

Olena Rayevnyeva¹, Iryna Aksonova², Viktoriia Derykhovska³, Olha Brovko⁴

ECONOMIC SECURITY OF THE REGIONS: COMPARATIVE ANALYSIS OF APPROACHES AND CONSTRUCTION OF THE TECHNOLOGY OF ASSESSMENT

ABSTRACT:

In today's conditions of country's development, the economic security of the regions serves as a guarantor of the independence of the territory and an indicator of its economic growth. Economic security acts as one of the components of national security and it is impossible to carry out effectively tasks for its maintenance without understanding of its essence. At the same time, the country's economic security is determined by the level of economic security of regional systems, the justified management of which requires an objective assessment of the state and development trends based on indicators of economic security. The purpose of the research is to generalize theoretical and analytical as well as methodological foundations for determining the level of the region economic security, the integral assessment technology formation and clustering of the regions of Ukraine according to the components of economic security. There were used the system approach, logical-comparative analysis, generalization method of information, methods of taxonomy and multivariate analysis during economic security research of the regions. Monographs of scientists from the mentioned issues, materials of periodicals, statistical information of the sites of the State Statistics Service of Ukraine, Main regional statistics officesismethodological and informational basis of the research. The research presents the results of calculating the integral indicators of economic security of Ukrainianregions for 64 indicators during 2015-2017. In terms of economic security there were applied cluster and discriminant analyses for the allocation of homogeneous groups of regions. In order to identify the factors having a negative impact on state of the general level of economic security of the regions, a correlation-regression model was built for each cluster. The results of the analysis demonstrate a low level of economic security of the regions of Ukraine. An integrated assessment of the economic security level of the regions made it possible to carry out a comparative analysis that identified the most volatile (weak, vulnerable) regions and showed according to which components of economic security should make the priority management impacts. In order to develop priority tactical and strategic measures to stabilize and increase the level of economic security of the regions their clusterization and analysis of cluster migration of the regions was carried out was. As a result of the use of multifactor econometric modeling, the weights of the impact of a specific structural component of economic security on its overall level for invariant regions are determined, and in accordance with this, a set of management recommendations for improving the economic security of the country's regions is formed.

¹ D.Sc. (Economics), Professor, Head of the Department of Statistics and Economic Forecasting
Simon Kuznets Kharkiv National University of Economics, UKRAINE

² Ph.D. (Economics), Associate Professor, Associate Professorof the Department of Statistics and Economic Forecasting
Simon Kuznets Kharkiv National University of Economics, UKRAINE

³ Ph.D. (Economics), Associate Professor of the Department of Statistics and Economic Forecasting
Simon Kuznets Kharkiv National University Economics, UKRAINE

⁴ Ph.D. (Economics), Associate Professor of the Department of Statistics and Economic Forecasting
Simon Kuznets Kharkiv National University Economics, UKRAINE



INTRODUCTION.

In today's conditions of development, the level of economic security of the country is determined by the effective functioning of the national economy real sector, the degree of its susceptibility and ability to generate innovative processes. Innovation plays a key role in the economic development of countries and territories, so it is necessary to create an environment for the effective development and enhancement of innovation activity of business entities. According to the calculations of the Global Innovation Index [1], which reflects the economic performance associated with both innovation potential and the conditions for its implementation, Switzerland is among the three most innovative countries (from 126 countries) in 2018, Sweden and the Netherlands. The value of the Global Innovation Index for them ranges from 63.1 to 68.4 points. As for Ukraine, it improved its position from 2015 to 2018, having risen from 56 place (35.72) to 43 place (38.5).

The current conditions of development necessitate the adoption of sound management decisions by the government on the identification, localization, neutralization and elimination of threats to the national security of the country, which arise and are permanently transformed during evolution of the national system of modern socio-economic relations. It is worth noting that the economic security of the country depends directly on the level and state of economic security of the territories, whose socio-economic and natural-resource potential must be interconnected and balanced in order to ensure sustainable development of the economy, to maintain its competitiveness both at national and international levels. Economic development is directly linked to innovation development, so to create an effective economic policy for the country and its regions, it is necessary to have tools to assess the state of the economy and find the causes and weaknesses of territorial development.

The urgency of these issues is exacerbated by the proliferation of globalization processes, when both traditional and non-traditional threats, which require a strong innovation potential and a corresponding basis, are growing for them. Thus, the theory and practice of governance is to identify ways to increase the innovation level in the development of regions in order to improve their economic security, and therefore to strengthen the internal and external competitiveness of the country.

Economic security acts as one of the components of the national security of the country, and it is impossible to provide it effectively without understanding its essence. At the same time, the overall level of economic security is determined by the level of regional economic security system. That is, a study of the very territorial aspect of economic security makes it possible to identify key existing or latent factors of economic security of the country. Under these conditions, the problem of defining the essence of the concept of "economic security of the region", the separation of its components, is especially relevant, given that this aspect needs further research.

The purpose of the study is to summarize the theoretical, analytical and methodological bases of determining the level of economic security of the region, the formation of technology of integrated assessment and clustering of regions of Ukraine by the components of economic security.

The mathematical toolkit for achieving this goal is a sound choice of multidimensional taxonomic analysis as a modern means of systemic scientific research.

Today, there are many definitions of the concept of "economic security", so to get a systematic view of this definition, it is proposed to explore it in two ways:

- analysis of the scientific and methodological basis on the basis of a critical rethinking of the works of domestic and foreign scientists in this field;
- analysis of the institutional basis on the basis of the study of normative documents, which illuminate the understanding of economic security within the legislative framework.

Since the economic security of the regions shapes the economic security of the country, it is advisable to use a common terminology at all levels of government. Comparative analysis and generalization of various scientific approaches of domestic and foreign scientists define the concept and assessment of economic security of the country and regions [5-25], analysis of the legislative and regulatory framework concerning ensuring the economic security of the country [2-4] made it possible to generalize the interpretation of the concept of "economic security" of the country and its regions, as the complex socio-economic systems, according to the following classification features (Table 1).

