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INTELLECTUAL INSTRUMENTAL ANALYSIS IN ECONOMIC SECURITY MANAGEMENT OF THE ENTERPRISES FOR COUNTERING RAIDING

Abstract. Modern views on the economic nature of countering raiding are a permanently important prerequisite for the stable development of the enterprises and the formation of a system of their effective management as the basis for ensuring economic security through the development and implementation of scenarios for countering raiders.

The presented article is aimed at the use of the analytical and methodological tools regarding the introduction into the activities of the enterprise to ensure economic security in terms of countering raiding.

Using the methods of forecasting and modeling the risk of raider seizure of the enterprises, scenarios for countering raiders (intensive, extensive and complex) have been developed for specifying and selecting the appropriate tools for making management decisions to ensure economic security.

The results of forecasting of the enterprises activities showed a significant influence of the environmental factors (financial, economic, social, etc.) on the risk of raider seizure of the representative enterprises within the formed groups. This became the scientific basis for justifying the choice and implementation of the comprehensive scenario for preventing the risk of raider seizure which combines the strategic alternatives.

The outcomes have confirmed the importance of the justification to support the choice and implementation of a comprehensive scenario for the risk preventing of raider seizure through the prism of the problems of ensuring the economic security of the enterprises in a transition economies.

The comprehensive scenario of prevention of raider capture for the enterprises-representatives of the first group provides carrying out the constant analysis of financial and

economic activity, introduction of mechanisms of stimulation of management and financing of risk protection. The following alternatives are proposed for the second group of enterprises with a high level of risk of raider capture, in particular: restructuring and separate accounting of the property complex, constant analysis of financial and economic activities, inclusion of government representatives in the board of directors, risk protection financing.

The practical value lies in the formation and implementation of preventive and stimulating measures to counter raiding to ensure the economic security of the enterprise. This will allow the managers to use the tools to protect against raiding and strengthen of the economic security of the enterprise.

Keywords: risk, raiding; security, modeling, management, forecasting, efficiency, usefulness.

JEL Classification M11, M21, G30

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ІНТЕЛЕКТУАЛЬНИЙ ІНСТРУМЕНТАЛЬНИЙ АНАЛІЗ В УПРАВЛІННІ ЕКОНОМІЧНОЮ БЕЗПЕКОЮ ПІДПРИЄМСТВ ЩОДО ПРОТИДІЇ РЕЙДЕРСТВУ

Анотація. Сучасні погляди на економічну природу протидії рейдерству є перманентно важливою передумовою стабільного розвитку підприємств і формування системи ефективного управління ними як основа забезпечення економічної безпеки за рахунок розроблення та реалізації сценаріїв протидії рейдерам.

Стаття спрямована на використання аналітико-методичного інструментарію щодо впровадження в діяльність підприємства для забезпечення економічної безпеки в частині протидії рейдерству.

За допомогою методів прогнозування і моделювання ризику рейдерського захоплення підприємств розроблено сценарії протидії рейдерам (інтенсивний, екстенсивний, комплексний) для конкретизації і вибору відповідних інструментів ухвалення управлінських рішень для забезпечення економічної безпеки.

Результати прогнозування діяльності підприємств показали значний вплив факторів зовнішнього середовища (фінансові, економічні, соціальні і т. п.) на ризик рейдерського захоплення підприємств-представників у рамках сформованих груп. Це стало науковою основою для обґрунтування вибору і реалізації комплексного сценарію попередження ризику рейдерського захоплення, який об'єднує стратегічні альтернативи. Комплексний сценарій попередження рейдерського захоплення для підприємств-репрезентантів першої групи передбачає проведення постійного аналізу фінансово-господарської діяльності, впровадження механізмів стимулювання менеджменту та фінансування ризик-захисту. Для підприємств-репрезентантів другої групи з високим рівнем ризику рейдерського захоплення запропоновано такі альтернативи, зокрема: реструктуризація і роздільний облік майнового комплексу, постійний аналіз фінансово-господарської діяльності, включення в раду директорів представників органів влади, фінансування ризик-захисту. Отримані результати підтвердили важливість обґрунтування вибору і реалізації комплексного сценарію попередження ризику рейдерського захоплення через призму проблем забезпечення економічної безпеки підприємств у перехідних економіках.

Практична цінність полягає у формуванні та реалізації попереджувальних і стимулювальних заходів протидії рейдерству для забезпечення економічної безпеки підприємства. Це дозволить керівникам підприємств використовувати інструментарій для захисту від рейдерства та зміцнення економічної безпеки підприємства.

Ключові слова: ризик, рейдерство, безпека, моделювання, управління, прогнозування, ефективність, корисність.

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Introduction. The activities of the enterprises in Ukraine are accompanied by crisis tendencies of the destabilizing nature, uncertainty and unpredictability of the partners' actions and a high risk of raider seizure. According to the representatives of the Anti-Raider Association of Ukraine for the period 2016—2020 about 5 thousand enterprises were affected by the raiding. The objective assessment of the impact of the environmental factors on the state of the economic security, timely response to the aggressive actions of raiders allows to form the effective mechanism for economic security of enterprises and to develop universal and specific management solutions for counteracting raider seizure. Modern scientific and methodological tools for modeling and forecasting the risk of raider seizure will allow to achieve the set goals.

The importance of developing the appropriate protection mechanism that will be the effective tool to increase the level of economic security of the enterprise in the long term is emphasized in the Presidential Decree of Ukraine «On the Decision of the National Security and Defense Council of Ukraine of September 14, 2020» [21]. The document establishes the priority areas of national security, social development in the direction of protection of the rights, freedoms and interests of citizens, sustainable development of the national economy and its integration into the modern European space.

Based on the promising directions of this strategy of ensuring the methodological foundations of economic security management in the process of countering raiding using modern intelligent tools of economic and analytical analysis, there is an immediate need for the realization into the activities of the enterprises in Ukraine.

