



THE BEX MODEL IN ESTIMATING THE CREDITWORTHINESS OF SMALL AND MEDIUM ENTERPRISES IN BIH

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Abstract

Loans constitute the largest portion of total banking assets in banks operating in Bosnia and Herzegovina, highlighting the critical importance of effectively managing credit risk for the successful operation of banks. The current level of non-performing loans extended to legal entities underscores the need for enhancing decision-making processes in credit operations within Bosnian and Herzegovinian banks. In this regard, we conducted a study to assess the feasibility of applying the BEX model to determine the creditworthiness of small and medium-sized enterprises (SMEs) in Bosnia and Herzegovina. The initial hypothesis of our research was that the BEX model would demonstrate sufficient accuracy in evaluating the creditworthiness of SMEs in Bosnia and Herzegovina. This hypothesis was based on the fact that the BEX model was developed using a sample of Croatian enterprises operating in transitional economic conditions, similar to the circumstances of Bosnian and Herzegovinian enterprises. The BEX model was employed to evaluate the financial stability of two groups of enterprises: 50 enterprises with regular repayment of credit obligations and 50 enterprises with delays in repayment exceeding 90 days. The success of the model's application was assessed based on correctly categorized enterprises (percentage of accurate categorization for regular enterprises, for irregular enterprises, and the overall average). Based on the results obtained, it was concluded that the BEX model lacks adequate precision in determining the creditworthiness of small and medium-sized enterprises in Bosnia and Herzegovina, leading to recommendations for further research.

Keywords: Banks, credit risk management, creditworthiness, bankruptcy prediction models, BEX model

INTRODUCTION

The banking sector in Bosnia and Herzegovina operates within a highly competitive environment, with a significant number of banks striving to increase their market share on a relatively small market to enhance their business performance and profitability. This underscores the critical need for making sound decisions when approving credit placements for both individuals and legal entities. The complexity of operations in the banking sector, fueled by the wide array of banking products, as well as the imperative for expedited decision-making in credit operations, highlights the necessity for quality data and indicators upon which decision-makers will base their approval or rejection of potential credit placements. Specifically, within Bosnian and Herzegovinian banks, the credit portfolio constitutes the most significant item of total assets, with 43.1% of loans extended to private enterprises in banks operating in the Federation of Bosnia and Herzegovina (Agency for Banking of the Federation of Bosnia and Herzegovina, 2023, p. 35), while this percentage in banks operating in the Republic of Srpska stands at 34.4% (Agency for Banking of the Republic of Srpska, 2023, p. 7). Additionally, it is noteworthy that only 85.52% of total loans granted to private enterprises in banks operating in the Federation of Bosnia and Herzegovina (Agency for Banking of the Federation of Bosnia and Herzegovina, 2023, p. 36), and 84.08% of loans in banks in the Republic of Srpska as of September 30, 2014 (Agency for Banking of the Republic of Srpska, 2023, p. 37) are classified as stage 1 credit risk.

As banks in the BiH market derive the majority of their profits from loans extended to the economy and the population, a crucial question arises: how to achieve growth in loan portfolios while simultaneously minimizing credit risk. Furthermore, the aforementioned data undeniably underscores the need to improve decision-making processes in credit operations with private enterprises. In this regard, our objective is to examine the potential use of the BEX model, developed in Croatia, for assessing the creditworthiness of small and medium-sized enterprises in Bosnia and Herzegovina.

SHORT OVERVIEW OF MORE SIGNIFICANT STUDIES

Successful management of credit risk has been a topic of discussion among numerous eminent authors in contemporary banking literature, resulting in the development of a multitude of models for predicting the insolvency and/or bankruptcy of enterprises. In the following sections, we will present the most significant models for predicting corporate bankruptcy.

