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BUILDING A NEURAL NETWORK MODEL FOR DIAGNOSING THE PROBABILITY OF BANKRUPTCY OF INNOVATIVE-ACTIVE ENTERPRISES AND CHECKING ITS ADEQUACY

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The article is devoted to the substantiation of the choice of financial indicators for discriminant and neural network models for diagnosing the financial condition of innovative active enterprises and determining the probability of their bankruptcy, as well as the construction of these models based on a study of the financial condition of 36 enterprises. The modern imperative of the successful development of the domestic economy is its transition to the rails of innovative development. This process is impossible without competent distribution of financial resources by business entities. In this regard, especially important is the question regarding the development of new approaches and methods for the assessment of readiness of enterprises for implementation of innovation activities due to which investors or, indeed, the state itself will be able to determine the amount of financial resources which is necessary for the development and implementation of new technologies, products or services. It is shown the importance of researching the financial condition of Ukrainian enterprises that are engaged in innovations, since their innovative activity is almost entirely financed by own means. With the aid of *Deductor* analytical platform, a discriminant model for assessing the financial situation and the probability of bankruptcy for innovative enterprises was built. The neural network model, which together with the analysis «if-then» gives an adequate forecast of the financial state of enterprises engaged in innovation activity, was substantiated and built. Five financial ratios ($X1$, $X2$, $X3$, $X4$ and $X5$) are selected and calculated for the analysis of the financial condition of 36 enterprises. For all the studied enterprises (both bankrupt and those against which bankruptcy proceedings were not initiated), the satisfactory forecast was for 30 out of 36 enterprises (83.33%), unsatisfactory for 2 enterprises (5.56%), in the gray zone there were 4 enterprises (11.11%). It is shown that the built neural network model provides forecasts of the financial condition of enterprises and the probability of their bankruptcy at a level significantly higher than discriminant models. The neural network model takes into account the specifics of domestic economic activity of enterprises, because it is built on the basis of financial data of Ukrainian enterprises.

Keywords: financial condition of enterprises, probability of bankruptcy, neural networks, neural network algorithm, discriminant model, Deductor analytical platform.

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Problem statement

The current conditions of the long-term economic crisis, which affected almost all enterprises in Ukraine, dictate their own rules regarding the financial and economic activities of enterprises. Each of them seeks, at least, to prevent the onset of bankruptcy and, at most, to achieve a stable financial condition. For a favorable development of enterprises, their management must be able to adequately assess the financial condition of business entities. The

solution of this problem is possible by applying modern methods and approaches, including theoretical, expert, mathematical modeling, and others. In particular, the use of modern analytical platforms for analyzing the financial condition of enterprises based on data mining is the key to more informed decisions, which is relevant in modern economic realities.

Analysis and research of publications

Numerous domestic and foreign researchers, in particular, E. Altman, R. Taffler and G. Tishow, K. Beerman, G. Davydova and A. Belikov, O. Tereshchenko, O. Chernyak, A. Matviychuk [1], O. Nedosekin [2] and other researchers are devoted to the problem of attracting financial indicators for models of assessing the financial condition of enterprises and the probability of their bankruptcy, as well as the construction of classical discriminant models.

Many aspects of the problem of assessing the probability of bankruptcy are currently debatable, especially requires consideration of the issue of improving the accuracy and adequacy of models to assess the real financial condition of domestic enterprises in conditions of economic uncertainty and prolonged economic crisis.

The purpose of the article

The purpose of the work is to build a neural network model for assessing the financial condition of enterprises and the probability of their bankruptcy based on the financial indicators of 36 domestic enterprises selected for the study, and to verify its adequacy.

Statement of the main material

The modern imperative of successful development of the domestic economy is its transition to the rails of innovative development. This process is impossible without a rational distribution of financial resources by business entities. In this regard, it is particularly important to develop new approaches and methods for assessing the readiness of enterprises to carry out innovative activities, through which either investors or the state itself will be able to determine the amount of financial resources necessary for the development and implementation of new technologies, products or services.

The relevance of the study of the financial condition of enterprises, including innovation-active ones, in the Ukrainian reality is confirmed by the fact that the share of own funds in the total amount of innovation costs has been steadily growing in recent years, that is, almost all the innovative activity of Ukrainian enterprises has been at the expense of their own funds.