Table 1

Determination of the essence of economic security of the country and regions in terms of different scientific approaches

The essence of the definition	Characteristics of the main points of the approach
<i>Classification feature 1 - Economic security as a component of the national interests of the state</i>	
The Law of Ukraine "On National Security of Ukraine", The National Security Strategy of Ukraine, the guidelines for calculating the level of economic security of Ukraine [2-4]	The main content of economic security reforms is to create conditions for overcoming poverty and reducing population differentiation in society, bringing socio-economic standards closer to the European level, achieving the economic criteria necessary for a country to become a member of international organizations.
Economic security is a set of effective actions of official state bodies, which provide resistance to external and internal threats, characterize the ability of the national economy to expand self-reproduction and meet the needs of citizens, society and the state at a certain defined level and time interval.	
Economic security is a state of the national economy that can maintain resilience to internal and external threats, provide high competitiveness in the global economic environment, and characterize the national economy's ability to grow sustainably	
Sokolnykov H. [5]	
Maintaining such a level of functioning of the economic and social complexes of the region, which ensures socio-economic stability, when the standard of living and living conditions of the population meet the minimum standards	
Kolosov O.[6]	
Economic security - protection of economic activity from destructive factors, creation of such economic conditions under which the normal life activity of the population	



Table 1 (continued)

The essence of the definition	Characteristics of the main points of the approach
would be ensured: employment, possibility of economic growth, support in working condition of all systems necessary for successful development and creation of living conditions of the population	
Hubskeyi B. [7]	
Economic security is the ability of the state to protect the national economic interests from external and internal threats, to carry out the progressive development of the economy in order to maintain the stability of society and sufficient defense potential under all conditions and options for the development of events.	
Classification feature 2 - Economic security as a state of the economy that protects its vital interests	
Glaz'ev S. [8]	In determining economic security, the concepts, conditions and factors that characterize the stability, sustainability and gradual development of the economy of a territory that is organically integrated into the economy of the country are taken into account.
Economic security - the state of the economy and productive forces of society in terms of the ability to independently ensure sustainable socio-economic development of the country, maintain the necessary level of national security of the state, as well as the appropriate level of competitiveness of the national economy in a global competition	
Senchagov V. [9]	
Economic security is a level of economic development in which there are no or minimized internal and external threats to maintaining the socio-economic, financial and political stability of the regions below the level sufficient to enhance the well-being of the population	
Edelev A. [10]	
Economic security - the ability and ability of the region's economy to gradually improve the quality of life of the population at the standard standards, to resist the impact of internal and external threats at the optimal cost of all types of resources and sustainable use of natural factors, to ensure the socio-economic and socio-political stability of the region	
Vechkanov G.,Chereshneva V., TatarkinaA. [11,12]	
Economic security - a set of factors and conditions in the current period, which reflects the stability, sustainability and gradual development of the regional economy, independence in integration with the economy of the country as a whole	
Tsukanov V., Reznik O.[13,18]	
Economic security is a set of conditions and factors that ensure the independence of the national economy as a whole, its sustainability, resilience and ability to constantly update and improve; the totality of the current state, conditions and factors that characterize the stability, sustainability and gradual development of the region's economy	
Classification feature 3 - Economic security as a set of conditions that protect the economy from external and internal threats	
Abalkin L., Arkhipov A., Horodetskiy A., Pankov V. [15]	They consider economic security in order to avoid possible economic threats to the country at all levels. Economic security acts as a set of factors that ensure the ability of economic systems to counter potential risks to sustainable development. Pay attention to social security as a subcategory related to economic security
Economic security is economic independence as an opportunity to manage the country's economy on its own; stability and stability of the national economy, which form the basis for the development of business activity, a guarantee for the protection of property and the ability of the state to deter destabilizing factors affecting the economy; ability to self-development and progress as a basis for modernization of production, constant improvement of the level of skills of employees	
Naidonov M., Kryvorotov V., Kalyna A. [13]	
Economic security is the range of levels of economic and social indicators within which a region is stable in its development over a long period; a set of measures aimed at sustainable, continuous development and improvement of the region's economy, including counteracting external and internal threats (through the interaction of industrial, social and natural spheres)	
ZhaliloYa., Chymitova A., Mikulchynova O. [13]	
Economic security is a characteristic of the components of the national economic	

Table 1 (continued)

The essence of the definition	Characteristics of the main points of the approach
complex, in terms of its ability to progressively develop in the path of sustainable growth of well-being of all sections of the population, in the conditions of social and economic sustainability, effective international cooperation (aimed at effective solution of internal and external problems that pose threats to the viability of the public interest)	
Varnaliy Z. [16]	
Economic security is a set of national measures aimed at sustainable development and improvement of the country's economy; includes a mechanism for counteracting internal and external threats, as well as the risks that accompany the state as a subject of financial relations	
Eletskiy M. [5]	
Economic security is a state of protection of the region's economy from threats and risks that impede sustainable reproduction and effective development	
Classification feature 4 - Economic security as the ability of an economy to provide and manage needs at national and international levels	
Geyecz` V., Ky`zy` mM., KlebanovaT. [14]	In defining the economic security, its important to emphasize not only the possibilities of the economy, but also the effective control of the authorities on the efficiency of economic system development and management decisions in the protection of national interests.
Economic security is a characteristic whose essence lies in the normal functioning of the economic system in general, the possibility of the normal functioning of the internal economic system and the painless integration into the world economic system.	
Gus'kov N., Zieniakin V., Kriukov V. [17]	
Economic security is an opportunity for effective control by regional authorities and management for the efficiency of use of all kinds of resources, achievement of high rates of economic growth, increase of competitiveness of business entities.	
Shaidarov O., Ermoshenko M. [18]	
Economic security is a state of the economy of the state and institutions of power, which ensures military, socio-political, economic stability and protection of national interests, the ability of the state to carry out economic policy and ensure the protection of national economic interests from external and internal threats	
Korotkov E., Beliaiev O. [5]	
Economic security is a state of the economy and the institutions of power, which provides guaranteed protection of national interests, social policy orientation, and sufficient defense potential, even in adverse conditions of development of internal and external processes.	
Kazantsev S. [19]	
Economic security is the protection of a territory from the undesirable influence of other states, from the action of forces capable of causing significant damage to its population, to its subjects, fauna and flora, natural environment or climate.	
Kalinina N.[20]	
Economic security - the ability, opportunity and willingness of the economy (economic system) to ensure stable and sustainable economic growth, meeting the needs of society and protecting national interests in various spheres from internal and external threats through effective governance	
Petrov I., Oganyan T [21]	
Economic security - the ability of a territory to withstand external and internal threats (the ability of regional authorities to build a system of confronting threats to economic security)	

Source: Developed by the authors

The proposed qualification features presented in table 1 enable to develop a content model of systematic understanding of the concept of economic security of the region (Fig. 1).

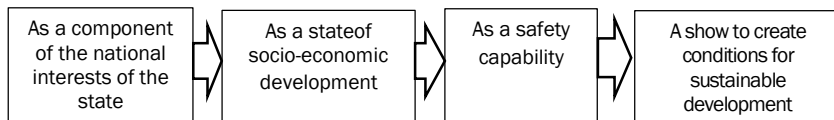


Fig. 1. Content model of the systematic representation of the economic security of the region

In accordance with the proposed model (Fig. 1), it can be concluded that economic security is a complex category that provides:

- prerequisites for the survival and preservation of territorial economic structures in times of crisis and future development;
- protecting the country interests and its territories in terms of resource potential;
- creation of internal immunity and external protection of territorial entities from destabilizing effects;
- attractiveness of regions in the domestic and world markets;
- supporting of quality conditions and way of the population life as well as the possibility of sustainable and normal reproduction of regional economic processes.