Beaver's model (1967) is a simple univariate statistical model. This model represents the first modern statistical model for predicting financial distress, marking the initiation of the use and application of statistical methodology in credit risk issues. Beaver's model is based on

financial ratios calculated from data extracted from financial statements. Beaver utilized a sample consisting of 158 enterprises (79 financially stable and 79 financially unstable) and analyzed 14 financial indicators (Altman & Sabato, 2005, p. 5). It was found that the following three ratios best predict the financial distress of enterprises: cash flow/total assets, net income/total debt, and cash flow/total debt.

Altman's model (1968), also known as the Z-score model, is one of the most well-known quantitative models for assessing the financial position of enterprises. The original model was developed in 1968 based on an initial sample of 66 enterprises. The enterprises were divided into two equal groups of 33 enterprises each. The first group comprised enterprises that had gone bankrupt, while the second group consisted of enterprises that had performed well. Following the sample selection, balance sheets and income statements were collected for the selected enterprises. As previous research had identified a large number of variables as significant indicators of business problems, a list of 22 potentially useful variables was prepared for evaluation. From this list, five financial ratios were selected as crucial predictors of corporate bankruptcy: net working capital/total assets, retained earnings/total assets, earnings before interest and taxes/total assets, market value of equity/book value of total liabilities, and sales/total assets (adapted from Altman, 2000, pp. 7-12).

Edmister (1972) utilized a sample of small and medium-sized enterprises, along with their financial statements from 1954 to 1969, in his research. He analyzed 19 financial indicators and developed a model for predicting the financial instability of small enterprises using multivariate discriminant analysis (adapted from Altman & Sabato, 2005, p. 2). In comparison to previous studies, Edmister introduced the following innovations into the research: the use of a three-year average of indicators, the use of a three-year trend of indicator movements, and the comparison of a business entity's indicators with the industry average indicators (Zenzerović & Peruško, 2006, p.15).

Altman, Haldeman, and Narayanan (1977) created the ZETA model, which is considered successful in predicting the likelihood of enterprise bankruptcy over a period of up to 5 years. The model achieved an accuracy rate of 96.2% in classifying enterprises one year before bankruptcy and 70% five years before bankruptcy. The research sample consisted of 53 failed enterprises that went bankrupt and 58 successful enterprises. During the study, 27 financial indicators were analyzed, but the model included the following seven: return on assets – EBIT/total assets, earning stability, EBIT/total interest expense, cumulative profitability – retained earnings/total assets, liquidity – total current assets/total current liabilities, capitalization – equity/total capital, and enterprise size – measured by total assets (adapted from Altman, 2000, pp. 31-43).

Ohlson (1980) used logistic regression to develop a model for predicting enterprise bankruptcy. Ohlson selected nine independent variables, which he believed would be useful for predicting bankruptcy, and tested them on a sample of industrial enterprises from 1970 to 1976. The sample consisted of 105 bankrupt enterprises and 2,058 successful enterprises. The research resulted in the formulation of three bankruptcy prediction models. Model 1 predicts bankruptcy within the first year, Model 2 within the second year, provided bankruptcy has not been initiated in the first year, while Model 3 is designed to predict bankruptcy within a two-year period. The accuracy of these models may be considered satisfactory. Specifically, Model 1 accurately predicts bankruptcy in 96.12% of cases, Model 2 in 95.55%, while the accuracy of Model 3 is 92.84%. Ohlson considers the main determinants for bankruptcy predictions to be: size, financial structure measured by leverage indicator, performance indicators including the ratio of net income to total assets and/or the ratio of cash flow from operating activities to total liabilities, and finally liquidity indicators (working capital ratio to total assets or the same ratio combined with the ratio of current liabilities to current assets) (adapted from Zenzerović & Peruško, 2006, pp. 144-146).

It is important to note that studies focusing on predicting enterprise insolvency predominantly feature research from the United States, which utilized American enterprises as samples. To be applicable in other parts of the world, these models need to be tested and, where possible, adapted to the reality of each country or bank (Minussi, Soopramanien & Worthington, 2006, p. 78). Additionally, it is evident that these models were developed during the 1970s and 1980s. Given the significant changes in business practices and the market since then, as well as the emergence of new industry sectors, it is logical to assume a likelihood of the need for model modification to successfully apply them in today's business conditions. Therefore, in order to enhance credit risk management regarding legal entities in Bosnian and Herzegovinian banks, it would be desirable to explore the possibility of using some of the existing models to assess the creditworthiness of enterprises in BiH.