In previous works, we conducted an economic and statistical analysis of indicators of the financial condition of well-off and bankrupt enterprises and tested the validity of the hypothesis of equality of their average values [4]. The study showed that the average financial indicators of successful and bankrupt enterprises are not statistically significant, which prompted the search for better methods to determine the financial condition of enterprises.

Further research was conducted in the direction of selecting indicators [5] in order to attract the latest in neural network models for analyzing the financial condition and determining the probability of bankruptcy of innovative enterprises [6].

The use of Kohonen maps for analyzing the financial condition and determining the probability of bankruptcy of innovative enterprises has allowed us to establish that neural networks are a better tool for diagnosing the financial condition of enterprises [6]. In addition, we have proposed an algorithm for serving and preliminary evaluation of data to determine the financial condition of enterprises [5, 7].

Our research [8] later led to the construction of a neural network model for diagnosing the financial condition and probability of bankruptcy of domestic innovative-active industrial enterprises, which shows the prospects for using neural networks to determine the probability of their bankruptcy.

For further construction and verification of the neural network model based on five indicators of the financial condition of enterprises, we used data from [9], in which the following indicators are proposed to characterize the financial condition of enterprises:

X1 – shelf life of fixed assets;
X2 – quick liquidity ratio;
X3 – coefficient of financial autonomy;
X4 – asset turnover ratio;
X5 – profitability of operations.

According to the authors of this work, a system of indicators describes the financial condition from the point of view of all activities of the enterprise, so it allows you to adequately assess it. Table 1 shows data on the financial indicators of 36 enterprises involved in the study as of 2018 [9].

In Table 1, enterprises with conditional numbers 2, 3, 5, 14, 20, 25, 29, 30, 31, 32, 34 and 35 are enterprises against which bankruptcy proceedings were initiated, the rest are 24 enterprises out of 36 enterprises-enterprises against which bankruptcy proceedings were not opened (the financial condition is satisfactory).

When grouping input parameters, it is important that they are not related. Otherwise, if such parameters are used for research, their impact on the object's state may be overestimated. It follows that for each group of parameters, it is advisable, first, to rank the input parameters by the degree of their influence on the target parameter, and,

Table 1

The value of financial indicators of enterprises involved in the study [9]

Business reference number	Enterprises	X1	X2	X3	X4	X5	State of enterprises in relation to bankruptcy (0 – nonbankrupt, 1 – bankrupt)
1	AVC	0.927	1.237	0.355	1.042	0.053	0
2	Agricole	0.982	0.328	0.226	0.061	–1.624	1
3	AgroExport	0.901	0.496	0.018	1.228	0.004	1
4	Agromars	0.707	1.682	0.845	0.751	0.422	0
5	Agroton	0.547	0.833	0.671	0.904	0.316	1
6	Alef-Vinal	0.474	0.833	0.736	0.039	–0.600	0
7	Wimm-Bill-Dann	0.539	0.227	–0.014	2.702	0.002	0
8	Veres	0.649	0.805	–0.202	1.319	–0.148	0
9	Scherban Group	0.902	0.867	0.160	1.838	0.009	0
10	Dacor	0.175	5.516	0.945	0.004	–45.992	0
11	Industrial dairy company	0.563	0.679	–0.648	0.172	–3.659	0
12	Inter-Contact	0.780	1.419	0.245	0.032	0.025	0
13	Kernel	0.701	0.891	0.009	1.039	0.004	0
14	Kyivkhleb	0.569	0.909	0.327	4.002	0.009	1
15	Conti	0.641	0.372	0.356	0.717	0.272	0
16	Kraft	0.818	1.028	0.599	1.891	0.104	0
17	Lactalis	0.220	1.899	0.581	0.957	–0.096	0
18	Mironovsky bread product	0.729	2.080	0.425	0.554	0.101	0
19	Dairy Alliance	0.300	0.058	0.778	0.060	0.035	0
20	Mriya	0.513	0.899	0.788	0.846	0.106	1
21	Nestle	0.801	2.027	0.771	1.915	0.035	0
22	Olkom	0.780	0.863	0.540	2.577	0.056	0
23	Rise	0.886	0.838	0.040	0.377	–0.151	0
24	Reimbursement	0.544	0.561	–0.059	3.728	–0.022	0
25	Rainford	0.619	1,403	0,367	0.929	–0.042	1
26	Rosan-Agro	0.687	0,414	0,284	1.324	0.023	0
27	Roschen	0.853	0,113	0,489	0.194	0.172	0
28	Smart-holding	0.238	1,658	0,419	0.445	–0.446	0
29	Union-Viktan	0.201	0.918	–0.252	5.076	–0.012	1
30	Taco	0.621	0.752	–0.339	1.067	–0.621	1
31	Ukrproduct Group	0.724	0.082	0.751	0.000	–1.829	1
32	Ukrros	0.472	1.110	0.705	0.001	–6.038	1
33	Universal investment group	0.626	0.462	0.274	1.143	0.008	0
34	Harvest	0.569	1.984	0.314	1.063	0.030	1
35	Bread Of Ukraine	0.282	0.470	0.525	0.035	–2.719	1
36	Unimilk	0.824	4.767	–0.131	4.147	–0.050	0