Based on the conducted research, it is possible to define economic security as a state of territorial economic system, in which is enabled not only to withstand the effects of destabilizing factors and threats, but in normal as well as in critical conditions not to lose the ability to develop in many spheres and to achieve national interests.

The essence of economic security is applied in the system of indicators, indicators of economic security. The creation of a sound indicative system for assessing economic security is devoted to the work [7, 22, 26-30], which offer a number of indicators related to investment, scientific, technical, financial, social, demographic, legal, food security and reflect the course as well as sources of crisis emergence. According to the methodological recommendations for calculating the level of economic security of Ukraine [3], the following components of economic security are identified: industrial, demographic, energy, foreign economic, investment-innovative, macroeconomic, food, social and financial.

A critical analysis of the literature [3, 31-41] has shown that today there are many different approaches and methods for assessing the economic security of systems at different levels of government. Thus, the methodology of the Global Competitiveness Index, the approach determining the threshold level of the region's economic security integral index, the method of calculating the coefficient of efficiency of ensuring economic security of the industry (economy sector), the methodology of the index of competitiveness of the region, the methodology of complex assessment of the level of socio-economic development of regions. It combines all of these methodological approaches with a common goal - to provide a

comprehensive and reasonable assessment of the level of economic security of territorial formation.

Comparative critical analysis of the existing methodological tools for the study of the level of economic security of the region [3, 7, 11, 18, 26, 29-38] allowed distinguishing five main groups of assessment methods:

- 1) monitoring the main socio-economic indicators and comparing them with thresholds;
- 2) dynamic assessment of the socio-economic development of the region with the help of the main indicators, through the integrated index of economic security;
- 3) expert assessment and ranking of regions by threat and security levels;
- 4) applying of economic tools to assess the consequences of threats to the regional economy security the on the basis of quantitative determination of losses;
- 5) economic and mathematical methods, including the method of multidimensional statistical analysis (clustering of regions through the economic security level), factor analysis, correlation-regression analysis of economic security indicators, etc.

The technology for assessing the economic security level of the region offered on Fig. 2 is aimed to assess all aspects of the economic life of a region from a systemic position in order to determine its economic security level, guided by the principles of representativeness, reliability and information accessibility, and taking into account the results of the theoretical, analytical and methodological support for assessing the economic security level.

Let's analyze diligently the essence of each stage.

Stage 1. Target focus of the stage is formation of the initial information indicative space for the economic security assessment at the regional level.

Methodological toolkit: logic-comparative analysis, statistical monitoring.

Formation of the list of indicators that underlie the assessment of economic security of regions is based on a comparative analysis of various methodological approaches to the assessment of economic security. The indicative system for assessing the level of economic security of regions used in this study contains indicators in accordance with the nine components of economic security proposed by the national methodology (industrial, demographic, energy, foreign economic, investment-innovative, macroeconomic, food, social, financial).

As a result of the first stage of technology, an indicative system includes 64 indicators for the period from 2015 to 2017. The indicators were selected based on the principles of ensuring the reliability of estimates at the regional level, the lack of high correlation between individual indicators, the sufficiency of static and dynamic variation, the correspondence of the list of major threats. The economic security of the region, the ability to monitor regularly and predict the factors that affect the level of security threats to the region.



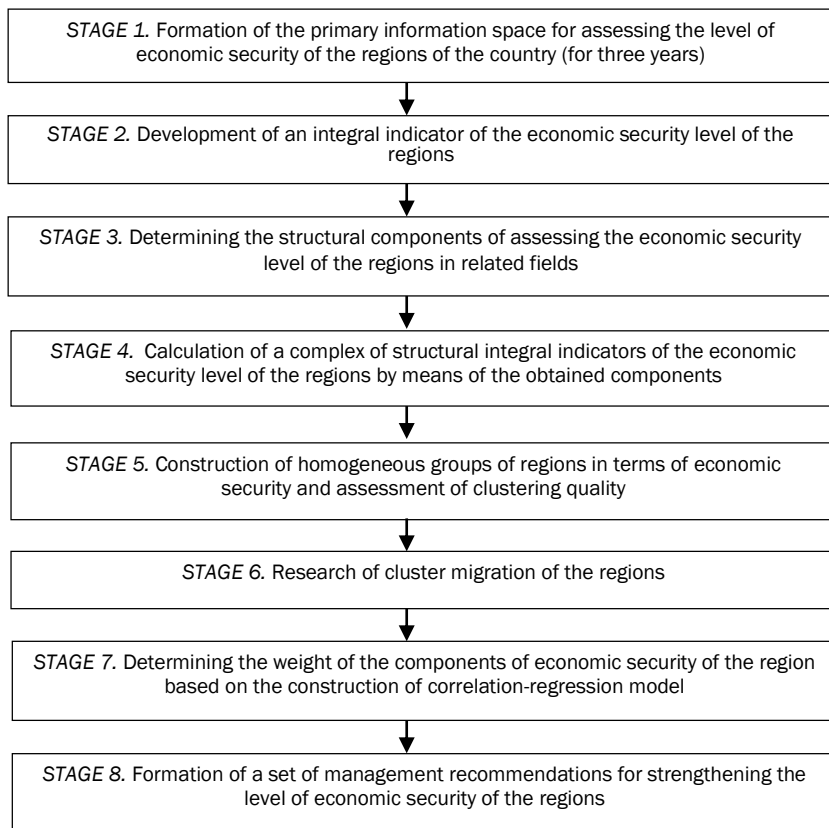


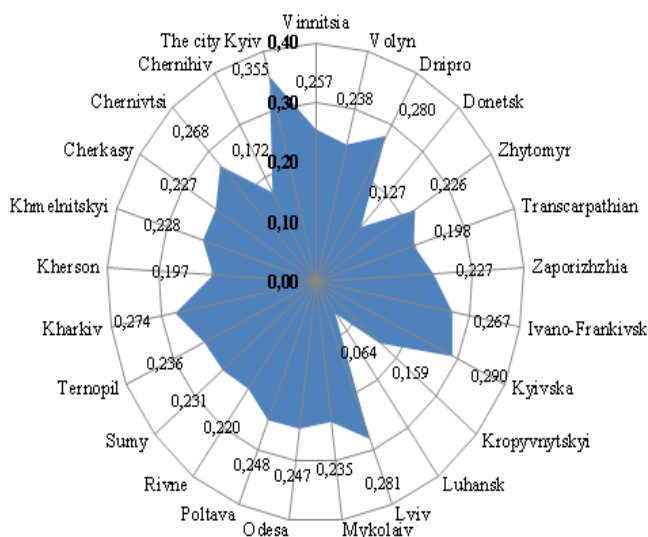
Fig. 2. Stages of an assessment technology of the level of economic security of the regions of the country. Source: Developed by the authors

Stage 2. Target focus of the stage is to assess the state of economic security of the regions by the created indicative space for the period 2015-2017.

