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MODELING OF FINANCIAL RESULTS OF SUBJECTS OF THE INNOVATION PROCESS IN THE REGION

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ABSTRACT

The article develops and substantiates a methodological approach to modeling the results of innovative development of subjects of the regional business environment. The basic values of financial forecasting were indicators of the innovative potential of the business entity and indicators of the innovative attractiveness of the region.

The system of indicators of innovation attractiveness of the region includes indicators of innovation activity of the region, social and economic indicators of regional development, indicators of innovative cooperation of the region, and indicators of international integration of the region. To assess the innovation potential of a business entity, such four levels of diagnostics are defined as: the potential of tangible assets; the potential of tangible assets in the form of working capital; the indicator of intellectual potential; the level of use of innovative potential.

To substantiate the methodology for analyzing the innovative attractiveness of the region, software was developed in the database management system MS Access environment. Trends were identified by autocorrelation analysis and the foster-Stewart method, and the pair correlation approach was used with the sequential search of all parameters to find the relationship between the parameters. To achieve this goal, we will use the Pearson coefficient; various types of one-dimensional regression are used to increase the accuracy of the model.

The forecast values calculated on the basis of modeling justified the existence of a close relationship between the expected economic results of the development of innovative cooperation in the region and the indicators of activation of entrepreneurial initiative. The results of modeling can be used as a basis for forming the policy of innovative development of the region. The results of modeling as well can be used in choosing strategic alternatives for innovative development of business entities.

Keywords: innovation process, financial results, innovation potential, innovation attractiveness

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INTRODUCTION

Successful implementation of the innovation process is the key to the development of the national economy, and the level of its efficiency determines the profitability of business entities. The results of the analysis of indicators of innovation processes in the regions of Ukraine indicate a low level of implementation of scientific, technical, and innovative potential, which does not provide the necessary reproduction of innovative and scientific and technical resources of the country. Thus, the dynamics of Ukraine's ratings on four approaches to assessing innovation capacity for 2014-2020 indicates the absence of active policies and breakthroughs in regional innovation processes. Factors that hinder the disclosure of scientific, technical and innovative potential include a low level of capacity of state institutions, unfavorable environment for conducting innovative business and unfriendly financial system" [1, p.5]. This situation actualizes the need to study the problem and develop ways to activate the innovation process in the regions of Ukraine. It is advisable to solve this problem from the point of view of modeling the

financial results of the subjects of the innovation process, which will allow us to specify «bottlenecks» and justify scenarios for overcoming them.

LITERATURE REVIEW

Innovations as priorities for ensuring the competitiveness of a business entity are implemented to obtain effects «that can be divided into internal and external. The internal effect provides an increase in the financial results of the enterprise, the external effect helps to increase customer loyalty and improve the image of the enterprise, ensures investment growth, access to new markets, etc." [2, p.195].

When calculating financial results as an internal effect, it is necessary to take into account not only the indicators of profit of enterprises but also the indicator of excess profit (the difference between profit and the product of the value of assets of enterprises and the rate of return on investment) [3, p.3].

Innovation strategy has a significant effect on financial performance. Internal process performance mediates the relationship between innovation strategy and financial performance [4, 5].

The result of the study highlighted that there is a positive relationship between process innovation, market innovation, and the financial performance of firms. While, results indicated that disruptive technology moderates the relationship of process innovation with financial performance but it has no moderating role in the relationship of market innovation with financial performance [6].

Financial results and their system in the form of indicators of financial and property status are ambivalent. On the one hand, they are indicators of the effectiveness of innovation at the enterprise, and on the other hand, they determine the level of innovation potential [7, p.78, 8, p.253] or investment attractiveness of the enterprise [9].

The study of the relationship between innovation investment and financial sustainability allows to weigh innovation expenditure and corporate target performance and design an executive incentive mechanism [10].

The expected effects of implementing innovation processes form the basis of long-term decisions that form the prerequisites for the innovative development of business entities. «Taking into account long-term criteria for evaluating the effectiveness of innovative solutions involves determining trends in indicators that characterize the results of their implementation in the long term based on the use of mathematical methods and forecasting models" [11].