secondly, to evaluate the mutual influence of input parameters in one group.

To solve this problem, it is possible to use an expert method, but if there is insufficient information, it is advisable to use correlation and regression analysis, which allows you to identify statistically significant relationships between parameters. Therefore, to determine the mutual influence of factors, we conducted a regression analysis.

To simplify the interpretation of the correlation value, each value of the correlation coefficient is proposed to correspond to the corresponding linguistic value of the strength of the connection between them in accordance with the data in table 2.

Table 2

Linguistic description of the strength of the connection between input parameters based on the correlation coefficient

Numeric value of the correlation coefficient r_{kj}	Binding force a_{kj}
$0.0 \le \lvert r_{kj} \rvert < 0.2$	very weak
$0.2 \le \lvert r_{kj} \rvert < 0.3$	weak
$0.3 \le r_{kj} \rvert < 0.5$	moderate
$0.5 \le \lvert r_{kj} \rvert < 0.7$	average
$0.7 \lvert r_{kj} \rvert \le 1.0$	strong

The modulus of the correlation coefficient indicates the degree of dependence between indicators: the closer its value is to zero, the weaker the linear relationship. Table 3 shows that all coefficients of pairwise correlation between input factors have a modulus value less than 0,4, except for the correlation coefficient between factors X2 and X5. It follows that the linear relationship between factors according to the data of correlation analysis can be considered weak. This further indicates that the selected indicators (financial coefficients X1, X2, X3, X4 and X5) are selected correctly, and they can be used for further research of the financial condition of the enterprise and the probability of their bankruptcy.

Table 3

Pairwise correlation coefficients between input variables X1, X2, X3, X4 and X5

×	X1	X2	X3	X4	X5
X1	×	–0.183	–0.187	0.000	0.374
X2	–0.183	×	0.164	0.117	–0.636
X3	–0.187	0.164	×	–0.391	–0.270
X4	0.000	0.117	–0.391	×	0.215
X5	0.374	–0.636	–0.270	0.215	×

At the next stage of the research we built a discriminant model for determining the financial condition of enterprises and determining the probability of their bankruptcy using the academic version of the *Deductor* analytical platform of *BaseGroup_Labs* company [10].

This model is a five-factor model, where the input factors are factors X1, X2, X3, X4 and X5, and the initial value is the probability of bankruptcy of FB (*Financial Bankruptcy*).

Visualization of the results of the *Linear regression* node, which was used to build a linear model of the dependence of the output factor FB on the input factors X1, X2, X3, X4 and X5, is shown in figure 1.

Выходное поле: FB

Атрибут	Коэффициент
9.0 <Константа>	0,64742
9.0 X1	-0,32642
9.0 X2	-0,15181
9.0 X3	0,057882
9.0 X4	0,049398
9.0 X5	-0,0068196

Fig. 1. Visualization of the results of the *Linear regression* node with respect to the construction of a linear model between the initial factor FB and the input factors X1, X2, X3, X4 and X5) obtained using *Deductor* analytical platform

Based on the results of calculations, a linear discriminant model is constructed, which will have the following form:

$$FB=0.64742-0.32642rX1-0.15181rX2+0.057882rX3+0.049398rX4-0.0068196rX5,$$

where FB is the indicator that characterizes the probability of bankruptcy of the enterprise;

X1, X2, X3, X4 та X5 – financial indicators (coefficients) that are used to build the model (Table 1).