Analysis of research and problem statement. The problem of ensuring the enterprises economic security, the peculiarities of the functioning of enterprises in conditions of unfriendly mergers and acquisitions, the assessment of raider threats and the theoretical and methodological

foundations of the formation of a mechanism for counteracting raider seizure have become the subject of systematic and in-depth studies of many foreign and Ukrainian scientists-economists. Varnaly [17] interprets security as a state, a situation of rest, when there is no real danger, as well as material, economic, political conditions, relevant authorities and organizations that contribute to the formation of such a situation.

Heets, Kyzym and Klebanova [6] emphasize the importance of ensuring economic security as it creates the basis for the sustainable functioning and development of the enterprise through the timely mobilization and most rational use of labor, financial, technical, technological and other resources of the enterprise under the influence of external and internal threats. Liashenko [12] works substantiate the theoretical and methodological principles of forming a mechanism for ensuring economic security which allowed to develop some elements of the mechanism for the forming economic security in terms of countering raiding of the enterprises.

Dreher i Schneider [5] analyze the link between the black economy and corruption and raiding, highlighting the shortcomings of the existing legal system in high-income countries. Kuzmynchuk [10] examines the institutional aspect of ensuring economic security in the system of the state regulation of entrepreneurship in the global and local aspects and creates the conditions for the development of a solid state policy in the field of protecting the property interests of business entities. Derevyanko [4] identifies the means of counteracting and overcoming «raiding» by implementing certain measures at the state level to increase the level of protection of enterprises from «raider» attacks through the introduction of a register containing attempts and cases of raider attacks on property and corporate business rights. The objective assessment of the impact of external and internal environmental factors on the state of economic security, a timely response to aggressive actions of raiders, the use of all opportunities to neutralize hostile takeovers and mergers allow us to form the effective mechanism for ensuring the economic security of the enterprises and to justify the management decisions to counter raider seizures. The problem of ensuring the economic security of an enterprise to counter raiding was studied in E. Croci's work [3], researched the features of corporate raiders' behavior in the long term. Lambrecht [12] developed a model and disinvestment in declining industries; which explains the consequences of the closure of low-leveraged companies on their owners. The works [8; 9; 19] assess the efficiency of the enterprise security system based on taking into account the factors of influence on corporate security. The use of economic and mathematical tools to study these processes were highlighted in these scientific papers [2; 7; 16; 18].

According to the authors, the existing approaches for predicting the influence of external and internal environmental factors on the risk of raider seizure and assessing the management decisions effectiveness to ensure the economic security of an enterprise do not allow to permit the systemic research, since they are accompanied by limited access to the necessary information, does not allow to take into account the full range of factors, reasons and the conditions for the flow of these processes, accumulate and structure information and make timely management decisions in the direction of countering or completely leveling possible threats. That is why the algorithm for modeling and predicting the influence of environmental factors on the risk of raider seizure is implemented which is based on the rules of fuzzy logic by using the mathematical theory of fuzzy sets [1]. It is considered the most reasonable and comprehensive approach for assessing the effectiveness of management decisions to ensure the economic security of the enterprises to counter raiding, which is presented in the work [14]. Its application in practice makes it possible, with the least errors, to form the priority tasks of management activities and implement a set of measures for the appropriate level of protection against raiding through the use of complex methods focused on preventing raider seizure of the enterprise. The urgency of the problem of the economic security ensuring of the enterprises in Ukraine in the difficult conditions of the economic activity, the negative influence of factors of both the internal and the external environment, raider threats requires the use of modern modeling tools, predicting the influence of factors on the risk indicator

of raider seizure of the enterprises and evaluating the effectiveness management decisions for the implementation of reasonable universal measures of targeted impact.

However, the fundamental studies are virtually non-existent by the using of intelligent instrumental analysis for model the factors influence on the risk indicator of raider seizure in the combination with the approaches to assessing the of management decisions effectiveness as the element of the mechanism for preventing the risk of raider seizure of an enterprise.

That is why the need to further develop the methodological dominants of the application of economic security in the process of countering raiding on the basis of existing scientific and practical, analytical, informational and methodological approaches for forecasting the development of crisis situations and assessing the management decisions effectiveness to ensure the economic security of enterprises requires further processing.

The purpose of this article is to further development of the methodological basis for the application of economic security to counter raiding based on the intelligent instrumental approach to modeling and forecasting the impact of the factors on the risk of raider seizure of machine-building enterprises and assessing the effectiveness of management decisions to ensure the economic security of the enterprises in Ukraine. In the research it is used scenario modeling of the situation which is based on the method of multi-criteria selection of strategic alternatives with using fuzzy sets to analyze possible options for the development of the resulting indicator — the risk of raider seizure and determine the best scenarios.

Research results. The mathematical theory of fuzzy sets developed by Zadeh [20] expands the possibilities of describing fuzzy concepts and their application in practice to analyze the strength and significance of the influence of environmental factors. The proposed method is implemented in Application Program Package (APP) MathLab (expansion of Fuzzy Logis Toolbox) to take into account the factors nature effects on the risk of raider seizure, the changes dynamics of depending on changes in the situation, changes in factors over time.

To select the best management decision from the existing set of alternatives, it is advisable to use the theory of utility, in the classical form it is considered in the work [15]. The methods of utility theory are used to select and quantify the most effective management decisions that are adequate to the current situation and take into account the forecast conditions for timely corrective actions to limit threats to the internal and external environment to ensure economic security.

The algorithm of modeling and appropriate researches tasks of the level of factors influence of external environment of the enterprises on the risk indicator of raider seizure are realized in this work on the basis of rules of fuzzy logic and are presented in *Fig. 1*. The feasibility of using the proposed modeling tools lies in the fact that when assessing the risks of raider seizure of the enterprises, the fuzzy classification of situations was taken into account, it is impossible to unambiguously determine within the framework of conventional models.