Through the empirical analysis of multiple linear regression, the authors verify the hypotheses which the influencing factors affect the enterprise performance, which may be improved by expanding the market demand, accelerating the transformation rate of technological achievements, increasing the number of patents and R&D investment, attracting and training more senior professional technical talents, etc. [12].

From the perspective of the strategic choice motivation of the innovation subject (including the enterprises, research institutions, and local governments), the authors construct a multiplayer stochastic evolutionary game model. The influence of each variable on the subject strategy adoption is analyzed by simulation [13].

Innovative development of the enterprise, from the point of view of analysis, should be considered as positive qualitative changes in the state of the enterprise (reflected in improving the efficiency of activities, improving financial condition, increasing market value, etc.) as a result of innovation activities and effective use of innovation potential [14, p.68].

When forming forecasting models and choosing an innovative solution, subjects use the "optimality principle" [15, p.280], the formation of which is determined by the goals and objectives of participants in the innovation process. The degree of achievement of these goals is determined, in addition to the level of innovative potential of participants, also by the innovative attractiveness of the territory of implementation of the innovation process.

To enhance their innovation abilities more efforts should be made to accelerate the perfecting of the institutional environment, to promote the element market and financial market to develop, and to improve the allocation efficiency of the capital market [16].

The level of innovation attractiveness of the region evaluates and determines the subject of the innovation process by important parameters and environmental factors, as well as their impact on the effectiveness of implementing the tasks of the innovation project.

In the structure of factors of innovative attractiveness of the region, scientists distinguish the innovative attractiveness of industries in the region, which is based on a two-block system of indicators (specific and non-specific) [17]. Interesting is

the approach of the authors, who to denote the external environment of innovation implementation distinguish the concept of "innovation space of the region", for the assessment of which there are two groups of indicators: indicators that characterize the presence of internal opportunities for pre-innovation activities; indicators that characterize the ability to transform opportunities into results [18, p.10].

Consequently, the financial results of the subject of the innovation process determine the level of its innovative potential and form the expected effects of the innovation project, with the established level of innovative attractiveness of the region.

AIMS AND OBJECTIVES

The purpose of this study is to model the financial results of the subjects of the innovation process of the region according to the established system of indicators with a justification of factors motivators and regressors.

METHODS

The methodological basis of performing research is being formalized by the classical provisions of economic theory, general scientific methods as well as methods of theoretical and applied innovation. In order to carry out the research, the authors follow general scientific and special principles, techniques and methods of scientific cognition in the field of innovation activity management.

Semantic and comparative analyses, as well as systematization method, have been used for theoretical substantiation of the systems of indicators of innovative attractiveness of the region and indicators of innovative potential of subjects. The trend model, one-dimensional regression, autocorrelation analysis method, and Forster-Stewart method are used to model and predict the values of financial results in innovative processes in the region.

For drafting the conclusions and theoretical synthesis of the results of the conducted research the abstract logical method was applied.

The application of the above-mentioned methods and techniques allowed for elaborating a comprehensive approach to the study. The implementation of this methodology is consistent with the requirements of the classification codes for scientific and economic research.

The proposed provisions and approaches are based on the study and generalization of the fundamental provisions of the theory and practice of innovative processes.

RESULTS

Based on the study and generalization of scientific methodological sources, a system of indicators of innovation attractiveness of the region was substantiated and formed, which will be used as a methodological basis for financial forecasting of the results of the innovation process of the subject which is given in Table. 1.

The following groups of indicators of innovative attractiveness of the region were used as basic values:

- indicators of innovation activity in the region;
- socio-economic indicators of regional development;
- indicators of innovative cooperation in the region;
- indicators of international integration of the region.

To assess the innovative potential of a business entity, the following four levels of diagnostics are defined:

- the potential of tangible assets;
- the potential of tangible assets in the form of working capital;
- an indicator of intellectual potential;
- the level of use of innovative potential.

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Table 1. Summary system of indicators for modeling the financial results of innovation processes in the region.