When calculating the FB indicator, we accept the following: when the resulting value has a value less than 0, then the probability of bankruptcy can be described using the linguistic term «very small", and the financial condition of the enterprise as «good"; when the value of the FB indicator is in the range from 0 (inclusive) to 1 (inclusive), then the probability of bankruptcy can be described using the linguistic term «uncertain", that is, the enterprise is in the «gray» zone; the value of the FB indicator equal to 1 means that the probability of bankruptcy can be described by the linguistic term «very high", and the financial condition of the enterprise, respectively, as "unsatisfactory".

The next step was to build a neural network [5r2r1] with 5 input neurons, one output neuron and two hidden layers whose schema is shown in Fig. 2. The neural network was built using with Deductor analytical platform according to the following parameters: activatin function is the sigmoid function, the setting process of neural network learning algorithm *Resilient Propagation* (*RPROP*), a step of descent of 0.5, step of lifting is 1.2.

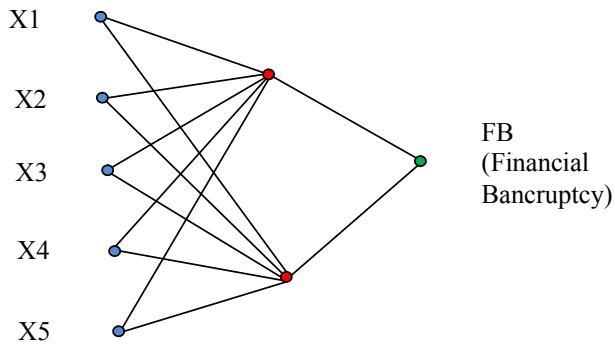

Fig. 2. A neural network Graph is proposed for building a model for determining the probability of bankruptcy of enterprises, obtained using *Deductor* analytical platform

A neural network that has been trained on the basis of input data vectors of 36 enterprises under study can be used to solve the problem of predicting the probability of bankruptcy. For this purpose, the "if-then « analysis is also used, the visualization of the results of which in the operation of the *Neural*

network node is shown in Fig. 3.

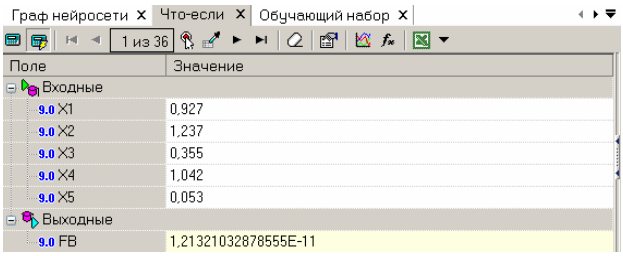

Fig. 3. Visualization of the results of the "if-then» analysis in in the operation of the *Neural network* node of the *Deductor* analytical platform for an enterprise with the conditional number 1

Fig. 3 shows the results of the "if-then « analysis for the first vector of the source data (for an enterprise with the conditional number 1) – line 1 (table 1). For it, the forecast value of the probability of bankruptcy FB=1.21r10^{-11} is obtained, that is, it is actually zero. The company with the conditional number "1" is not the one before which the bankruptcy procedure was initiated, so when building the model, the FB value for it was assumed to be zero a priori. Thus, in our opinion, the value of the probability of bankruptcy FB = 1.21Ч10^{-11}, obtained using a built neural network with parameters [5r2r1], within the framework of the proposed model, is acceptable.

The results of calculating the probability of bankruptcy in the above-mentioned enterprise and other enterprises of the study group of 36 enterprises are presented in Fig. 4 and Fig. 5.