One of the most well-known and commonly used models for credit risk based on accounting data is Altman's Z-score model. Research has already been conducted in Croatia, Serbia, and BiH to assess the potential use of Altman's model for evaluating the creditworthiness of domestic enterprises.

Research conducted in Croatia has shown that the implementation of Altman's Z-score model in the Croatian economic environment is not adequate, and the accuracy of predicting enterprise bankruptcies is significantly lower compared to the United States (Škeljo, 2000, cited in Zenzerović & Peruško, 2009, p. 350).

A study conducted in Serbia tested the application of the original Altman Z-score model, the Z'-score model developed for non-listed enterprises, and the Z''-score model developed for emerging markets, on enterprises representing the Serbian capital market. These models were tested from 2006 to 2009 on a sample of 44 enterprises, comprising enterprises included in the Belex15 basket as of September 2010 and Belexline, and excluding enterprises from the financial sector. The results of testing the accuracy of Altman's models concluded that these models, designed for developed capital markets, cannot be successfully applied to predict enterprise bankruptcies in transition countries (adapted from Muminović, Pavlović & Cvijanović, 2011, pp. 9-10).

Similar studies have been conducted in BiH. Specifically, the feasibility of using Altman's original Z-score and revised Z'-score to analyze the operations of enterprises in FBiH was tested using a sample of 40 enterprise clients of a commercial bank in FBiH. The enterprises were divided into two groups: those regularly repaying credit obligations and those with delays exceeding 90 days. The selected enterprises had sales revenue of less than 3 million BAM and employed, on average, fewer than 20 people, indicating they were small and medium-sized enterprises (SMEs). The research found that neither the Z-model nor the revised Z'-model achieved an adequate level of accuracy in assessing the creditworthiness of enterprises operating in FBiH. Specifically, the Z-model yielded a type I error of 25% and a type II error of 65%, while the revised Z'-model resulted in a type I error of 70% and a type II error of 0%. The accuracy rates of the models were 55% for the Z-model and 65% for the Z'-model (Salkić, 2011, pp. 333-335).

In addition to the aforementioned study, the possibility of determining the creditworthiness of SMEs in BiH using Kralicek's DF indicator was tested with a sample of 40 enterprises. These enterprises were also divided into two groups: a group of "healthy" enterprises with clients regularly repaying credit obligations or with delays of up to 30 days, and a group of "unhealthy" enterprises with clients delaying payments to the bank for more than 90 days. The selected enterprises had sales revenue of less than 5 million BAM and employed, on average, fewer than 30 people, indicating they were SMEs. The study found that the DF indicator did not achieve an adequate level of accuracy in assessing the creditworthiness of Bosnian and Herzegovinian enterprises. Specifically, with a cutoff value of $DF \leq 0.3$, the type I error rate was 95%, meaning that out of 20 "poor" enterprises, only one was correctly identified as potentially problematic (Salkić, 2013, pp. 62-67).

Salkić also investigated the possibility of determining the creditworthiness of SMEs in BiH using Kralicek's Quick Test based on an analysis of a sample of five credit-indebted enterprises with one commercial bank in BiH, which were delinquent in repaying their credit

obligations to the bank for more than 90 days, in accordance with the Basel definition of default. The results showed that Kralicek's Quick Test, with a cutoff of 3 (average) for good enterprises, correctly classified 4 out of 5 enterprises, achieving an accuracy rate of 80% (Salkić, 2013, pp. 26-30).