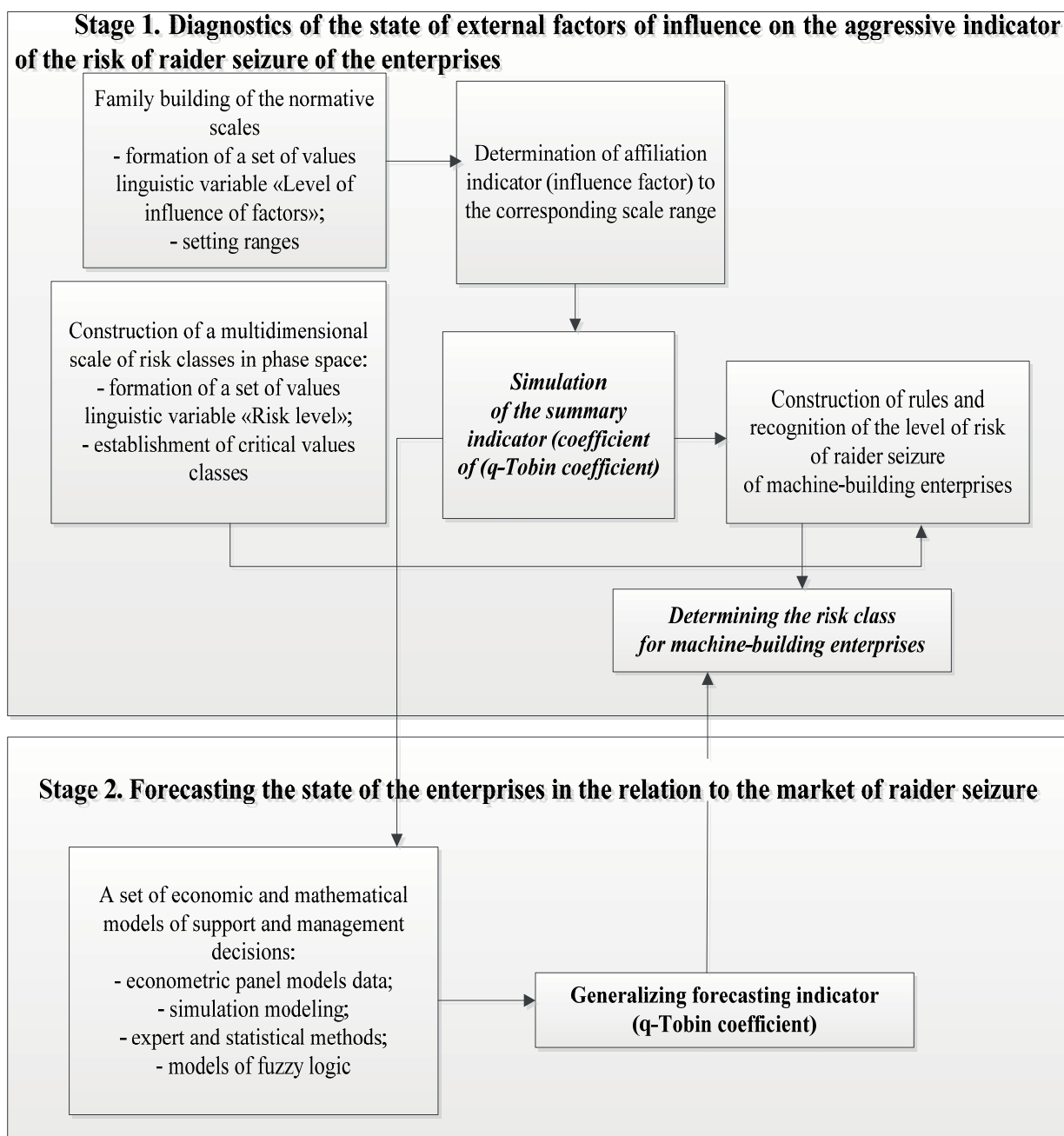


Fig. 1. Algorithm for the factors influence modeling on the risk indicator of raider seizure of the enterprises

The development of a set of justified management decisions for the economic security of the enterprises, depending on the specific case of the protection level against raiding, it is implemented on the basis of the utility theory by implementing a multi-criteria choice of management decisions based on adaptive convolution by using fuzzy sets and determining the fuzzy utility of alternative management decisions.

Within the framework of the proposed approach, as a result of monitoring the economic activity of the enterprises, a reasonable list of directions for ensuring economic security in terms of protection against raiding is formed which can be implemented under the certain conditions, in particular: 1) warning is responsible for the deterrent risk scenario; 2) reduction is responsible for the scenario of neutral risk; 3) transfer is responsible for the neutral risk scenario; 4) active counteraction is responsible for the incentive risk scenario. Within the framework of various options for the levels of protection against raiding, depending on the situation at the enterprise, a complex of management decisions is formed.

The definition of a set of criteria for evaluating alternatives is based on the following initial input data:

1) the linguistic variable for assessing the relative importance of the criteria has a four-level gradation, given by fuzzy numbers of triangular type of membership functions: $W = \{W_1$ — partially important; W_2 — locally important; W_3 — complexly important; W_4 — systemically important};

2) the linguistic variable for assessing the importance of alternatives according to the criteria has a three-level gradation, given by fuzzy numbers of triangular form of membership functions: $R = \{R_1$ = satisfactory; R_2 = good; R_3 = excellent};

3) the calculation of weighted estimates of alternatives ($R_{ij}, i = \overline{1, m}$) according to the coefficient of the relative importance of the criteria ($W_j, j = \overline{1, m}$) was carried out according to the following formulas:

$$R'_1 = R'_{11}W'_1 + R'_{12}W'_2 + R'_{13}W'_3, \quad (1)$$

$$R''_1 = R''_{11}W''_1 + R''_{12}W''_2 + R''_{13}W''_3, \quad (2)$$

$$R^*_1 = R^*_{11}W^*_1 + R^*_{12}W^*_2 + R^*_{13}W^*_3, \quad (3)$$

where R', R'', R^* accordingly, the left border, the right border, the top of the fuzzy number R ;

W', W'', W^* — boundaries and top of the fuzzy number W .

Calculating the fuzzy utility of alternatives for solving the problem of forming options for ensuring the economic security in the framework of preventing raider attacks of the enterprises is based on the calculating the fuzzy utility of an alternative a_i .