Fig. 4 shows the predicted values of the probability of bankruptcy 24 companies studied, against which no bankruptcy proceedings (financially stable companies), where the X-axis presents the conditional numbers of financially stable enterprises, and on the ordinate axis – probability of approach of bankruptcy. As you can see from Fig. 4, almost all enterprises in this group have a probability of bankruptcy that does not exceed 0.125. Only for companies with conditional numbers 6 and 15, the probability of bankruptcy was 0.999 and 0.667, respectively. Thus, for 22 enterprises out of 24, that is, for 91.67% of this group of enterprises, the forecast of the probability of bankruptcy is satisfactory. An enterprise with the conditional number 15, in our opinion, can be considered one that has a problematic financial condition, it is located in a conditional «gray» zone, that is, for this enterprise, the initiative to initiate bankruptcy proceedings requires additional justification.

Figure 5 shows the forecasted values of the probability of bankruptcy of 12 bankrupt enterprises (enterprises with conditional numbers 20, 25, 29, 31, 32, 34 and 35, their numbers are represented on the abscissus axis). Among them, 7 companies out of 12 forecast bankruptcy probability values exceed 0.800, meaning their bankruptcy forecast is satisfactory. For another enterprise-an enterprise with the conditional number 14 – the probability of bankruptcy values are close to the group of failed enterprises.

Enterprises with the nominal numbers 2, 3 and 5 are located in the conditional «gray» zone. For them, the forecasted probability of bankruptcy was 0.663, 0.663 and 0.668, respectively, but the probability of bankruptcy of bankrupt enterprises is close to the values.

For an enterprise with conditional numbers 30, the forecast for its detection as a bankrupt turned out to be unsatisfactory (zero forecasted probability of bankruptcy when the enterprise was actually identified as a bankrupt). Thus, for 8 enterprises out of 12, that is, for 66.67% of enterprises, the forecast of the probability of bankruptcy is satisfactory. For one enterprise, i.e. for 8.33% of the total number of bankrupt enterprises, the forecast was unsatisfactory.

For all the studied enterprises (both bankrupt and those against which bankruptcy proceedings were not initiated), the satisfactory forecast was for 30 out of 36 enterprises (83.33%), unsatisfactory for 2 enterprises (5.56%), in the gray zone there were 4

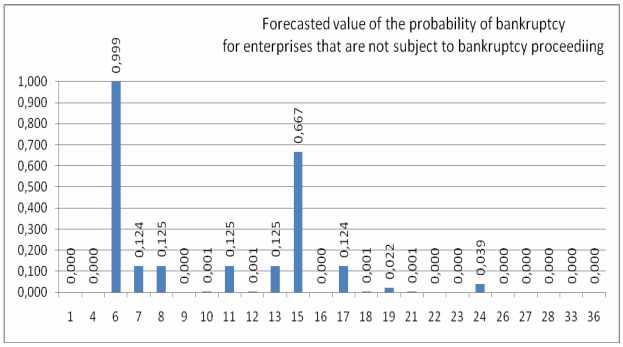

Fig. 4. Forecast values of the probability of bankruptcy of the studied enterprises against which bankruptcy proceedings were not initiated (for financially stable enterprises)

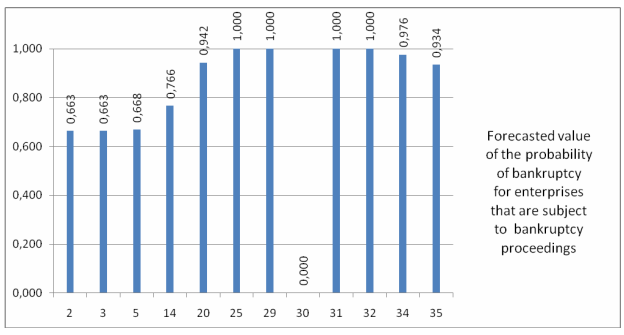

Fig. 5. Forecasted values of the probability of bankruptcy of the studied enterprises against which bankruptcy proceedings were initiated

enterprises (11.11%).

Thus, a neural network model is constructed that provides forecasts of the financial condition of enterprises and the probability of their bankruptcy at a level significantly higher than the discriminant models, the characteristics of which are given in [4]. In addition, the neural network model takes into account the specifics of domestic economic activity of enterprises, because it is built on the basis of financial data of Ukrainian enterprises.