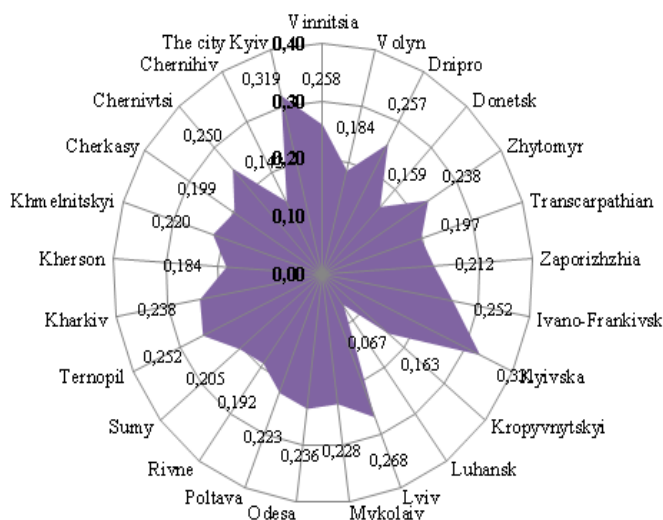
Methodological toolkit: the method of integral estimation is a taxonomic method of the level of development that allows to obtain unambiguous quantitative assessment as a synthetic value of a multidimensional phenomenon or process [42]. The integral index obtained by this method is a normalized value and varies in the range from 0 to 1, which allows to rank the studied regions by means of the economic security development level.

The results of the calculations are visualized in Fig. 3.

The level of economic security of the Ukrainian regions in 2015



The level of economic security of the Ukrainian regions in 2016



The level of economic security of the Ukrainian regions in 2017

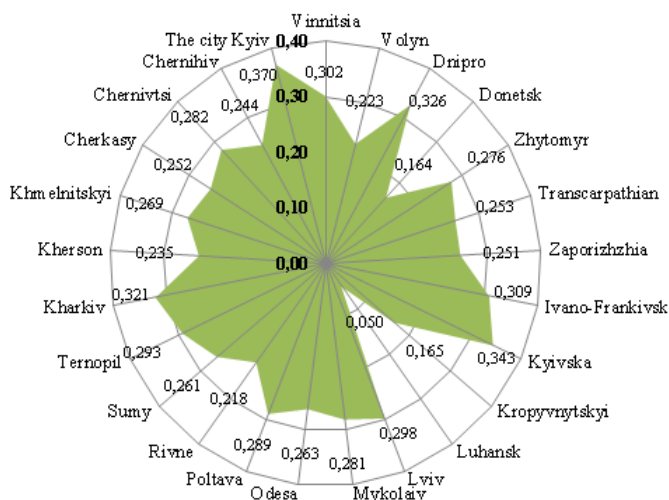


Fig. 3. The distribution of the regions of Ukraine
according to the economic security level

Source: Developed by the authors.

Lugansk, Donetsk, Kropyvnytskyi and Kherson regions held stable positions during the period under review, while the city Kyiv, Kyiv and Dnipropetrovsk regions were the leading regions. It is also advisable to note the regions that have significantly deteriorated. Thus, in 2017 compared to 2015, the Lugansk (-21.99%), Volyn (-6.4%) and Rivne (-0.56%) regions had a negative increase in the economic security level. It should be noted that Chernihiv (42.17%), Donetsk (29.97%), Transcarpathian (27.85%), Ternopil (24.15%) and Zhytomyr were the five regions that increased significantly the rate of economic security growth (22.36%) regions. On the whole, the economic security of the regions of Ukraine is at a very low level: the highest and lowest values in 2017 are in the city Kyiv (0.37) and Luhansk region (0.05), respectively. That is, the issues of territorial economic development need to be addressed urgently and the decentralization reforms initiated in 2014 are only the first steps towards building the economic independence of the country's regions. In particular, the priorities for local governments should create a favorable investment climate in the region, to support the innovative development of the territory, to provide a significant degree of diversification and flexibility of the regional socio-economic system in order to respond promptly to changing geopolitical changes and localization of risks and localization of risks, and sustainable development of the region, etc.

It should be noted that the integrated (comprehensive) assessment of the economic security level of the region is a tool for comparative analysis of territorial systems, which enables to identify the most fragile (weak, vulnerable) regions. Moreover, in carrying out analytical and coordinating functions, the integrated assessment of the level of economic security of the region acts as an indicator of the current state of all spheres of the region vital activity, serves as an information base for operational management of economic security, which, in turn, should use the management of territories as a basis management decisions as well as development of a system of priority tactical and strategic measures to stabilize and improve the economic security of the regions.

Stage 3. Target focus of the stages to form the structural components for the integrated assessment of the economic security of the regions.

Methodological toolkit: monographic analysis, logic-comparative analysis.

The comparative and monographic analysis of the studies in the field of assessing the economic security of the regions made it possible to conclude there are related areas among the economic security indicators. Based on a logical analysis of the close links and interdependencies between indicators, the following structural components have been proposed for assessing economic security: 1) a group of macroeconomic, financial and foreign economic indicators; 2) a group of production-energy and innovation-investment indicators; 3) a group of socio-demographic and food indicators.

Stage 4. Target focus of the stage is an assessment of the level of development of structural components of economic security for the period from 2015 to 2017 in order to identify urgent components.

Methodological toolkit: a taxonomic method of developmental level.

For each of the structural components of economic security identified in Step 3, using the method of multidimensional comparative analysis (taxonomy method), an integral indicator of the level of development for the period 2015-2017 was calculated (Table 2).