The fuzzy expected utility of the alternative $a_i, i = \overline{1, m}$ has options $x_j, j = \overline{1, n}$ which follow with linguistic probabilities \tilde{P}_{ij} and have fuzzy utility \tilde{u}_j .

Denote $p = (p_1, p_2, \dots, p_n)$, $u = (u_1, u_2, \dots, u_n)$ i $pu = \sum_{j=1}^n p_j u_j$.

Then the fuzzy expected utility of the alternative a_i is the relevant fuzzy set:

$$\mu_{V_i}(u) = \sup_{pu} \min_{j=1, n} (\mu_{u_j}(u_j), \mu_{\tilde{P}_{ij}}(p_j)), \quad (4)$$

in restricting:

$$u = up, \sum_{j=1}^n p_j = 1. \quad (5)$$

The calculation algorithm is represented by the following sequential stages [13]:

Stage 1. Compilation of alternatives for countering raiding ((a_i) in ascending order.

Stage 2. The choice of the value ($\alpha (\alpha \in [0, 1])$) for determining the level sets.

Stage 3. Determination of special indices (k^- and k^+) in which the smallest and largest values of the utility function are achieved.

$$1 - \sum_{j=1}^{k^-} m_{ij}(\alpha) - \sum_{j=k^-+1}^n m_{ij}(\alpha) \in [m_{ik^-}(\alpha), M_{ik^-}(\alpha)], \quad (6)$$

$$1 - \sum_{j=1}^{k^+} m_{ij}(\alpha) - \sum_{j=k^++1}^n m_{ij}(\alpha) \in [m_{ik^+}(\alpha), M_{ik^+}(\alpha)]. \quad (7)$$

Stage 4. Assessment of the values of the fuzzy interval of the usefulness of measures. Calculation of the values of the corresponding Infimum and Supremum (maximum and minimum of the utility function) ($(\inf V_{i_\alpha} (k = k^-)$ and $(\sup V_{i_\alpha} (k = k^+)$) by the formulas:

$$\inf V_{i_\alpha} = \max_{k=1, n} \left(\sum_{j=1}^{k-1} M_{ij}(\alpha) u_j + (1 - \sum_{j=1}^{k-1} M_{ij}(\alpha) - \sum_{j=k+1}^n m_{ij}(\alpha)) u_k + \sum_{j=k+1}^n m_{ij}(\alpha) u_j \right), \quad (8)$$

$$\sup V_{i_\alpha} = \min_{k=1, n} \left(\sum_{j=1}^{k-1} m_{ij}(\alpha) u_j + (1 - \sum_{j=1}^{k-1} m_{ij}(\alpha) - \sum_{j=k+1}^n M_{ij}(\alpha)) u_k + \sum_{j=k+1}^n M_{ij}(\alpha) u_j \right), \quad (9)$$

where m and M are definitely the lower bounds of the parent factors.

Stage 5. Estimation of utility — the position of the coordinates of the vertex from the function of belonging to the tricot type for the formula:

$$V_1 = \sum_{j=1}^n \tilde{P}_j \tilde{U}_j, \quad (10)$$

with the relevant fuzzy probabilities of the level of financial security $\tilde{P}_1, \tilde{P}_2, \tilde{P}_3$ and the relevant fuzzy utilities — \tilde{U}_i

Stage 6. Construction and graphical interpretation of the membership functions of the calculated fuzzy expected utility of alternatives.

Effectiveness evaluation of the implementation of management decisions to ensure economic security was carried out on the basis of simulation experiments, it allows, on the basis of comparing the simulated value of the q-Tobin coefficient in the forecast period with its base value, to determine an acceptable scenario for countering raider seizure (intensive prevention, extensive prevention, comprehensive measures of intensive prevention, measures of extensive prevention, a full range of measures).

The study uses the following two linguistic variables: «Level of influence of environmental factors» and «Level of risk». On the first stage of modeling, the set of the states of the enterprise under the factors influence is divided into five fuzzy sets. In turn, the linguistic variable «Level of risk» has three meanings: fuzzy subset «Retaining risk»; fuzzy subset «Neutral risk»; fuzzy subset «Incentive risk». The functions of belonging to each level of the influence of the environmental factors and the level of risk of raider seizure of the enterprises by the certain linguistic variables are constructed. The rules of fuzzy logical inference are formed to determine compliance between the level of risk and the set of values for the linguistic variables of the factors influence on the levels of the environment. Simulation experiments were performed which allowed to look at possible variants of the future situations development in the conditions of influence of this set of the factors. Using the methods of cognitive and scenario modeling, the influence of possible options for the development of the enterprises under the influence of environmental factors was realized and predicted the values of the economic result from their implementation were obtained for the generalizing indicator (q-Tobin) (Fig. 2). It should be noted that in order to prevent the influence on the image of the studied objects – enterprises – in the research it is not «revealed» their names, but submit them under numbers. To obtain results tied to real enterprises.

Within the framework of the study, a high level of dependence of the parameters - the coefficients of the threats assessing of raider seizure of the enterprise on the occurrence and degree of intensification of the action of factors and risks of raider seizure was established. Thus, there is a growing need to manage processes that affect the state and trends in the development of critical indicators, that is, it is necessary to develop measures that help prevent the possibility of the transition of threatening indicators to critical ones. In order to develop a set of grounded management decisions for ensuring economic security of the enterprise, depending on the specific case of the level of protection against raiding, the study carried out a multicriteria choice and substantiation of their effectiveness of solutions based on the intellectual instrumental analysis.