Direction	Diagnostic levels	Diagnostic indicators	Indicator value					Purpose of diagnostics
			2015	2016	2017	2018	2019	
1	2	3	4	5	6	7	8	9
1. innovative potential of the subject	Potential of tangible assets	Non-current assets, thousand UAH	1373	1273	4264	3970	3690	Determining the sufficiency of available resources for conducting innovation activities
	Potential of tangible assets in the form of working capital	Working capital, thousand UAH	1523	1257	4422	6353	3525	
	Intellectual potential	Level of the use of own intangible assets in innovation activity, %	50	67	72	87	93	
	Level of use of innovation potential	Volume of sold innovative products, thousand UAH	12179	13216	9800	12795	17579	
		Cost of sold innovative products, %	79	81	81	78	80	
		Level of involvement of partners, %	5.6	5.1	4.9	3.8	3.2	
2. Innovative activity of regional enterprises	Performance indicators	Share of the volume of products (goods, services) sold by innovatively active enterprises, %	83	71	62	56	35	Determining the level of innovation activity in the region
		Share of innovative products (goods, services) sold, %	17	29	38	44	65	
	Effectiveness indicators	Share of innovatively active industrial enterprises, %	35	35	35	35	12.8	
		Number of enterprises that have sold innovative products (goods, services) % of the total number of industrial enterprises	18.5	17.6	15.4	14.9	19.1	
		Share of innovation costs	25	32	39	44	56	
		External research projects, %	75	68	61	56	45	
3. Financial results of the subject	Market sustainability	Share of innovation costs	0.8	0.7	0.5	0.5	0.5	Determination of sufficient financial resources for innovation activities
	Profitability	Internal research projects	7.6	11.4	6.3	11.4	7.5	
		Coefficient of autonomy	-0.03	-0.07	-0.11	0.05	0.01	
	Liquidity	Product profitability, %	1.4	0.9	0.6	0.7	0.6	
		Return on assets, %	1.4	0.9	0.6	0.7	0,6	
		Coverage ratio	0.9	0.4	0.1	0.2	0.2	
	Financial sustainability	Quick liquidity ratio	0.26	0.42	0.96	1.12	1,05	
		Absolute liquidity ratio	0.30	-0.03	-0.64	-0.38	0.69	
	Financial stability of the region's innovation activities	Funding ratio	78	89	89	88	86	
4. Main socio-economic indicators of regional development	Capital investment	Investment volume, thousand UAH	13387	18605	24106	28996	29298	Assessment of the region's development level
	Financial results	Index financial result before tax	109,1	108.2	99.1	101.3	101.1	
	Consumer market	Disposable income index of the population	108.7	109.1	108.1	107.3	109.9	
		Consumer Price Index	145.2	111.9	113.0	110.1	112.4	
	Regional product	Gross regional product (in actual prices), mln.UAH	94690	114842	147404	16789	18978	
5. Innovative cooperation in the region	Structure	Number of innovatively active enterprises involved in innovative cooperation in Ukraine	38	32	27	12	10	Assessment of the level of internal cooperation of innovatively active enterprises
		Share of the number of enterprises that independently implemented innovative products (goods, services) and / or technological processes, %	82	81	80	79,8	87,6	
	Management	The ratio of the number of innovatively active enterprises that independently carried out to the number that entered into innovative cooperation	70/30	60/40	65/35	67/33	76/24	
		Share of the number of innovatively active enterprises involved in innovative cooperation, %:						
		▪ customers:	21	19	17	17	11	
		▪ institutions of Higher Education:	10	10	9	11	8	
		▪ suppliers of equipment, materials, components, and software	43	43	41	45	42	
		Share of the number of innovatively active enterprises involved in innovative cooperation within the enterprise, %	69	69	73	82	87	
6. International integration of the region		Export volumes, mln UAH	1206.3	1275.6	1585.2	1895.6	1982.3	Assessment of the level of external cooperation of innovatively active enterprises
		Share of innovatively active enterprises involved in innovative cooperation outside of Ukraine, %	10	22	25	26	29	
		Import volumes, mln UAH	1447.9	1699.4	2180.4	2707.3	27890.1	

To develop a model for predicting the financial results of an innovation entity, a corresponding program has been developed and designed in the MS Access DBMS in order to be able to store the values of economic indicators by year.