Table 2

Integral assessment of the level of development of structural components of economic security of the regions

№	Regions of Ukraine	The value of integral estimates by structural components								
		Macroeconomic, Financial and Foreign Economic			Energy, Innovation and Investment			Socio-demographic and food		
		2015	2016	2017	2015	2016	2017	2015	2016	2017
1	Vinnitsia	0,488	0,498	0,496	0,154	0,180	0,206	0,463	0,437	0,440
2	Volyn	0,331	0,214	0,256	0,172	0,191	0,187	0,447	0,351	0,362
3	Dnipro	0,468	0,416	0,564	0,276	0,281	0,296	0,368	0,336	0,373
4	Donetsk	0,253	0,488	0,293	0,200	0,190	0,193	0,187	0,202	0,207
5	Zhytomyr	0,341	0,367	0,439	0,186	0,238	0,231	0,392	0,358	0,369
6	Transcarpathian	0,266	0,313	0,394	0,182	0,199	0,197	0,359	0,330	0,368
7	Zaporizhzhia	0,525	0,470	0,509	0,180	0,199	0,196	0,344	0,312	0,326
8	Ivano-Frankivsk	0,254	0,300	0,350	0,240	0,249	0,265	0,465	0,407	0,442
9	Kyivska	0,264	0,350	0,342	0,287	0,353	0,341	0,456	0,450	0,442

Table 2 (continued)

№	Regions of Ukraine	The value of integral estimates by structural components								
		Macroeconomic, Financial and Foreign Economic			Energy, Innovation and Investment			Socio-demographic and food		
		2015	2016	2017	2015	2016	2017	2015	2016	2017
1	Vinnitsia	0,488	0,498	0,496	0,154	0,180	0,206	0,463	0,437	0,440
2	Volyn	0,331	0,214	0,256	0,172	0,191	0,187	0,447	0,351	0,362
3	Dnipro	0,468	0,416	0,564	0,276	0,281	0,296	0,368	0,336	0,373
4	Donetsk	0,253	0,488	0,293	0,200	0,190	0,193	0,187	0,202	0,207
5	Zhytomyr	0,341	0,367	0,439	0,186	0,238	0,231	0,392	0,358	0,369
6	Trans-carpathian	0,266	0,313	0,394	0,182	0,199	0,197	0,359	0,330	0,368
7	Zaporizhzhia	0,525	0,470	0,509	0,180	0,199	0,196	0,344	0,312	0,326
8	Ivano-Frankivsk	0,254	0,300	0,350	0,240	0,249	0,265	0,465	0,407	0,442
9	Kyivska	0,264	0,350	0,342	0,287	0,353	0,341	0,456	0,450	0,442
10	Kropyvnytskyi	0,314	0,290	0,298	0,136	0,161	0,136	0,305	0,304	0,263
11	Luhansk	0,170	0,397	0,139	0,227	0,193	0,188	0,063	0,039	0,031
12	Lviv	0,314	0,401	0,449	0,255	0,239	0,233	0,453	0,415	0,414
13	Mykolaiv	0,436	0,487	0,525	0,186	0,188	0,210	0,382	0,356	0,376
14	Odesa	0,384	0,341	0,398	0,273	0,301	0,290	0,325	0,297	0,292
15	Poltava	0,305	0,257	0,442	0,220	0,225	0,240	0,418	0,383	0,387
16	Rivne	0,289	0,259	0,254	0,180	0,215	0,205	0,406	0,323	0,332
17	Sumy	0,333	0,227	0,415	0,216	0,229	0,226	0,371	0,350	0,347
18	Ternopil	0,277	0,346	0,408	0,207	0,261	0,259	0,417	0,373	0,386
19	Kharkiv	0,348	0,275	0,384	0,264	0,242	0,298	0,410	0,392	0,419
20	Kherson	0,251	0,302	0,329	0,175	0,188	0,206	0,371	0,317	0,340
21	Khmelnitskyi	0,394	0,378	0,423	0,171	0,195	0,200	0,397	0,364	0,392
22	Cherkasy	0,333	0,313	0,343	0,153	0,153	0,196	0,445	0,394	0,386
23	Chernivtsi	0,308	0,282	0,367	0,232	0,251	0,222	0,451	0,408	0,418
24	Chernihiv	0,315	0,291	0,407	0,135	0,136	0,208	0,335	0,286	0,331
25	The city Kyiv	0,270	0,225	0,306	0,351	0,365	0,416	0,540	0,471	0,446

Source: Developed by the authors.

Given that the value of the integral indicator varies in the range (0; 1), exploring the tendency of changes in the values of individual structural components of economic security, the management of territories can decide on priority areas (areas) to improve the level of economic security of regions.

Stage 5. Target focus of the stage is: classification of the regions of Ukraine by the level of economic security on the basis of the obtained values of the integral estimates the development level of its structural components.

Methodological toolkit: cluster and discriminant analysis.

It is worth to note that with the aim of obtaining internally homogeneous and externally isolated groups of regions, the cluster analysis was performed by two methods. Initially, hierarchical clustering methods (the Ward method) were used and hierarchical algorithms in the form of dendrites were constructed, which clearly showed a detailed understanding of the structure of the original data. Then, to confirm the required number of selected clusters, iterative methods were applied, in particular, the k-means method allowed dividing the regions of Ukraine into 3 cluster groups - high, medium and low economic security clusters. At the same time, the quality control of the clustering obtained met the three functionals of

quality, namely: the sum of squares of distances to the center of the class, the sum of internal class differences between objects, and the total intra class variance sought to be minimized, i.e. all criteria took the necessary minimum values. The results of clustering quality based on determination of average values are presented in Fig. 4.

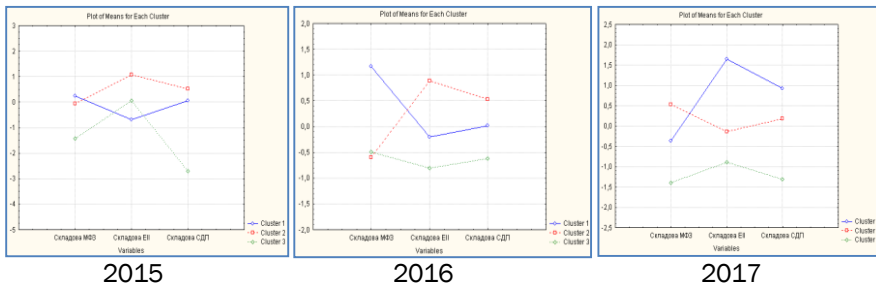


Fig. 4. Average values of factor groups for the three clusters in 2015-2017
Source: Developed by the authors

The quality of the clustering is also confirmed by the use of discriminant analysis. Thus, for the whole study period, continuous cluster groups were obtained, Wilks 'statistics are close to zero (in 2015 Wilks' Lambda = 0.0733, in 2016 Wilks' Lambda = 0.0935 and in 2017 Wilks' Lambda = 0.1145), which indicates good discrimination of objects. That is, the distribution of regions of Ukraine by the level of development of economic security components in 2015, 2016 and 2017 is correct (Fig. 5).