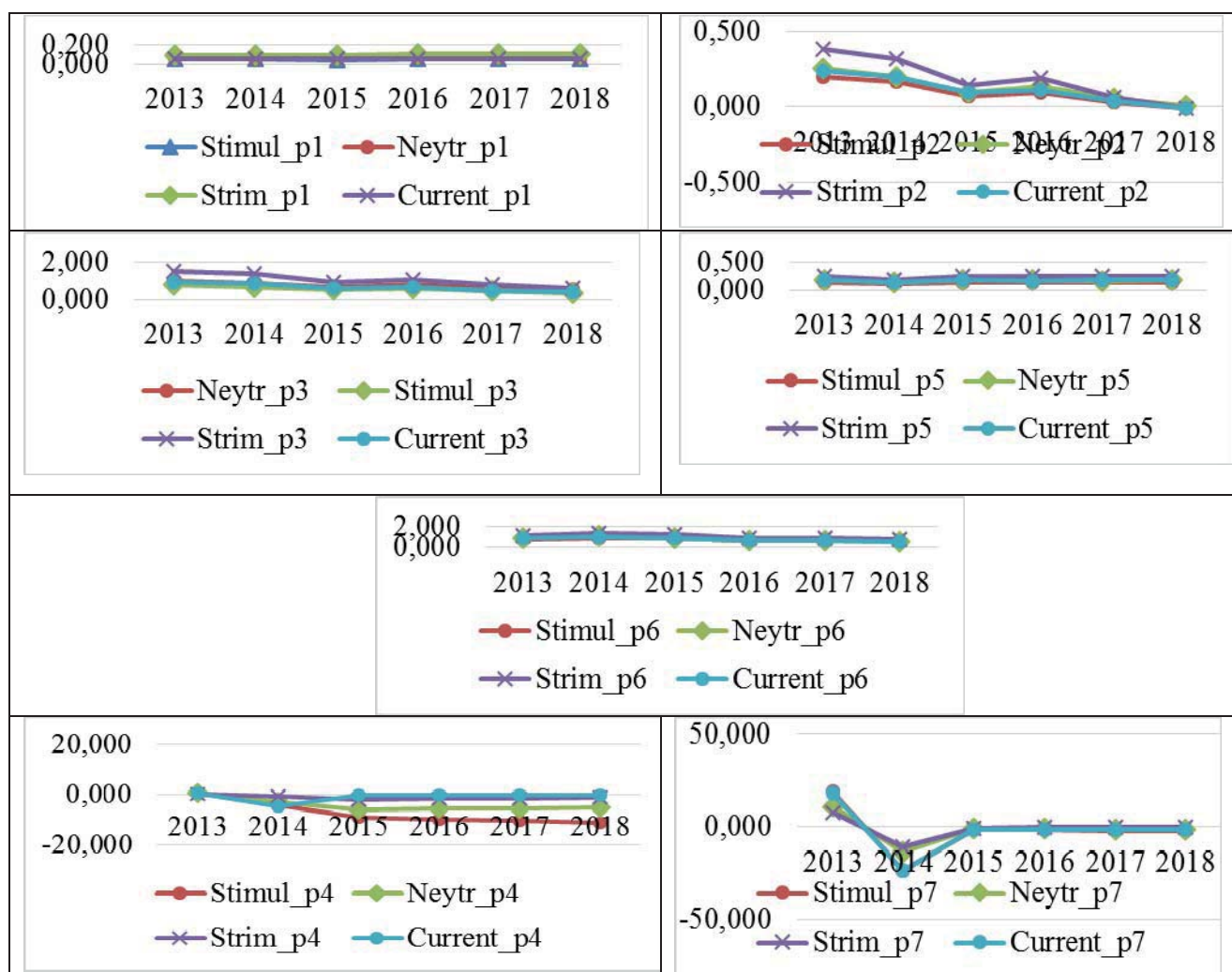


Fig. 2. Dynamics of the predicted values of the q-Tobin index for the studied of the enterprises under the conditions of the baseline scenario and risk scenarios

Note: Stimul_p1 — stimulating risk for №1; Stimul_p2 — stimulating risk for № 2; Stimul_p3 — stimulating risk for № 3; Stimul_p4 — stimulating risk for № 4; Stimul_p5 — stimulating risk for № 5; Stimul_p6 — stimulating risk for № 6; Stimul_p7 — stimulating risk for № 7; Strim_1 — deterrent risk for № 1; Strim_2 — deterrent risk for № 2; Strim_3 — deterrent risk for № 3; Strim_4 — deterrent risk for № 4; Strim_5 — deterrent risk for № 5; Strim_6 — deterrent risk for № 6; Strim_7 — deterrent risk for № 7; Neytr_p1 — neutral for № 1; Neytr_p2 — neutral for № 2; Neytr_p3 — neutral for № 3; Neytr_p4 — neutral for № 4; Neytr_p5 — neutral for № 5; Neytr_p6 — neutral for № 6; Neytr_p7 — neutral for № 7; Current_p1 — base for № 1; Current_p2 — base for № 2; Current_p3 — base for № 3; Current_p4 — base for № 4; Current_p5 — base for № 5; Current_p6 — base for № 6; Current_p7 for № 7.

The set of the investigated enterprises is divided into two groups according to the value of the Tobin's q -coefficient which characterizes the level of risk of raider seizure [14]. Among the first group enterprises for which the risk of raider seizure is low, enterprise № 5 was selected for the further analysis.

Fuzzy probabilities of utility options of the management decision options it is established for enterprise № 5, the level of raider risk of which is relatively low by the value of the Tobin's q -coefficient. The graphical interpretation of affiliation functions of the calculated fuzzy expected benefits of strategic development alternatives is shown in *Fig. 3*.