It is evident that most of the conducted studies have concluded that credit models, developed using samples of enterprises operating in the United States and the European Union, do not have adequate accuracy for assessing the creditworthiness of enterprises in transition countries. In this study, our aim is to test the possibility of applying the BEX model without aspiring to compare it with other presented credit models. Since the BEX model was developed in Croatia in 2008, the hypothesis is that this model will have satisfactory accuracy in assessing the creditworthiness of SMEs in BiH, considering the contextual similarities in BiH and Croatia, and the conditions under which enterprises operated in both countries in 2008. In the following sections, we will present the basic aspects of the BEX model.

THEORETICAL FRAMEWORK OF BEX (BUSINESS EXCELLENCE) MODEL

The BEX (Business Excellence) model was constructed by Belak and Aljinović-Berać in 2008 through the application of statistical and mathematical research methods on data extracted from the financial statements of 201 enterprises listed on the Zagreb and Varaždin stock exchanges during the period from 2003 to 2007. A total of 1005 financial statements were analyzed in this process. The statistically proven predictive value of BEX exceeds 90%. Unlike models reliant on capital market indicators, BEX is independent of such metrics, allowing its calculation for all enterprises. Constructed on standardized balanced financial statements, the BEX model may exhibit significant deviations from results in cases of small enterprises with unstable and non-standardized reports and those financed through a combination of funding sources as depicted in the statements and private loans from their owners (Belek, 2014, pp. 305-306). The BEX model of excellence is calculated according to the following formula:

$$\text{BEX} = 0,388\text{ex1} + 0,579\text{ex2} + 0,153\text{ex3} + 0,316\text{ex4}$$

where:

ex1 = EBIT/Total assets,

ex2 = Net income/Equity × Cost of capital,

ex3 = Working capital/Total assets,

ex4 = 5 (Net income + Depreciation + Amortization)/Total liabilities.

Enterprises with a negative BEX index exhibit very poor business performance. Enterprises with a BEX index between 0 and 1 are in a situation where it is difficult to assess whether it is good or bad. If the BEX index is between 1 and 2, the rank of business

performance is considered good, while enterprises with an index between 2 and 4 are deemed very good. Enterprises with a BEX index between 4 and 6 have an excellent rank of business performance, and those with an index higher than 6 are candidates for world-class (Kereta, Barišić, 2019, pp. 24-25).

RESEARCH METHODOLOGY

As a database for the sample of enterprises used to test the BEX model, the credit portfolio of loans granted to small and medium enterprises by a commercial bank was utilized. The bank operates throughout the territory of Bosnia and Herzegovina (FBiH, RS, and Brčko District) and consistently achieves solid business results, indicating that the bank's credit policy is at a satisfactory level. Using the expert sampling method, 100 enterprises were selected and divided into two equal groups:

- "Good" enterprises: clients with regular repayment of credit obligations or with delays of up to 30 days. (performing loans PL);
- "Bad" enterprises: clients who have delayed payments to the bank for more than 90 days from the approval of the loan (non-performing loans NPL).

The selected enterprises have sales revenue of less than 7 million BAM and employ fewer than 250 people on average, qualifying them as small and medium-sized enterprises. According to the Bosnian and Herzegovinian economic reality, the threshold for this division is significantly lower than that prescribed by Basel.

According to the Law on Accounting and Audit in the Federation of Bosnia and Herzegovina, the definition of small or medium-sized legal entities is as follows (Zakonu o računovodstvu i reviziji u Federaciji Bosne i Hercegovine, 2009):

- Small legal entities include enterprises that meet at least two of the following three conditions: the average number of employees is less than 50, the average value of business assets at the end of the business year is less than 1,000,000.00 BAM, and the total annual revenue is less than 2,000,000.00 BAM.
- Medium-sized legal entities include enterprises that meet at least two of the following three conditions: the average number of employees is between 50 and 250; the average value of business assets at the end of the business year ranges from 1,000,000.00 to 4,000,000.00 BAM, and the total annual revenue ranges from 2,000,000.00 to 8,000,000.00 BAM.

Official financial statements (balance sheets and income statements) of the borrowers at the time of loan approval were used for coefficient calculations. Delays in repaying credit obligations occurred within 12 months after loan approval, in accordance with the requirements of the Basel Accord, considering the possibility of predicting delays for a period of one year.