Conclusions

The readiness of enterprises to implement innovations depends to a large extent on their financial condition. In recent years, in Ukraine, the financing of innovative activity of enterprises is carried out at the expense of their own funds. Adequate estimates of the financial condition of enterprises in conditions of economic uncertainty are given by using modern tools for decision support – Deductor analytical platform. Based on the financial statements of 36 domestic enterprises, a discriminant and neural network model for assessing the financial condition and probability of bankruptcy of enterprises was constructed using *Deductor* analytical platform. It was found that the accuracy of predicting bankruptcy based on the built neural network model significantly exceeds the discriminant models, in addition, it takes into account the features of the financial condition of domestic enterprises.

Further research by the authors will be aimed at improving models for assessing the financial condition of enterprises and the probability of their bankruptcy, obtained using modern tools for modeling economic processes-fuzzy logic and neural networks in the direction of increasing their accuracy.

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ПОБУДОВА НЕЙРОМЕРЕЖЕВОЇ МОДЕЛІ ДІАГНОСТИКИ ІМОВІРНОСТІ НАСТАННЯ БАНКРУТСТВА ІННОВАЦІЙНО-АКТИВНИХ ПІДПРИЄМСТВ І ПЕРЕВІРКА ЇЇ АДЕКВАТНОСТІ

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Статтю присвячено обґрунтуванню вибору фінансових показників для дискримінантних і нейромережевих моделей діагностики фінансового стану інноваційно активних підприємств і визначення ймовірності їх банкрутства, а також побудові цих моделей на основі дослідження фінансового стану 36 підприємств. Сучасним імперативом успішного розвитку вітчизняної економіки є її перехід на рейки інноваційного розвитку. Цей процес неможливий без грамотного розподілу фінансових ресурсів господарюючими суб'єктами. У зв'язку з цим особливо актуальним є питання щодо розробки нових підходів і методів оцінки готовності підприємств до здійснення інноваційної діяльності, завдяки яким інвестори або, по суті, сама держава зможуть визначити обсяг фінансових ресурсів, необхідних для розробки і впровадження нових технологій, продуктів або послуг. Показано важливість дослідження фінансового стану українських підприємств, що займаються інноваціями, оскільки їх інноваційна діяльність практично повністю фінансується за рахунок власних коштів. За допомогою аналітичної платформи Deductor *було побудовано дискримінантну модель оцінювання фінансового становища та імовірності настання банкрутства інноваційно-активних підприємств. Обґрунтовано і побудовано нейромережеву модель, яка разом з аналізом «якщо-тоді» дає адекватний прогноз фінансового стану підприємств, що здійснюють інноваційну діяльність. Для аналізу фінансового стану 36 підприємств обрано і розраховано п'ять фінансових коефіцієнтів (*X*1,* X*2,* X*3,* X*4 і* X*5). Для всіх досліджуваних підприємств (як банкрутів, так і тих, проти яких не було порушено процедуру банкрутства) задовільний прогноз виявився для 30 з 36 підприємств (83,33%), незадовільним для 2 підприємств (5,56%), в сірій зоні виявилося 4 підприємства (11,11%). Таким чином, побудована нейромережева модель надає прогнози фінансового стану підприємств та імовірності настання їх банкрутства на рівні, значно вищому, ніж дискримінантні моделі. Нейромережева модель враховує специфіку внутрішньої економічної діяльності підприємств, оскільки побудована на основі фінансових даних українських підприємств.*

Ключові слова: фінансовий стан підприємств, імовірність настання банкрутства, нейронні мережі, нейромережевий алгоритм, дискримінантна модель, аналітична платформа *Deductor.*

ПОСТРОЕНИЕ НЕЙРОСЕТЕВОЙ МОДЕЛИ ДИАГНОСТИКИ ВЕРОЯТНОСТИ НАСТУПЛЕНИЯ БАНКРОТСТВА ИННОВАЦИОННО-АКТИВНЫХ ПРЕДПРИЯТИЙ И ПРОВЕРКА ЕЁ АДЕКВАТНОСТИ