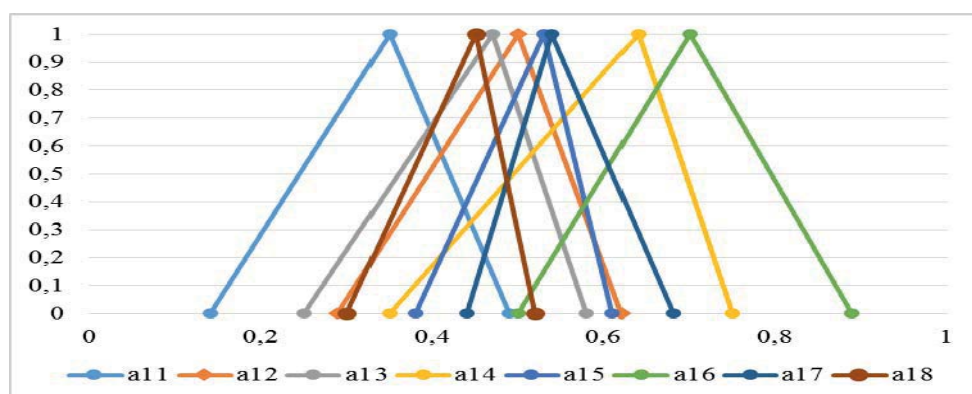


Fig. 3. Affiliation functions of fuzzy expected utility alternatives for enterprise № 5

This graph shows the calculated functions of belonging to the fuzzy expected benefits of the strategic alternatives to ensure the appropriate level of risk of raider seizure $m(U)$ and the value of utility of each alternative solution U .

Analyzing the obtained functions of affiliation, it can be concluded that the greatest expected utility for the studied enterprise has a solution a_{1_6} — a constant analysis of the financial and economic activities, the value of the expected utility from this event is 0.89. Alternatives are also quite important: a_{1_4} — the development of corporate management (0.75); a_{1_7} — introduction of management incentives (0.68), a_{1_2} — financing of risk protection (0.62), so the priority implementation of certain management decisions will also be more effective among others. Among the second group enterprises for which the risk of raider seizure is high, the enterprise № 7 was chosen for the further analysis.

Fuzzy probabilities of utility options of management decision variants should also be established for enterprise № 7, the level of raider risk of which is the highest in terms of Tobin's q -coefficient [14]. A graphical interpretation of affiliation functions of the calculated fuzzy expected benefits of strategic development alternatives is shown in Fig. 4.

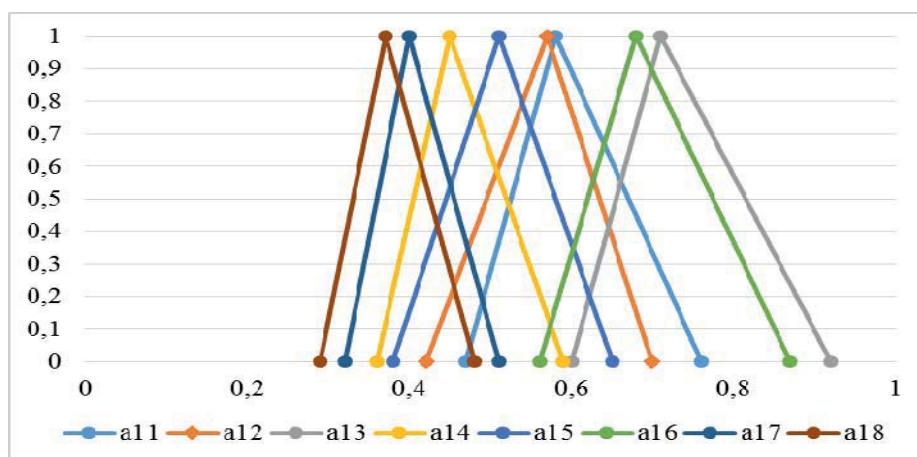


Fig. 4. Affiliation functions of fuzzy expected utility alternatives for enterprise № 7

This graph shows the calculated functions of belonging to the fuzzy expected benefits of strategic alternatives to ensure the appropriate level of risk of raider seizure $m(U)$ and the value of the benefits of each alternative solution U . Analyzing the obtained functions of affiliation, it leads to a conclusion that the greatest expected utility for enterprise № 7 a_{1_3} — restructuring and separate accounting of the property complex, the value of the expected utility from this event is

0.92; a_{1_6} – constant analysis of financial and economic activities (0.87); a_{1_1} — inclusion in the board of directors of authorities (0.76); a_{1_2} — risk protection financing (0.7). Priority implementation of the certain management decisions will be more effective among others.

As a result of the combination of the most useful alternatives for the studied enterprises, it was formed 3 types of decision-making scenarios: a scenario for the implementation of a full range of activities (Scen_All) an intensive warning scenario (Scen_Int) an extensive raiding prevention scenario (Scen_Ext).

The results of simulation experiments to assess the management decisions effectiveness for selected enterprises are given in *Table*. Thus, based on the simulation results, the most acceptable strategies for enterprises-representatives of each group enterprises are established: for enterprise № 5 (relatively low level of risk of raider capture) and for enterprise №7 (high level of risk of raider seizure) the best result is obtained under the conditions of implementation scenario «Scen_All» — comprehensive implementation of management decisions that have been selected as the most effective for each enterprise. According to the results of calculations, the implementation of this approach improves the quality of development alternatives based on non-random selection of comprehensive measures for the appropriate level of protection against raiding, taking into account their usefulness for the enterprise and requires implementation and control by the economic security units for counteracting raiding.

Table

The results of simulation experiments on scenarios for the implementation of alternatives to prevent raider seizure

Alternatives	The value of the Tobin coefficient (Y)					
	enterprise № 5			enterprise № 7		
Scenarios	Y (2018), unit	Absolute increase, unit	Relative increase, %	Y (2018), unit	Absolute increase, unit	Relative increase, %
Baseline scenario	0,577	-	-	-1,720	-	-
Full range of events (Scen_All)	0,836	0,259	45	-0,024	1,696	-98,6
Intensive prevention measures (Scen_Int)	0,709	0,133	23	-0,516	1,204	-70
Extensive warning measures (Scen_Ext)	0,605	0,029	5	-1,152	0,568	-33

On this basis, based on the calculations results, a conceptual approach to the organization of units of the functional structure of the security service for countering raiding in the system of economic security of the enterprises can be proposed.

The implementation of this approach allows to solve the problem of synthesis of functional structure for the implementation of the mechanism of economic security in the framework of protection against raiding and to establish that the proposed structure is characterized by continuity of management decision-making to eliminate threats of raider seizure assessment, parallel implementation of its various stages, combining into one integrated complex which allows to identify and prevent external and internal risks, ensuring the sustainability of enterprises based on the economic interests and available resources.