ANALYSIS AND FINDINGS

Calculation of the BEX index for small and medium enterprises in BiH

In the following Table, the values of the BEX model for enterprises that regularly meet their obligations to the bank are presented, with the note that the cost of capital applied is the interest rate offered by banks on fixed-term deposits of 1.5% annually.

Table 1. Values of the BEX model for enterprises that regularly meet their obligations to the bank

PL enterprises	ex1 (EBIT/ Assets)	ex2 (Net income/Equity × Cost of capital)	ex3 (Working capital/ Total assets)	ex4 5 x (Net income + Depreciation + Amortization)/ Total liabilities	BEX
PL1	0.09	10.26	0.47	0.77	6.29
PL2	0.04	1.85	0.08	0.43	1.23
PL3	0.15	15.62	0.61	1.73	9.74
PL4	0.17	18.19	0.18	1.66	11.15
PL5	0.00	3.74	0.06	0.26	2.25
PL6	0.24	21.51	0.44	9.74	15.69
PL7	0.14	32.48	0.10	1.14	19.23
PL8	0.06	2.95	0.18	1.87	2.35
PL9	0.07	8.51	0.30	1.95	5.62
PL10	0.06	8.36	0.28	0.79	5.15
PL11	0.01	-5.34	0.07	-0.14	-3.12
PL12	-0.03	-9.45	-0.21	0.00	-5.51
PL13	0.04	3.64	0.15	2.86	3.05
PL14	0.01	0.00	0.22	0.40	0.16
PL15	0.01	9.36	0.30	0.17	5.52
PL16	0.10	11.75	0.14	1.05	7.19
PL17	0.09	19.55	0.31	0.72	11.63
PL18	0.13	23.81	0.04	1.06	14.18
PL19	0.13	0.00	0.93	0.00	0.19
PL20	0.12	38.41	0.03	0.63	22.49
PL21	0.12	10.76	0.14	1.08	6.64
PL22	0.11	8.77	0.32	2.49	5.96
PL23	0.00	-0.54	0.54	0.07	-0.21
PL24	0.17	15.98	0.13	1.30	9.75
PL25	0.20	29.06	0.21	1.51	17.41

Table 1...

PL26	0.40	31.51	0.69	8.69	21.25
PL27	0.32	18.86	0.67	32.60	21.45
PL28	0.06	30.01	0.54	0.30	17.58
PL29	0.16	12.35	0.19	2.08	7.90
PL30	0.35	64.86	0.28	2.13	38.41
PL31	0.08	53.92	-0.28	1.63	31.73
PL32	0.57	40.18	0.69	16.74	28.88
PL33	0.06	4.36	0.28	0.27	2.68
PL34	0.01	18.95	0.16	3.28	12.04
PL35	0.02	0.37	0.05	0.10	0.26
PL36	0.53	54.84	0.36	5.90	33.88
PL37	-0.08	19.54	0.00	1.46	11.74
PL38	0.11	7.38	0.22	3.23	5.37
PL39	0.00	0.92	0.21	4.07	1.85
PL40	0.14	20.32	0.34	0.83	12.13
PL41	0.13	27.93	-0.04	2.34	16.96
PL42	0.05	2.79	0.14	3.47	2.76
PL43	0.05	3.08	0.21	1.54	2.32
PL44	0.02	0.97	0.25	3.25	1.63
PL45	0.05	6.93	-0.17	1.17	4.38
PL46	0.20	19.26	0.12	2.66	12.09
PL47	0.17	20.48	0.17	1.41	12.40
PL48	0.09	11.90	0.00	1.73	7.47
PL49	0.32	73.67	0.10	2.10	43.46
PL50	0.31	29.05	0.13	4.55	18.40

Results of the BEX model for enterprises that regularly meet their obligations to the bank are as follows:

- For 3 enterprises, the BEX model value is negative, incorrectly categorizing them into the group of enterprises whose existence is threatened.
- 3 "good" enterprises or 6% enterprises were classified as needing improvement enterprises, with values between 0 and 1.
- 44 enterprises with regular debt repayment, or 88%, were correctly classified as good enterprises.