Table 1 also provides an illustration of the application of financial forecasting based on the Statistical Yearbook [19] and financial statements of the subject of the innovation process of the Lviv region [20].

The constructed model of financial forecasting provides for the use of such developed tools for indicators – financial results of the subject of the innovation process of the region:

1. Means of assessing the financial and property condition of an entity: depreciation coefficient of fixed assets; return on Assets; Fund return of fixed assets; asset turnover ratio; financing ratio; Solvency Ratio; Total Coverage Ratio; Current (total) liquidity ratio; coverage ratio; absolute liquidity ratio (solvency); share of own working capital in inventory coverage; equity provision ratio; financial autonomy coefficient; rapid liquidity ratio; absolute liquidity ratio; net working capital; coefficient of solvency (autonomy); coefficient of provision of own working capital; coefficient of maneuverability of equity capital".
2. Tools for identifying diagnostic levels and indicators.

The structure of the model database tables includes seven levels for analysis which are shown in Fig. 1.

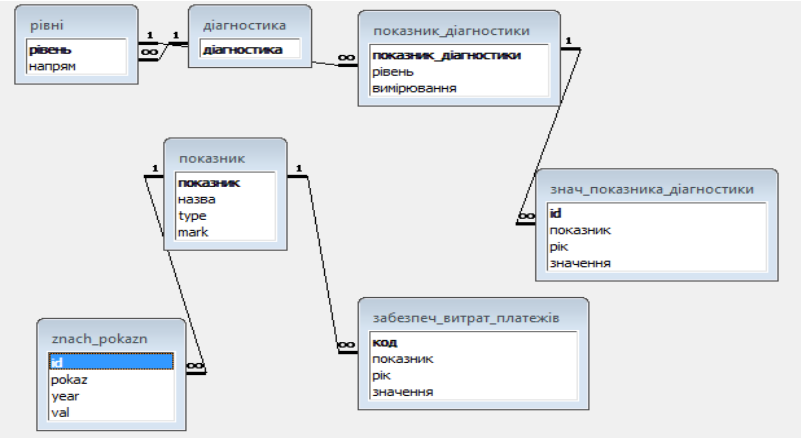

Figure 1. Scheme of the database of the model of financial forecasting of the results of the innovation process.

When constructing the database scheme of the forecasting model the following relations are used:

- Indicator – list of indicators, type of indicators, coefficient of the importance of indicators;
- Znach_pokazn – coefficient values by year;
- Providing_payment_costs – values of indicators by year;
- Diagnostics – diagnostic areas (infrastructure, finance, etc.);
- Levels – distribution of diagnostic levels by direction;
- Indicator of diagnostics – list of diagnostic indicators and their units of measurement;
- Value_diagnostic_indicator is the value of diagnostic indicators by year.

The time range of five years is chosen for modeling since it allows you to perform a procedure for mathematical forecasting and extrapolation of indicators.

To assess the level of innovative attractiveness of the region, we will use the trend model, the planning step is one year.

Consecutive values of time series levels that depend on each other form autoregressive processes. One way to measure the relationship between current and past values of series Levels is to calculate autocorrelation coefficients.

The study of methodological sources allowed us to justify the choice for identifying trends in favor of using the autocorrelation analysis method and the Forster-Stewart method. To use the foster-Stewart method in a financial forecasting model, you need to perform four steps.

The first stage involves "comparing each level of the original time series, starting from the second level, with all the previous ones, and defining two numerical sequences":

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$$k_t = \begin{cases} 1, yt\ more\ than\ all\ previous\ values \\ 0, in\ the\ opposite\ direction \end{cases} \quad (1)$$

$$k_t = \begin{cases} 1, yt\ less\ than\ all\ previous\ values \\ 0, in\ the\ opposite\ direction \end{cases} \quad (2)$$

$t = 2, 3, \dots, n.$

The second stage assumes that the calculated values s and d:

$$s = \sum_{t=2}^{n}(k_t + l_t) \quad (3)$$

$$d = \sum_{t=2}^{n}(k_t - l_t) \quad (4)$$

It is important to note that the value s, which characterizes the change in the time series, takes a value from *0* (all levels of the series are the same) to *n – 1* (the series is monotonous).