Conclusion. The article implements the algorithm for modeling of the environmental factors influence (financial, economic, social, etc.) on the risk indicator of raider seizure of the enterprises based on the rules of fuzzy logic. The proposed toolkit makes it possible to analyze the strength and significance of the environmental factors influence and to predict the state of the enterprise in relation to the risk of raider seizure. The study also revealed the consequences of the environmental factors influence and the risk levels of raider seizure and their combinations on the functioning of the enterprise, forecasting the q-Tobin index for the studied enterprises for each level of the risks of raider seizure and certain influence factors.

The assessment of the management decisions effectiveness for ensuring the economic security of the enterprises in countering raiding made it possible to establish the most acceptable strategies for enterprises-representatives of each group, taking into account the predicted values of the q-Tobin index

The practical value of the obtained results is the knowledge of how to facilitate the choice of timely corrective actions in order to limit the threats to the internal and external environment to ensure the economic security of enterprises. These results might be of a special practical importance for business owners and managers and anyone interested in preventing the threats of raider seizure.

The further research prospects are to solve the problem of the building of the functional structure of the security service to counter raiding in order to increase the efficiency of managerial decisions, the quality and timeliness of their adoption and the possibility of implementing timely corrective actions to prevent raider seizures in the conditions of action of threats of the internal and external environment.

Література

1. Антонюк О. П. Обґрунтування вибору параметрів моделі на основі інформаційних критеріїв. *Економічний простір*. 2015. № 95. С. 255—262.
2. Baltagi Badi H. *Econometric Analysis of Panel Data*. New York : John Wiley Sons, Inc., 1995. 258 p.
3. Croci E. Corporate Raiders, Performance and Governance in Europe. *European Financial Management*. 2007. Vol. 13. № 5. P. 949—978.
4. Derevyanko B., Pashkov, Turkot O., Zahrisheva N., Bisiuk O. Addressing the issue of corporate raiding in Ukraine. *Problems and Perspectives in Management*. 2020. Vol. 18 (1). P. 171—180.
5. Dreher A., Schneider F. Corruption and the Shadow Economy: an Empirical Analysis. *Public Choice*. 2010. Vol. 144 (1). P. 215—238.
6. Гесць В. М., Кизим М. О., Клебанова Т. С., Черняк О. І. та ін. Моделювання економічної безпеки: держава, регіон, підприємство : монографія / за ред. В. М. Гейця. Харків : ВД «ІНЖЕК», 2006. 240 с.
7. Wooldridge J. M. *Econometric analysis of cross section and panel data*. Cambridge, Massachusetts ; London, England : The MIT press, 2010. 736 p.
8. Кавун С. В. Економічна безпека підприємства: інформаційний аспект : монографія. Харків : Щедра садиба плюс, 2014. 311 с.
9. Kavun S., Čaleta D., Vršec M., Brumník R. Estimation of the Effectiveness and Functioning of Enterprises in Boards of Corporate Security. *European Journal of Scientific Research*. 2013. Vol. 104. № 2. P. 304—323. URL : <https://goo.gl/BPTeGu>.
10. Кузьминчук Н. В. Економічна безпека в системі державного регулювання підприємництва: інституціональний аспект. *Адаптивне управління: теорія і практика. Економіка*. 2018. Вип. 5 (10). URL : <https://amtp.org.ua>.
11. Lambrecht B., Myers S. Theory of Takeovers and Disinvestment. *The Journal of Finance*. 2007. № 2. P. 809—845.
12. Ляшенко О. М. Концептуалізація управління економічною безпекою підприємства : монографія. Луганськ : Вид-во СНУ ім. Володимира Даля, 2011. 400 с.
13. Момот Т. В., Писаревський М. І. Оцінка впливу параметрів загроз рейдерського захоплення на показник ринкової вартості підприємств машинобудування. *Проблеми економіки*. Харків : ХНЕУ, 2015. № 4. С. 309—319.
14. Писаревський М. І. Аналітичний аспект оцінки ризику рейдерського захоплення підприємств машинобудування. *Східна Європа: економіка, бізнес та управління*. 2016. Вип. 2. С. 313—317. URL : http://www.easterneuropebm.in.ua/journal/2_2016/60.pdf.
15. Рыжов А. П., Лупан І. В. Элементы теории нечетких множеств и измерения нечеткости. Москва : Диалог-МГУ, 1998. — 190 с.
16. Шевченко Н. Г., Лупай І. В. Моделювання з використанням панельних даних. *Наукові записки КДПУ. Математичні науки*. Кіровоград : КДПУ ім. В. Винниченка, 2014. Вип. 73. С. 66—79.
17. Варналії З. С., Буркальцева Д. Д., Сасенко О. С. Економічна безпека України: проблеми та пріоритети зміцнення : монографія. Київ : Знання України, 2011. 299 с.
18. Wooldridge J. M. *Econometric Analysis of Cross Section and Panel Data*. Cambridge : MIT Press, 2002. Ch. 10. 1051 p.
19. Забродський В. А., Кизим М. О. Власність, економічна безпека і держава. *Економічна кібернетика*. 2000. № 3—4. С. 58—63.
20. Zadeh L. Fuzzy Sets. *Information and Control*. 1965. Vol. 8. P. 338—353.
21. Указ Президента України № 392/2020 «Про рішення Ради національної безпеки і оборони України від 14 вересня 2020 року «Про Стратегію національної безпеки України». URL : <https://www.president.gov.ua/documents/3922020-35037>
22. На заступника міністра юстиції пропонують відкрити кримінальну справу. *Асоціація тваринників України*. 2017. 25 жовтня. URL : <https://www.usba.com.ua/index.php/na-zastupnika-ministra-usticii-proponuut-vidkriti-kriminalnu-spravu>.

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References

1. Antoniuk, O. P. (2015). Obgruntuvannia vyboru parametriv modeli na osnovi informatsiinykh kryteriiv [Substantiation of the choice of model parameters on the basis of information criteria]. *Ekonomicnyi prostir — Economic space*, 95, 255—262 [in Ukrainian]
2. Baltagi Badi, H. (1995). *Econometric Analysis of Panel Data*. New York: John Wiley Sons, Inc.

