.60
x2	1.63	2.87
x3	5.32	8.22
x4	5.10	3.84
x5	3.68	5.47
x6	4.57	2.36
x7	5.32	7.47
x8	1.59	8.34
x9	2.69	12.73
x10	1.21	2.83
x11	6.73	15.72
x12	2.61	4.60
x13	6.20	7.40
x14	1.26	2.99
x15	3.27	3.97
x16	6.37	5.20
x17	4.56	6.36
x18	8.25	5.42
x19	7.36	6.15
x20	4.82	6.66

Source: own processing

The application of the two bankruptcy risk models shows a higher applicability of the proposed model, by adjusting the risk model to the current structure of the balance sheet of companies in the field of industry, from 4 companies with Taffler model to 7 companies in the proposed model.

6. Conclusions

The update of the Taffler bankruptcy risk model proves to have a greater resonance in the detection of companies that are going to declare insolvency, to the detriment of the original model. In the case of applying the Taffler model, from the sample formed, 4 companies were identified on

which insolvency was expected during two consecutive financial years. On the other hand, the proposed model for detecting the risk of bankruptcy found the insolvency of 7 companies in the field of industry. Although bankruptcy risk models may not have a very high degree of accuracy, they can be a relevant tool for detecting this risk. The limitation in the application of these types of models results primarily from their predictive, estimative construction, which cannot take into account the unpredictable events of markets and consumption habits.

7. References

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