The value d characterizes the change in the variance of the time series levels and varies from *– (n – 1)* (the series gradually decreases) to *(n – 1)* (the series gradually increases).

The third stage involves testing the hypothesis for randomness:

1. deviation of the value s from μ – the mathematical expectation of the value *s* for a series in which the levels are randomly located;
2. deviation of the value d from zero.

Such verification is proposed to be carried out using the calculated values of the Student's *t*-criterion for determining the average value and for calculating the variance indicator:

$$t_s = \frac{|s-\mu|}{\sigma_1};\ \sigma_1 = \sqrt{21n_n - 3{,}4253} \quad (5)$$

$$t_d = \frac{|d-0|}{\sigma_2};\ \sigma_2 = \sqrt{21n_n - 0{,}8456} \quad (6)$$

where μ – a mathematical expectation of the value and defined for a series in which the levels are randomly located; σ_1 – standard deviation for the value s; σ_2 – standard deviation for the value d.

At the fourth stage of using the prediction model, the calculated values of t_s and t_d should be compared with the tabular value of the student's t-criterion with a given level of significance of t_a. If the calculated value of t is less than the tabular value of t_a, the hypothesis that there is no certain trend is confirmed, if the calculated value is greater, then the trend exists.

It should be noted that if the value $(t_s)$is determined to be greater than the table value (t_a), and the inequality $(t_d) < (t_a)$ holds, then we can conclude that for a given time series, there is a trend on average. At the same time, it can be stated that there is no trend of variance of the series levels.

The calculated value t_s and t_d hould also be compared with tabular values in subsequent years, which made it possible to talk about the presence or absence of a trend in indicators.

The next step in building a financial forecasting model is to analyze time series smoothing methods.

The basis of the mathematical apparatus for this model and forecasting values based on the analysis of previous ones, we use the methodology of Mathematical Statistics – correlation analysis.

To build a model of financial forecasting in innovative processes in the region, it is necessary to use the approach of paired correlation with a sequential search of all parameters to find the relationship between the parameters. To achieve this goal, we will use the Pearson coefficient. The next type of prediction is a prediction made on the basis of regression analysis, which makes it possible to build a model that best matches the data set obtained as a result of the simulated experiment. The degree of compliance is estimated by the sum of the squares of errors, and the error is the difference between the predicted model and the experimental data.

One-dimensional regression will be used to model and predict the values of financial results in the region's innovation processes, and various types of one-dimensional regression will be used to increase the accuracy of the model.

The main form of the MS Access DBMS software is shown in Fig.2.

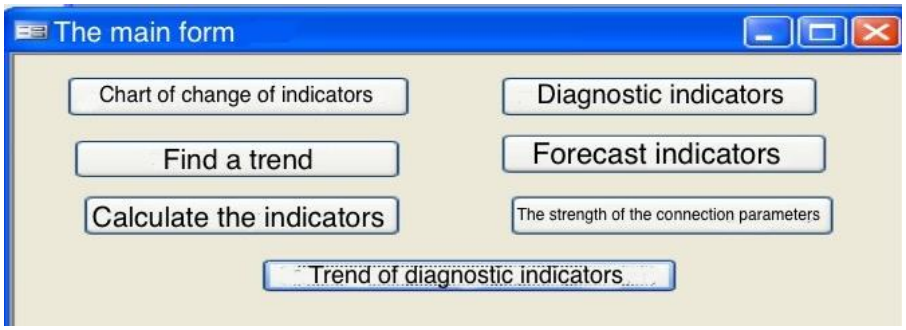

Figure 2. Main database form.

When generating initial parametric data for building a prediction model, the type attribute can contain the following two values:

Table. – table value (input information).

The optimum value that should be studied in a multi-criteria optimization problem.

Based on the Forster-Stewart criterion, you need to search for trends in indicator values. We get the following values (the "Find trends" button).

Indicators are automatically calculated based on Tabular values. The calculation results are displayed in an Excel file to allow further analysis.