Classification Matrix (Spreadsheet1)					Classification Matrix (Spreadsheet1)				
Rows: Observed classifications					Rows: Observed classifications				
Columns: Predicted classifications					Columns: Predicted classifications				
Group	Percent Correct	G_1:1 p=,32000	G_2:2 p=,48000	G_3:3 p=,20000	Group	Percent Correct	G_1:1 p=,20000	G_2:2 p=,36000	G_3:3 p=,44000
G_1:1	100,0000	8	0	0	G_1:1	100,0000	5	0	0
G_2:2	100,0000	0	12	0	G_2:2	100,0000	0	9	0
G_3:3	100,0000	0	0	5	G_3:3	100,0000	0	0	11
Total	100,0000	8	12	5	Total	100,0000	5	9	11

Classification Matrix (Spreadsheet1)				
Rows: Observed classifications				
Columns: Predicted classifications				
Group	Percent Correct	G_1:1 p=,20000	G_2:2 p=,60000	G_3:3 p=,20000
G_1:1	100,0000	5	0	0
G_2:2	100,0000	0	15	0
G_3:3	100,0000	0	0	5
Total	100,0000	5	15	5

Fig. 5. Classification matrices for 2015, 2016 and 2017 respectively
Source: Developed by the authors

Stage 6. Target focus of the stage is to analyze the migration of regions between high, medium and low economic security clusters for the period from 2015 to 2017.

Methodological toolkit: logical method, method of comparison.

The composition of clusters and migration of regions by cluster in 2015-2017 are presented in Table 3.

Table 3

Migration of Ukrainian regions between economic security (ES) clusters

Cluster name	List of the regions that are part of each cluster		
	2015	2016	2017
"High level of the ES"	Dnipro, Ivano-Frankivsk, Kyivska, the city Kyiv, Lviv, Odesa, Kharkiv, Chernivtsi	Ivano-Frankivsk, Kyivska, Odesa, Chernivtsi, the city Kyiv	Dnipro, Kyivska, the city Kyiv, Ivano-Frankivsk, Odesa
"Medium level of the ES"	Vinnitsia, Zhytomyr, Transcarpathian, Zaporizhzhia, Kropyvnytskyi, Mykolaiv, Poltava, Sumy, Ternopil, Kherson, Khmelnytskyi, Chernihiv	Vinnitsia, Dnipro, Zhytomyr, Zaporizhzhia, Lviv, Mykolaiv, Ternopil, Kharkiv, Khmelnytskyi	Vinnitsia, Zhytomyr, Lviv, Transcarpathian, Zaporizhzhia, Mykolaiv, Poltava, Sumy, Ternopil, Kharkiv, Kherson, Khmelnytskyi, Cherkasy, Chernivtsi, Chernihiv
"Low level of the ES"	Volyn, Donetsk, Luhansk, Rivne, Cherkasy	Volyn, Donetsk, Sumy, Luhansk, Chernihiv, Transcarpathian, Kropyvnytskyi, Kherson, Poltava, Rivne, Cherkasy,	Volyn, Donetsk, Kropyvnytskyi, Luhansk, Rivne

Source: Developed by the authors.

Based on the analysis of cluster migration (Table 3), it is advisable to identify invariant regions, which are stable representatives of the respective cluster groups during the study period. Thus, Kyiv city and regions of Kyiv, Odesa and Ivano-Frankivsk are in the cluster of high economic security level. In the medium-security economic cluster, the situation of such regions as Vinnitsia, Zhytomyr, Zaporizhzhia, Mykolaiv and Khmelnytskyi is unchanged. The low level of economic security is consistently represented by Volyn, Donetsk, Luhansk and Rivne regions. Other regions are constantly changing their positions. Thus, in 2015 the Kharkiv region was characterized by high level of economic security, and in 2016, 2017 it was transferred to the middle level cluster; In 2015, the Chernihiv region was classified as a medium-security economic cluster, in 2016 its position got worse and it moved to a group of weak regions, and in 2017 it again joined the medium-security economic cluster. Such variations indicate the instability of regional development, which causes a destabilizing effect on the overall level of economic security of the country.

Stage 7. Target focus of the stage is to determine the cause and effect of the poor level of overall economic security of the regions from 2015 to 2017.

Methodological toolkit: statistical modeling method - correlation-regression analysis.

Multifactor econometric model for each of the selected clusters was constructed due to the results of the previous steps. The value of regression equation parameters is proposed to be interpreted as weighting factors of influence of a specific structural component on the general level of economic security of regions. The simulation results are shown in Table 4.

Table 4

The results of correlation-regression analysis

Cluster name	Kind of econometric model	Criteria for assessing model adequacy
High level of the ES	$L_{Hcl}^{ES} = 0,167 + 0,363MFF + 0,264EII + 0,642SDF$ *	$R=0,87$; $R^2=0,76$; $F(3,8)=8,312$
Medium level of the ES	$L_{Mcl}^{ES} = 0,183 + 0,186MFF + 0,835EII + 0,481SDF$ *	$R=0,86$; $R^2=0,74$; $F(3,11)=10,391$
Low level of the ES	$L_{Lcl}^{ES} = 0,031 + 0,094MFF + 0,266EII + 0,454SDF$ *	$R=0,98$; $R^2=0,96$; $F(3,8)=71,526$

* Note: L_{Hcl}^{ES} , L_{Mcl}^{ES} , L_{Lcl}^{ES} - high, medium and low economic security level of regions, respectively; MFF - Macroeconomic, financial and foreign economic structural component; EII - Energy and innovation and investment structural component; SDF - Socio-demographic and food structural component. The models are based on indicators of invariant regions for the period 2015 - 2017.

Source: Developed by the authors.

According to the results obtained (Table 4), for the regions with high and low levels of economic security clusters the most significant impact on the overall level of economic security is the socio-demographic and food structural component (0.642 and 0.454 respectively), for the regions with the middle level of the economic security - energy and innovation-investment structural component (0.835). That is, in order to increase the level of economic security of a territory, its management should focus the vector of managerial influence on improving the values of indicators of these components.

Stage 8. Target focus of the stage is to develop a set of methodological recommendations for strengthening the level of economic security of the regions.

Methodological toolkit: method of generalization.

In accordance with the results obtained in the previous stages, a list of tactical and strategic measures to improve the level of economic security of the regions is proposed. In particular, regions that are part of the "High level of the ES" cluster are characterized by a steady increase in the performance of all structural components of economic security. That is why the emphasis on regional governance should focus on maintaining and extending the existing level across all components of economic security. The leaders of this cluster are the Kyiv city and regions of Kyiv, Ivano-Frankivsk, Odesa. During the study period, these regions differed

consistently high, in comparison with other regions, the values of the integral estimates of the groups of indicators of economic security components. However, in order to intensify the overall level of economic security, the economic policies of these territories should be consolidated in terms of socio-demographic and food components. In general, for the regions of this cluster, the strategic vector should be aimed at balancing inter-regional relations, using competitive advantages in the innovation-investment sphere for the development of foreign economic activity.