Table 2. Values of the BEX model for enterprises that do not

regularly meet their obligations to the bank

NPL enterprises	ex1 (EBIT/ Assets)	ex2 (Net income/Equity x Cost of capital)	ex3 (Working capital/ Total assets)	ex4	BEX
				5 x (Net income + Depreciation + Amortization)/ Total liabilities	
NPL1	-0.01	10.08	0.00	0.22	5.90
NPL2	0.16	43.95	0.18	1.08	25.88
NPL3	0.00	9.06	-0.26	0.26	5.29
NPL4	0.02	33.33	-0.38	0.07	19.27
NPL5	0.01	0.16	0.05	0.01	0.10
NPL6	-0.03	8.47	0.33	0.62	5.14
NPL7	0.05	4.56	0.46	0.49	2.89
NPL8	-0.08	0.42	-0.15	0.39	0.31
NPL9	0.06	22.22	0.20	0.34	13.03
NPL10	0.12	61.67	0.04	0.79	36.01
NPL11	0.05	3.51	-0.10	0.44	2.18
NPL12	0.14	31.03	0.33	0.73	18.30
NPL13	0.06	13.37	0.02	0.53	7.93
NPL14	0.03	2.67	0.57	0.70	1.86
NPL15	0.01	82.91	-0.20	-0.65	47.77
NPL16	0.04	1.96	0.19	0.32	1.28
NPL17	-0.24	39.58	-0.08	0.49	22.97
NPL18	0.01	2.18	-0.09	0.50	1.41
NPL19	-0.01	0.22	-0.28	0.82	0.34
NPL20	0.07	5.56	0.35	0.07	3.32
NPL21	0.13	0.00	-0.04	0.78	0.29
NPL22	0.05	5.72	-0.30	0.52	3.45
NPL23	0.01	0.00	0.11	0.00	0.02
NPL24	0.11	27.35	-0.15	0.43	15.99
NPL25	0.29	52.53	0.28	1.90	31.17
NPL26	0.12	31.48	0.68	0.70	18.60
NPL27	0.02	1.67	-0.04	0.25	1.05
NPL28	0.08	7.81	-0.13	1.53	5.01
NPL29	0.07	11.67	0.03	0.72	7.02
NPL30	0.02	1.64	0.05	0.20	1.03
NPL31	0.27	36.12	0.12	2.14	21.72

Table 2...

NPL32	0.01	7.41	-0.39	0.48	4.39
NPL33	0.02	1.18	-0.04	0.98	0.99
NPL34	0.04	0.36	0.03	0.01	0.23
NPL35	0.02	11.11	0.72	0.11	6.59
NPL36	0.06	21.43	0.10	0.24	12.52
NPL37	0.00	7.41	0.41	0.11	4.38
NPL38	0.01	0.31	0.15	0.19	0.27
NPL39	0.05	5.03	0.51	0.37	3.13
NPL40	0.06	20.37	-0.18	0.51	11.95
NPL41	0.00	0.70	-0.19	0.06	0.39
NPL42	0.17	4.98	0.29	0.32	3.09
NPL43	-0.13	2.69	0.06	0.36	1.63
NPL44	-0.46	40.10	0.11	2.73	23.92
NPL45	-0.01	0.68	0.43	0.18	0.51
NPL46	-0.31	1.48	0.26	0.21	0.84
NPL47	0.04	11.64	0.44	0.71	7.05
NPL48	0.06	12.50	-0.12	0.45	7.38
NPL49	-0.07	-1.63	0.13	0.38	-0.83
NPL50	-0.05	1.06	0.03	0.50	0.76

Results of the BEX model for enterprises with irregular repayment of obligations to the bank are as follows:

- Only one bad enterprise has a negative BEX value and is correctly classified as an enterprise with poor business performance.
- In enterprises needing improvement, 12 "bad" enterprises were classified, or 24%.
- 37 (74%) enterprises with irregular repayment of obligations to the bank were classified as good enterprises.