3. Croci, E. (2007). Corporate Raiders, Performance and Governance in Europe. *European Financial Management*, 13 (5), 949—978.
4. Derevyanko, B., Pashkov, V., Turkot, O., Zahrisheva, N., & Bisiuk, O. (2020). Addressing the issue of corporate raiding in Ukraine. *Problems and Perspectives in Management*, 18 (1), 171—180.
5. Dreher, A., & Schneider, F. (2010). Corruption and the Shadow Economy: an Empirical Analysis. *Public Choice*, 144 (1), 215—238. <https://doi.org/10.1007/s11127-009-9513-0>.
6. Heiets, V. M., Kyzym, M. O., Klebanova, T. S., Cherniak, O. I. (et al.). (2006). *Modeliuvannia ekonomichnoi bezpeky: derzhava, rehion, pidpriemstvo [Modeling of economic security: state, region, enterprise]*. V. M. Heiets (Ed.). Kharkiv: VD INZHEK [in Ukrainian].
7. Jeffrey, M. (2010). Wooldridge. Econometric analysis of cross section and panel data. Cambridge; Massachusetts; London, England: The MIT press.
8. Kavun, S. V. (2014). *Ekonomichna bezpeka pidpriemstva: informatsiyni aspekt [Economic security of the enterprise: information aspect]*. Kharkiv: Shchedra sadyba plius [in Ukrainian].
9. Kavun, S., Čaleta, D., Vršec, M., & Brumník, R. (2013). Estimation of the Effectiveness and Functioning of Enterprises in Boards of Co prorated Security. *European Journal of Scientific Research*, Vol. 104 (2), 304—323.
10. Kuzmynchuk, N. V. (2018). Ekonomichna bezpeka v systemi derzhavnoho rehuliuвання pidpriemnytstva: instytutsionalnyi aspekt [Economic security in the system of state regulation of entrepreneurship: the institutional aspect]. *Adaptyvne upravlinnia: teoriia i praktyka. Ekonomika — Adaptive control: theory and practice. Economy*, 5 (10). Retrieved from <https://amp.org.ua> [in Ukrainian].
11. Lambrecht, B. (2007). Theory of Takeovers and Disinvestment. *The Journal of Finance*, Vol. 2, 809—845.
12. Liashenko, O. M. (2011). *Kontseptualizatsiia upravlinnia ekonomichnoiu bezpekoiu pidpriemstva [Conceptualization of management of economic security of the enterprise]*. Luhansk: Vyd-vo SNU im. Volodymyra Dalia [in Ukrainian].
13. Momot, T. V., & Pysarevskyi, M. I. (2015). Otsinka vplyvu parametriv zahroz reiderskoho zakhoplennia na pokaznyk rynkovoї vartosti pidpriemstva mashynobuduvannia [Estimation of influence of parameters of threats of raider capture on an indicator of market value of the machine-building enterprise]. *Problemy ekonomiky — Problemy ekonomiky*, 4, 309—319 [in Ukrainian].
14. Pysarevskyi, M. I. (2016). Analitichnyi aspekt otsinky ryzyku reiderskoho zakhvatu pidpriemstv mashynobuduvannia [Analytical aspect of risk assessment of raider capture of machine-building enterprises]. *Shhidna Yevropa: ekonomika, biznes ta upravlinnia — Eastern Europe: Economy, Business and Management*, 2, 313—317. Retrieved from http://www.easterneurope-bm.in.ua/journal/2_2016/60.pdf [in Ukrainian].
15. Ryzhov, A. P. (1998). *Elementy teorii nechetkikh mnozhestv i izmereniya nechetkosti [Elements of the theory of fuzzy sets and fuzzy measurements]*. Moscow: Dialog-MGU [in Russian].
16. Shevchenko, N. H., & Lupai, I. V. (2014). Modeliuvannia z vykorystanniam panelnykh danykh [Modeling using panel data]. *Naukovi zapysky KDPU. Matematychni nauky — Scientific notes of KSPU. Mathematical sciences*, 73, 66—79. Kirovograd: KDPU im. V. Vynnychenka [in Ukrainian].
17. Varnalii, Z. S., Burkaltseva, D. D., & Saienko, O. S. (2011). *Ekonomichna bezpeka Ukrainy: problemy ta priorityety zmitsnennia [Economic security of Ukraine: problems and priorities of strengthening]*. Kyiv: Znannia Ukrainy [in Ukrainian].
18. Wooldridge, J. M. (2002). Econometric Analysis of Cross Section and Panel Data. Cambridge: MIT Press.
19. Zabrodskyi, V. A., & Kyzym, M. O. (2000). Vlasnist, ekonomichna bezpeka i derzhava [Property, economic security and the state]. *Ekonomichna kibernetika — Economic Cybernetics*, 3—4, 58—63 [in Ukrainian].
20. Zadeh, L. (1965). Fuzzy Sets. *Information and Control*, 8, 338—353.
21. Ukaz Prezidenta Ukrainy № 392/2020 «Pro rishennia Rady natsionalnoi bezpeky i oborony Ukrainy vid 14 veresnia 2020 roku «Pro Stratehiu natsionalnoi bezpeky Ukrainy» [Decree of the President of Ukraine № 392/2020 «On the decision of the National Security and Defense Council of Ukraine of September 14, 2020» On the National Security Strategy of Ukraine]. (2020). Retrieved from <https://www.president.gov.ua/documents/3922020-35037> [in Ukrainian].
22. Asotsiatsiia tvarynnikiv Ukrainy. (2017, October 25). *Na zastupnyka ministra yustytzii proponuiut vidkryty kryminalnu spravu [It is proposed to open a criminal case against the Deputy Minister of Justice]*. Retrieved from <https://www.usba.com.ua/index.php/na-zastupnika-ministra-usticii-proponuiut-vidkriti-kryminalnu-spravu> [in Ukrainian].

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