The next stage of a comprehensive analysis of the innovative attractiveness of the region is the analysis of diagnostic indicators, respectively, interface elements of DBMS MS Access are used for this purpose.

In the lower-right part of the form, you can automatically create a chart based on the value of the selected indicator by year.

To determine the forecast values of indicators by level you need to normalize the value of indicators using the formula:

$$x_{norm} = \frac{x - x_{min}}{x_{max} - x_{min}} \quad (7)$$

Next, indicators are convoluted using the multiplicative method, which involves multiplying the value of normalized indicators by levels and by year, since we have normalized indicators in different units of measurement. After that, we will find the level trend based on the Forster-Stewart criterion.

Indicators are predicted using regression analysis tools by iterating through models to find the highest correlation coefficient. The regression parameters use the variable X – the year of forecasting, and the variable Y – predicted coefficients.

The use of a forecasting model involves determining the strength of the relationship between the parameters of the model, which is carried out by calculating the correlation coefficient. The value of the coupling strength is justified using a linguistic variable with the limits defined in Table 2.

Table 2. Limits of a linguistic variable for determining the strength of the relationship between parameters of the prediction model.

№	Variable name	Borders
1	There is no connection	0 – 0,4
2	Weak connection	0,41 – 0,7
	Significant connection	0,5 – 0,69
3	Strong connection	0,7 – 0,89
4	Very strong connection	0,9 – 0,99
5	Functional communication	1

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For analysis, you need to take those pairs of parameters whose relationship is no less than a "significant relationship".

CONCLUSIONS

Summing up the research, we can determine that the indicator of innovation attractiveness is a system that identifies the effectiveness of using the innovative potential of a region in the context of developing or implementing an innovative project or program.

So, the proposed approach to modeling the financial results of the subject of the innovation process of the region allows us to predict changes in the innovation potential of the subject of innovation in certain conditions of the innovation space of a certain region.

Using this approach will ensure that its users are reliable and objective about the results obtained.

Thus, if modeling is used by self-government bodies, its results will allow us to analyze the factors of innovation attractiveness of the region and determine the objects of critical attention of the innovation space of the region.

Objective assessment and provision of innovative opportunities in the region, indicators and characteristics of opportunities for implementing innovative processes should be taken into account when forming and implementing an innovative strategy for the development of the region. Long-term innovative solutions of local self-government bodies should be aimed at strengthening the identified motivators and weakening demotivators.

If the user of financial modeling is a representative of the business environment, then its results will allow the subject to predict changes in the indicators of his financial and property status.

In the case of solving the multi-criteria problem of maximizing the sum of indicators of criteria with certain coefficients, it is sufficient to take into account the increase in only certain parameters of the financial and property status, which will automatically lead to an increase in the value of other indicators.

The presence of a strong relationship between some parameters is obvious. For example, the values of the financial parameters "Own current assets" and "Financial autonomy coefficient" are directly proportional to the value of the indicator "Own indicator". The dependence of the indicators "Coverage ratio" and "Financial autonomy ratio" is also linear, they both depend on the amount of asset turnover.

Finding the parameters between which the functional relationship is established indicates that in the multi-criteria optimization problem, one of the pair parameters can be omitted, which significantly reduces the number of criteria.

Determining the strength of the relationship between the coefficients of the financial and property status of the subject of innovation and justifying the factors that accompanied their change should be the task of monitoring programs for the implementation of innovative development in the region.