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Статья посвящена обоснованию выбора финансовых показателей для дискриминантных и нейросетевых моделей диагностики финансового состояния инновационно активных предприятий и определения вероятности их банкротства, а также построению этих моделей на основе исследования финансового состояния 36 предприятий. Современным императивом успешного развития отечественной экономики является ее переход на рельсы инновационного развития. Этот процесс невозможен без грамотного распределения финансовых ресурсов хозяйствующими субъектами. В этой связи особенно актуальным является вопрос о разработке новых подходов и методов оценки готовности предприятий к осуществлению инновационной деятельности, благодаря которым инвесторы или, по сути, само государство смогут определить объем финансовых ресурсов, необходимых для разработки и внедрения новых технологий, продуктов или услуг. Показана важность исследования финансового состояния украинских предприятий, занимающихся инновациями, поскольку их инновационная деятельность практически полностью финансируется за счет собственных средств. С помощью аналитической платформы Deductor *была построена дискриминантная модель оценки финансового положения и вероятности банкротства инновационных предприятий. Обоснована и построена нейросетевая модель, которая вместе с анализом «если-то» дает адекватный прогноз финансового состояния предприятий, осуществляющих инновационную деятельность. Для анализа финансового состояния 36 предприятий выбраны и рассчитаны пять финансовых коэффициентов (*X*1,* X*2,* X*3,* X*4 и* X*5). Для всех исследуемых предприятий (как банкротов, так и тех, против которых не было возбуждено процедуру банкротства) удовлетворительный прогноз оказался для 30 из 36 предприятий (83,33%), неудовлетворительным для 2 предприятий (5,56%), в серой зоне оказалось 4 предприятия (11,11%). Таким образом, построенная нейросетевая модель предоставляет прогнозы финансового состояния предприятий и вероятности наступления их банкротства на уровне, значительно более высоком, чем дискриминантные модели. Нейросетевая модель учитывает специфику внутренней экономической деятельности предприятий, поскольку построена на основе финансовых данных украинских предприятий.*

Ключевые слова: финансовое состояние предприятий, вероятность наступления банкротства, нейронные сети, нейросетевой алгоритм, дискриминантная модель, аналитическая платформа *Deductor.*

BUILDING A NEURAL NETWORK MODEL FOR DIAGNOSING THE PROBABILITY OF BANKRUPTCY OF INNOVATIVE-ACTIVE ENTERPRISES AND CHECKING ITS ADEQUACY

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The article is devoted to the substantiation of the choice of financial indicators for discriminant and neural network models for diagnosing the financial condition of innovative active enterprises and determining the probability of their bankruptcy, as well as the construction of these models based on a study of the financial condition of 36 enterprises. The modern imperative of the successful development of the domestic economy is its transition to the rails of innovative development. This process is impossible without competent distribution of financial resources by business entities. In this regard, especially important is the question regarding the development of new approaches and methods for the assessment of readiness of enterprises for implementation of innovation activities due to which investors or, indeed, the state itself will be able to determine the amount of financial resources which is necessary for the development and implementation of new technologies, products or services. It is shown the importance of researching the financial condition of Ukrainian enterprises that are engaged in innovations, since their innovative activity is almost entirely financed by own means. With the aid of Deductor *analytical platform, a discriminant model for assessing the financial situation and the probability of bankruptcy for innovative enterprises was built. The neural network model, which together with the analysis «if-then» gives an adequate forecast of the financial state of enterprises engaged in innovation activity, was substantiated and built. Five financial ratios (*X*1,* X*2,* X*3,* X4 *and* X*5) are selected and calculated for the analysis of the financial condition of 36 enterprises. For all the studied enterprises (both bankrupt and those against which bankruptcy proceedings were not initiated), the satisfactory forecast was for 30 out of 36 enterprises (83.33%), unsatisfactory for 2 enterprises (5.56%), in the gray zone there were 4 enterprises (11.11%). It is shown that the built neural network model provides forecasts of the financial condition of enterprises and the probability of their bankruptcy at a level significantly higher than discriminant models. The neural network model takes into account the specifics of domestic economic activity of enterprises, because it is built on the basis of financial data of Ukrainian enterprises.*

Keywords: financial condition of enterprises, probability of bankruptcy, neural networks, neural network algorithm, discriminant model, *Deductor* analytical platform.

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