The cluster of regions with "middle level of the ES" is the most numerous and stable in terms of migration of regions between clusters. However, in 2016, the composition of this cluster changed significantly, namely Poltava, Sumy, Kherson and Chernihiv regions migrated to a cluster with a "low EB", which can be explained by the prolonged impact of the socio-economic and political crisis that began in 2014. Priorities Increasing the level of economic security for the representatives of this cluster is increasing the values of production, energy and innovation-investment component. Thus, the regional authorities should ensure the innovative and technological development of the territories, use motivational mechanisms for attracting capital investments, revitalize economic activity in the region, as well as promote the development of industrial and social infrastructure, rational use of available natural resources and adequate energy supply of the region.

Donetsk, Luhansk, Volyn and Rivne regions are the permanent representatives of the cluster of regions with "low level of the ES". As for the first two regions, their presence in the respective cluster is explained by the difficult situation in the East of the country and the corresponding destabilizing consequences. The Donetsk and Luhansk regions are industrially significant for the state, have significant resource potential and extensive manufacturing and technological infrastructure, but unfortunately, due to armed conflict, they are temporarily limited in their effective use. For the other regions of this cluster, in addition to the lowest integrated estimates of all components of economic security, there is a significant deterioration in the values of the socio-demographic and food security group, which, incidentally, is also the most important for increasing the overall level economic security. Therefore, the vector of managerial influence should be aimed at improving the quality of life of the population of the territory, creating the right conditions for the reproduction of quantitative and qualitative composition of the population, ensuring the effective functioning of regional labor markets and implementation of social programs to reduce crime and migration outflow of population, development of educational sphere and health care. It is also necessary to concentrate the region's management on creating an attractive investment climate, attracting financial resources to the region, which will help to

create a proper industrial, social infrastructure and serve as a basis for the transition of the regions into clusters with "Medium and High levels of the ES".

CONCLUSION.

In modern conditions, which are characterized by uneven regional development, which restrains the country's innovative development and worsens the state of its economic security, the definition of priority directions and the search for approaches to the assessment of the components of economic security of the regions is a topical issue both in scientific and methodological as well as practical aspects. The proposed technology for assessing the level of economic security of the regions of the country is aimed at identifying effective areas of regional policy to create conditions for increasing the sustainability of regional development, eliminating interregional disproportions as the basis of economic security of the country as a whole.

Based on the results of the research, we came to the conclusion that an assessment of the economic security of the regions should be based on a system of specific indicators that meet the systematic, comprehensive and balanced requirements and are subordinated to the achievement of the strategic goals of the country. In this case, the results of the assessment can be used for taking precautionary measures to eliminate real and potential threats to economic security, both at regional and national levels.

Further research within this scientific field is to determine the vector of threshold and optimal values of economic security indicators of the region, justify the choice of methods of normalization of their values and determine the weighting coefficients of indicators for each component of economic security at the regional level.

REFERENCES:

- [1] Global innovation index (2019). URL: <https://www.globalinnovationindex.org/analysis-indicator>.
- [2] Pro natsionalnu bezpeku Ukrainy: Zakon Ukrainy. №2469-VIII. (2018). Retrieved from <https://zakon3.rada.gov.ua/laws/show/2469-19>.
- [3] Pro zatverdzhennia Metodychnykh rekomendatsii shchodo rozrakhunku rivnia ekonomichnoi bezpeky Ukrainy (Nakaz Ministerstva ekonomichnoho rozvytku i torhivli Ukrainy). №1277. (2013). Retrieved from <https://zakon.rada.gov.ua/rada/show/v1277731-13>.
- [4] Pro Stratehiu natsionalnoi bezpeky Ukrainy (Rishennia Rady natsionalnoi bezpeky i oborony Ukrainy). (2015). Retrieved from <https://zakon.rada.gov.ua/laws/show/287/2015#n7>.
- [5] *Ugrozy i zashchishchennost' ekonomiki Rossii: opyt otsenki* (2016). pod red. S. V. Kazantseva, V. V. Karpova. Novosibirsk: IEOPP SO RAN [in Russian].
- [6] Il'in, V. N. (2016). Ekonomicheskaya bezopasnost' v sisteme natsional'noy bezopasnosti RF. *Ekonomicheskie nauki*. Retrieved from <https://novainfo.ru/article/7701>.
- [7] Hubs'kyi, B.V. (2001). *Ekonomichna bezpeka Ukrainy: metodolohiia vymiru, stan i stratehiia zabezpechennia*. Kyiv Ukrarkhbudinform [in Ukrainian].