Errors in enterprise classification and accuracy of BEX model predictions

In the following table, the types of errors made by the model are shown under the condition that good enterprises are rated higher than 1, and bad ones are rated lower than 1. Type one error (I) shows how many enterprises with irregular repayment of credit obligations the BEX model incorrectly classified as enterprises with regular operations. Type two error (II) indicates the misclassification of enterprises that regularly repay credit obligations, which this model classified as enterprises with compromised operational stability. The third column calculates the average of type I and II errors. The fourth column shows the average accuracy of

the model's assessment, calculated as the difference between one and the average errors of type I and II.

Table 3. Errors in enterprise classification and accuracy of BEX model predictions

Error type I (percentage)	Error type II (percentage)	Error average percentage	Average accuracy of model's assessment
74%	12%	43%	57%

Based on the presented results, we may draw the following conclusions:

- Although it has a relatively high accuracy in assessing good enterprises at 88%, the BEX model has a high error rate (74%) in classifying enterprises that irregularly meet their obligations;
- Testing the model's accuracy with a threshold value of 1 revealed an average error rate of 43%;
- The average accuracy rate of 57% does not confirm the hypothesis that the BEX model, created to assess enterprises in neighboring Croatia, has adequate precision in assessing the business excellence of small and medium-sized enterprises in Bosnia and Herzegovina.

CONCLUSION

The Basel Agreement recommends that financial institutions introduce credit models and rating systems to assess the creditworthiness of clients in order to better manage credit risk. Banks have the option to develop their own credit models and rating systems or to use external rating models. In both cases, credit models and rating systems determine the creditworthiness of potential borrowers based on entered financial and/or qualitative indicators of enterprise performance. Assessing creditworthiness, or assessing the credit risk of a potential loan, allows decision-makers to make such decisions in credit operations that expose the bank to an acceptable level of credit risk. Assessing the creditworthiness of a potential borrower implies several decisions by the bank: whether the bank will approve or reject the requested loan, the amount of the approved loan, as well as the terms of approval (interest rate, term, required collateral).

By using scoring models and rating systems in the credit decision-making process, banks have multiple benefits as they are objective and consistent, eliminate discriminatory practices, are relatively simple and easy to interpret, and allow for providing better services to

clients for faster approval or rejection of requests. During the development, implementation, and use of scoring models, it is necessary to keep in mind that previous experiences in practice have shown that their adaptation is necessary both to the type and size of the enterprises they evaluate, as well as to the specific countries or regions in which the enterprises operate.

In this paper, we tested the possibility of applying the BEX model to assess the creditworthiness of small and medium-sized enterprises in Bosnia and Herzegovina. According to the results obtained, the percentage of type II error is 12%, meaning that the model correctly classified 44 out of 50 enterprises that regularly repay their credit obligations into the safe zone. However, the percentage of type I error, which shows the percentage of enterprises that irregularly repay credit obligations and which the BEX incorrectly classified as enterprises with regular business operations, is 74%. Based on the calculated average accuracy of the model assessment, which is 57%, we can conclude that the research hypothesis that the BEX model, developed on a sample of Croatian enterprises, has the appropriate precision in determining the creditworthiness of small and medium-sized enterprises in Bosnia and Herzegovina has not been confirmed.

It is essential to point out that the research was conducted using a sample of limited size containing a relatively small number of borrowers from only one bank. In future research, it would be desirable to use a larger sample of legal entities to determine which key financial indicators most significantly predict the insolvency of Bosnian and Herzegovinian enterprises, attempt to modify some of the existing bankruptcy prediction models to the business conditions of enterprises in Bosnia and Herzegovina (by changing the values of weights or replacing financial indicators in the model), and/or create a new model for assessing the creditworthiness of enterprises in Bosnia and Herzegovina.

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