REFERENCES / ЛІТЕРАТУРА

1. Stan naukovo-innovacijnoyi diyalnosti v Ukrayini u 2020 roci: naukovo-analitychna zapyska [The state of scientific and innovative activity in Ukraine in 2020: scientific and analytical note] [Electronic resource] / T.V. Pisarenko, TK Kuranda, TK Kvasha and others. - K.: UkrINTEI, 2021. - 39 p. [in Ukrainian].
2. Kirdina, O. G., Utkina, Yu. M., Kondratyuk, M. V. Upravlinnya innovacijnoyu diyalnistyu pidpryyemstv v umovax globalnoyi konkurentospromozhnosti. [Management of innovative activity of enterprises in the conditions of global competitiveness] Visnyk ekonomiky transportu i promyslovosti, 2020, 69. S.193-200. [in Ukrainian].
3. Yemel`yanov, O. Yu. Innovacijnyj rozvytok pidpryyemstv: sutnist`, poslidovnist` ocinyuvannya ta pereshkody na jogo shlyahu [Innovative development of enterprises: the essence, sequence of evaluation and obstacles in its path]. Efektyvna ekonomika, 2020, # 11. Retrieved from: http://www.economy.nayka.com.ua/?op=1&z=8329 (accessed 16.12.2021) [in Ukrainian].
4. Hutahayan, B. "The mediating role of human capital and management accounting information system in the relationship between innovation strategy and internal process performance and the impact on corporate financial performance", Benchmarking: An International Journal, 2020, Vol. 27 No. 4, pp. 1289-1318. Available at https://doi.org/10.1108/BIJ-02-2018-0034

5. MALKIEL, B. G. Finance and innovation. Entrepreneurship, Innovation, and the Growth Mechanism of the Free-Enterprise Economies, 2021, 324.

6. Muharam, H., Andria, F., Tosida, E. T. Effect of process innovation and market innovation on financial performance with moderating role of disruptive technology. *Systematic Reviews in Pharmacy*, 2020, 11(1), 223-232.

7. Markina, I. A., Voronina, V. L., Xoroshko, D. R. Upravlinnya innovacijnym potencialom yak faktor strategichnogo rozvytku ta konkurentnyh perevag pidpryyemstva [Management of innovation potential as a factor of strategic development and competitive advantages of the enterprise], *Shidna Yevropa: ekonomika, biznes ta upravlinnya*. 2020. Vyp. №3 (26). S. 76-81. [in Ukrainian]

8. Procz`, V. I. Rozkryttya sutnisnoyi harakterystyky` innovacijnogo potencialu pidpryyemstva [Disclosure of the essential characteristics of the innovative potential of the enterprise]. Suchasni problemy i perspektyvy rozvytku obliku, analizu ta kontrolyu v umovah globalizaciyi ekonomiky: materialy XII Mizhnar. nauk.prakt. konf. (5 grudnya 2020 r). / vidp. red. V.V. Chudovecz. Vyp. 14. Luczk: IVV Luczkogo NTU, 2020. 428 s. 253-255. [in Ukrainian]

9. Karpenko L.M. Statystychna ocinka innovacijno-investycijnoyi pryvablyvosti pidpryyemstv Odeskogo regionu: prognostychna validnist` [Statistical assessment of innovation and investment attractiveness of enterprises in the Odessa region: prognostic validity]. Available at: http://shorturl.at/eqQSU (accessed 16.12.2021) [in Ukrainian]

10. Xu, X. L., Shen, T., Zhang, X., & Chen, H. H. The role of innovation investment and executive incentive on financial sustainability in tech-capital-labor intensive energy company: Moderate effect. Energy Reports, 2020, 6, 2667-2675.

11. Mykytyuk, V. P. Ocinyuvannya efektyvnosti innovacijnogo proektu z pozyciyi investycijnogo aspektu. *Visnyk Hmelnyczkogo nacionalnogo universytetu [Evaluating the effectiveness of an innovative project from the standpoint of investment]. Ekonomichni nauky*, 2017, 5, 156-161. [in Ukrainian]

12. Ma, J., Guo, M. Analysis of scientific and technological innovation influence factors affect enterprise performance. International Journal of Internet Manufacturing and Services, 2020, 7(1-2), 162-175.