- [8] Glaz'ev, S.Yu. (1997). Osnovy obespecheniya ekonomicheskoy bezopasnosti strany. *Rossiyskiy ekonomicheskii zhurnal*, 1, 5-6 [in Russian].
- [9] Senchagov V.K. (2008). Metodologiya obespecheniya ekonomicheskoy bezopasnosti. *Ekonomika regiona*, 3, 28–39 [in Russian].
- [10] Edelev, A.L. (2007). *Strategicheskaya stabil'nost' i ekonomicheskaya bezopasnost' sub"ektov Rossiyskoy Federatsii*. Moskva Akademiya ekonomicheskoy bezopasnosti MVD Rossii [in Russian].
- [11] Vechkanov, G.S. (2007). *Ekonomicheskaya bezopasnost'*. Sankt-Peterburg: Piter [in Russian].
- [12] *Kachestvo zhizni i ekonomicheskaya bezopasnost' Rossii* (2009). pod red. V.A. Cheresheva, A.I. Tatarkina. Ekaterinburg: Institut ekonomiki Uro RAN [in Russian].
- [13] Antoshkin, V. K. (2014). Sutnist sotsialno-ekonomichnoi bezpeky ta yii zviazok kh natsionalnoiu bezpekoiu derzhavy. *Visnyk Berdianskoho universytetu menedzhmentu i biznesu*, 3 (27), 17-23 [in Ukrainian].
- [14] Geyecz', V.M., Ky`zy`m M.O., Klebanova T.S., Chernyak O.I., Rayevnyeva O.V. (2006). *Modelyuvannya ekonomichnoyi bezpeky` : derzhava, region, pidpry`emstvo*. V.M. Geyecz (red). Xarkiv: VD «Inzhhek» [in Ukrainian].
- [15] Abalkin, L. I. (2009). Ekonomicheskaya bezopasnost' Rossii: ugrozy i ikh otrazhenie. *Voprosy ekonomiki*, 12, 38–41 [in Russian].
- [16] Varnaliy, Z. S., Burkal'tseva D. D., Naenko A. S. (2011). *Ekonomicheskaya bezopasnost' Ukrainy: problemy i priority ukrepleniya*. Kiev Znanie Ukrainy [in Russian].
- [17] Gus'kov, N.S. (2000). *Ekonomicheskaya bezopasnost' regionov Rossii*. Moskva: Algoritm [in Russian].
- [18] Reznik, O. (2016). Ekonomicheskaya bezopasnost' kak sostavlyayushchaya natsional'noy bezopasnosti Ukrainy. Retrieved from http://www.essuir.sumdu.edu.ua/bitstream/123456789/48907/1/Rezn%D1%96k_economic_security_as_a_component.PDF.
- [19] Kazantsev, S.V. (2010). Ekonomicheskaya bezopasnost' i otsenka ekonomicheskoy zashchishchennosti territorii. *Region: ekonomika i sotsiologiya*, 3, 40–56 [in Russian].
- [20] Kalinina, N.M. (2010). Ekonomicheskaya bezopasnost' regiona: sushchnost', ugrozy i mery obespecheniya. *Sibirskiy trgovno-ekonomicheskii zhurnal*, 10, 17–23 [in Russian].
- [21] Petrov, I.V. & Oganyan, T.M. (2012). Nekotorye aspekty klassifikatsii indikatorov ekonomicheskoy bezopasnosti regiona. *Terra Economicus*, 10, 1–3, 201–204 [in Russian].
- [22] Alekseev, A. L. & Alekseev, A. V. (2017). Teoreticheskie podkhody k opredeleniyu ponyatiya «ekonomicheskaya bezopasnost'». *Privolzhskiy nauchnyy vestnik*, 1 (65), 49-51 [in Russian].
- [23] Zor'ka, E. I. (2016). Podkhody k opredeleniyu ponyatiya «ekonomicheskaya bezopasnost'». *Interaktivnaya nauka*, 5, 77-79 [in Russian].
- [24] Starikova, O. V. (2015). Teoretiko-metodologicheskie osnovy ekonomicheskoy bezopasnosti regional'noy ekonomicheskoy sistemy. *Upravlencheskoe konsultirovanie*, 2, 165-174 [in Russian].
- [25] Kozlova, A.V. (2012). Bezopasnost' gosudarstva v ekonomicheskoy sfere: teoreticheskiy aspekt. Retrieved from <https://docplayer.ru/47127137-Bezopasnost-gosudarstva-v-ekonomicheskoy-sfere-teoreticheskiy-aspekt.html>.
- [26] Fedorenko, V.H. & Hryshchenko, I.M. & Voronkova, T.Ye (2017). *Ekonomichna bezpeka Ukrainy: monohrafiya*. Kyiv: TOV «DKS tsentr» [in Ukrainian].
- [27] Institut ekonomicheskogo analiza. (2019). Retrieved from <http://www.iea.ru>.
- [28] Korableva, A. A. (2017). Ekonomicheskaya bezopasnost' regiona v sisteme vidov regional'noy bezopasnosti: utochnenie terminologii. *Vestnik Tomskogo gosudarstvennogo universiteta. Ekonomika*, 40, 27-40 [in Russian].
- [29] Novikova, I.V., Krasnikov, N. I. (2009). Metodika vydeleniya indikatorov ekonomicheskoy bezopasnosti regiona. Retrieved from <https://cyberleninka.ru/article/v/metodika-vydeleniya-indikatorov-ekonomicheskoy-bezopasnosti-regiona>.
- [30] Synytsia, S. M. & Brynze, B. S. (2014). Ekonomichna bezpeka yak vazhlyve zavdannia

- stratehichnoho rozvytku. *Visnyk Prykarpatskoho universytetu. Ekonomika*, X, 48-53 [in Ukrainian].
- [31] Nebava, M. I. & Mironova, Yu. V. *Ekonomichna bezpeka pidpriemstva* (2017). Vinnytsia: VNTU [in Ukrainian].
- [32] Ivanov, A. (2012). Metodika otsenki ekonomicheskoy bezopasnosti regiona. *Regional'naya ekonomika: teoriya i praktika*, 43, 47 – 56 [in Russian].
- [33] Indeks global'noy konkurentosposobnosti. (2019). Retrieved from <https://gtmarket.ru/ratings/global-competitiveness-index/info>.
- [34] Pilko A. D. (2013). Postanovka zadachi otsinky rivnia bezpeky rozvytku terytorialnoi systemy. *Biznes-Inform*, 10, 173 – 179 [in Ukrainian].
- [35] Pilko A. D., Savchuk N. V. (2015). Modeliuvannya protsesu otsiniuvannya rivnia ekonomichnoi bezpeky rehionu. *Biznes-Inform*, 8, 77-84 [in Ukrainian].
- [36] Sukhorukov A. I., Kharazishvili Yu. M. (2013). Shchodo metodolohii kompleksnoho otsiniuvannya skladnykh ekonomichnoi bezpeky derzhavy. *Stratehichni priority*, 3 (28), 5-15 [in Ukrainian].
- [37] Fond «Efektyvne upravlinnia». (2019). Retrieved from <https://platfor.ma/>.
- [38] Chekhovych H. T. (2013). Metodychni pidkhody do otsinky ekonomichnoi bezpeky krain ta rehioniv. *Efektivna ekonomika*, 6. Retrieved from http://nbuv.gov.ua/UJRN/efek_2013_6_74.
- [39] Yakymenko Yu. M. (2015). Vybir pidkhodu do otsinky ekonomichnoi bezpeky biznesu v orhanizatsii. *Ekonomika. Menedzhment. Biznes*. 3 (13), 133 – 142 [in Ukrainian].
- [40] Murphy, K. M., Topel, R. H. (2013). Some Basic Economics of National Security. *American Economic Review*, 103(3), 508-511. Retrieved from <http://dx.doi.org/10.1257/aer.103.3.508>.
- [41] Hacker, J.S., Huber, G., Nichols, A. (2012). *The Economic Security Index: A New Measure for Research and Policy Analysis*. San Francisco, CA: Fed. Reserve Bank of San Francisco. Retrieved from <http://www.frbsf.org/publications/economics/papers/2012/wp12-21bk.pdf>
- [42] Plyuta V. (1989). *Sravnitel'nyy mnogomernyy analiz v ekonometricheskom modelirovanii* (V. V. Ivanov, per. s pol'sk.). Moskva: Finansy i statistika [in Russian].