13. Li, J., Ren, H., Zhang, C., Li, Q., Duan, K. Substantive innovation or strategic innovation? Research on multiplayer stochastic evolutionary game model and simulation. Complexity, 2020. https://www.hindawi.com/journals/complexity/2020/9640412

14. Kobyelyev V.M., Vasylyuk K.O. Innovatsiyna diyal'nist' promyslovoho pidpryyemstva [Innovative activity of an industrial enterprise]. *Visnyk Natsional'noho tekhnichnoho universytetu "Kharkivs'kyy politekhnichnyy instytut" (ekonomichni nauky)* zb. nauk. pr. Kharkiv, 2018. № 47 (1323). S. 67-72. [in Ukrainian]

15. Sokolova, L. V., Veryasova, G. M., Ivanova, V. B., Sokolov, O. Ye. Teoretyko-metodologichni aspekty pryjnyattya strategichnyh rishen` u sferi innovacijno-investycijnoyi diyal`nosti promyslovyh pidpryyemstv: sytuacijnyj pidxid: monografiya [Theoretical and methodological aspects of strategic decision-making in the field of innovation and investment activities of industrial enterprises: a situational approach]. Sumy, Trytoriya, 2020. C.275-305. [in Ukrainian]

16. Zhong, T.; Zuo, Y.; Sun, F.; Lee, J.Y. Customer Concentration, Economic Policy Uncertainty and Enterprise Sustainable Innovation. Sustainability 2020, 12, 1392. Available at https://doi.org/10.3390/su12041392

17. Topalova I. A. Kompleksna ocinka innovacijnoyi pryvablyvosti galuzi promyslovosti v regioni: metodychnyj aspect [Comprehensive assessment of the innovative attractiveness of industry in the region: a methodological aspect]. *Vestnyk ekonomycheskoj nauki Ukrainy*, 2019, 1 (36), 137-142. [in Ukrainian]

18. Olshanska O. V., Kostynecz` V. V., Stenicheva I. B. Metodychnyj pidxid do ocinyuvannya formuvannya innovacijnogo prostoru regioniv [Methodical approach to assessing the formation of innovation space in the regions]. *Aktualni problemy ekonomiky*. 2020, 11 (232). S. 6-17. [in Ukrainian]

19. Statystychnyj zbirnyk «Regiony Ukrayiny» [19. Statistical collection "Regions of Ukraine"]. Derzhavna sluzhba statystyky Ukrayiny, 2020, Kyyiv, 272 s. [in Ukrainian]

20. Finansova zvitnist` TOV «Texnik» za 2015-2019. [20. Financial statements of Technik LLC for 2015-2019]

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МОДЕЛЮВАННЯ ФІНАНСОВИХ РЕЗУЛЬТАТІВ СУБ'ЄКТІВ ІННОВАЦІЙНОГО ПРОЦЕСУ РЕГІОНУ

У статті розроблено та обґрунтовано методичний підхід до моделювання результатів інноваційного розвитку суб'єктів регіонального бізнес-середовища. Базовими величинами фінансового прогнозування слугували показники інноваційного потенціалу суб'єкта господарювання та показники інноваційної привабливості регіону.

До системи показників інноваційної привабливості регіону включено: показники інноваційної активності регіону, соціально-економічні показники розвитку регіону, показники інноваційного співробітництва регіону, показники міжнародної інтеграції регіону. Для оцінювання інноваційного потенціалу суб'єкта господарювання визначено такі чотири рівні діагностики: потенціал матеріальних активів; потенціал матеріальних активів у формі оборотних засобів; показник інтелектуального потенціалу; рівень використання інноваційного потенціалу.

Для обґрунтування методики аналізу інноваційної привабливості регіону розроблено програмне забезпечення в середовищі СУБД MS Access. Ідентифікування трендів здійснено методом аналізу автокореляції та методом Форстера-Стюарта, використано підхід парної кореляції з послідовним перебиранням усіх параметрів для пошуку залежності між параметрами. Для досягнення цієї мети використовуватимемо коефіцієнт Пірсона; для збільшення точності моделі залучені різні види одновимірної регресії.

Розраховані на основі моделювання прогнозні величини обґрунтували існування тісного зв'язку між очікуваними економічними результатами розвитку інноваційного співробітництва в регіоні та показниками активізації підприємницької ініціативи. Результати моделювання можуть бути покладені в основу формування політики інноваційного розвитку регіону. Також результати моделювання можуть бути використані при виборі стратегічних альтернатив інноваційного розвитку суб'єктів господарювання.

Ключові слова: інноваційний процес, фінансові результати, інноваційний потенціал, інноваційна привабливість

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