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Research paper

Methodical Approach to Assessing the Regional Economic Security Level Based on its Components Systemic Interrelations

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Abstract

At the present stage of development of Ukraine, the differences in the regions competitiveness levels due to the destabilizing factors influence are aggravated, which is a danger both for the state economy as a whole and for its regions. Therefore, the need for timely and comprehensive assessment of the territorial systems economic security, detailed study of the factors influencing regional economic security level and the interrelations between its functional components arise.
The purpose of the study is to assess regional economic security level and investigate the systemic interrelations of its components on the basis of a retrospective analysis.
The integral assessment of regional economic security level is suggested based on the combined use of indicative and functional methods. It has been determined that the most indicators deviate from threshold values due to a number of destabilizing and disincentive powerful factors influence.
It has been established that demographic and investment components have instant dependence and the greatest influence on regional economic security unsatisfactory state. For each safety component, two indicators that most affect its integral assessment are highlighted.
The study of the economic security components systemic interrelations enables local governments to apply effective measures to counter real threats and neutralize them when forming strategic and program documents on ensuring regional development security.

Keywords: *correlation coefficient, indicator, integral index, regional economic security.*

1. Introduction

This document can be used as a template for Microsoft Word versions 6.0 or later.
The current realities of any country existence and socio-economic conditions dynamic development necessitate the solution of important scientific and applied problem of ensuring security at the state, society, enterprise, and personal level. Neglecting economic security can lead to catastrophic consequences: economy decline and undermining a nation livelihood system with country sovereignty consequent loss. A separate and independent state is considered one that is able to ensure economic security at all levels. A certain system of economic security levels, interconnected and connected in a certain sequence exists and where the regional economic security plays an essential role. National economy largely depends on the regional economy, and national economic security and regional economic security have common features and goals. Ensuring the regional economic security as the foundation of state national security acquires exceptional relevance.
Scientific studies of regional and state economic security problems ensuring as a condition for their development attract more and more attention of politicians, scientists, and broad population. Today considerable theoretical and methodological material has been accumulated. At the same time, the regional aspects of economic security formation in Ukraine are studied incompletely, they need to be developed, improved and refined. Modern scientific and methodological support is necessary for assessing and regulating the regional economic security.

Most scientists in assessing the regional economic security levels use methods for monitoring basic economic indicators upon which the integral indicators of the regional economic security components and the overall integral indicator are calculated. It enables to carry out complex analysis of the economic security current state, to identify its adverse and negative economic trends. In particular, it is proposed:
- assessment of the regional economic security in individual areas with the calculation of each integral indicator, based on Delphi method [10];
- determination of regional economic security integral indicator based on the arithmetic mean values of standardized indicators that are stimulants or disincentives; step-by-step calculation of economic security indicators: indicators characterizing economic security standardization, the regional integral assessment determination, regional economic security indicators determination [11];
- use of the upper indicators (the best indicator value in all Ukraine regions) and the lower indicators (the worst value of a certain indicator in all Ukraine regions) as standard threshold values which estimate the regional state (safe or dangerous) [12];
- allocation of the socio-economic component in the regional economic security which assessment should be carried out with such criteria as: the ability of the economy to sustainable growth, the stability of the regional financial system, support for the regional scientific potential , the dependence of the regional economy on the import of the most important products, the regional relationship with near and far-abroad countries, regional poverty and unemployment rate, living standards, demographics [13];

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- regional grouping according to the state of security, risk, threat or danger depending on the negative factors impact intensity according to coherence stability and ability to develop, preconditions for autopoiesis, external economic openness, protection from potential conflicts [14];
- highlighting two theoretically significant ways of assessing economic security and its components at the regional level [15]: identifying the likelihood of certain threats and assessing their preventing, , eliminating or mitigating possibilities, determining the degree of individual threats influence on the regional economic security based on the iterative k-means method, as well as the integral index calculation based on the results of the indicators system analysis with the threshold, optimal lower and upper values
- determination of regional economic security components integral indexes
(investment, innovation, financial, foreign trade, food, social, demographic) based on the results of vertical (security level dynamics for selected components of regional economic security) and horizontal (changes in individual components of regional security) analysis [2];
- a combination of methodological approaches to the assessment of integral indicators of sustainable development with a methodology for calculating the regional economic security level [17];
- the use of a modified methodology based on the method of economic security calculating in Ukraine; the list of indicators contains regional development indicators of life spheres (investment, foreign economic, scientific and technological, industrial, financial, energy, environmental, social) [18];
- study of the economic security regional component relative to the concept of stable development upon the regional economic security investment and financial components, the calculation of the regional stable development index in the economic, environmental and social dimensions [19];
- economic security criteria reduction to factors that ensure the economic growth rate per capita [21].
- selection of regional economic security indicators considering regional system development specifics, highlighting two groups of indicators: economic security indicators and additional analytical information indicators [27].
- using only threshold values of regional economic security indicators without calculating the integral index that makes it impossible to estimate its general condition [22, 23,24,25,26].

The analysis of the methodological basis for the regional economic security assessing revealed a fragmentation of approaches to the assessment methodology, economic security components and the list of indicators. Modern studies in general are focused on not a comprehensive assessment of economic security, but on its components estimation.

The purpose of the study is to assess the regional economic security level, the systemic interconnections of its components on the retrospective analysis basis, to study the dependence of economic security components integral indicators on the most significant indicators integral subindexes, to determine the effect of economic security components on the regional economic security integral index.

The theoretical and methodological basis of the study is the fundamental premise of economic theory, modern concepts of economic security at the meso-level, scientific works of Ukrainian and foreign scientists.

When conducting research methods of system analysis, theoretical generalization (in the study of the regional economic security assessing methods), comparative analysis (in identifying cause-effect relationships, data classification and systematization), economic, statistical and graphical (in the process of regional economic security levels and trends determining), comparative analysis (when comparing the studied regional economic security levels), correlation and regression analysis (in the course of establishing the influence I indicators on the corresponding economic security subindex integral component, economic security and its components interrelation), abstract and logical analysis (in the process of conclusions) are used.

2. Main body

In the conditions of competition aggravation, lack of natural, financial and human resources, the impact of negative external and internal factors, for Ukrainian regions the task of finding new opportunities and effectively using their own advantages for development arises.

At the state level, the regional development, the coherence of subjects' interests in economical various sectors with the needs of territories are not ensured, that led to the formation of regional economies with low value-added, low efficiency in the use of financial resources, and significant regional imbalances in economic development.

The above processes require focusing on ensuring economic security at the regional level; they are basis for ensuring the state economic security and the condition for sustainable economic development, improving competitiveness of the regions and the country as a whole.

When selecting areas for assessing the economic security state, all regions of Ukraine are analyzed according to the following criteria: total area, population, gross regional product, industrial potential (industrial output), agricultural production (agricultural output), export-import operations, the volume of annual income per 1 person. The analysis has been conducted when one oblast with specified indicators, similar to Poltava oblast, has been selected in each Ukrainian region. According its results, the central region is represented by Poltava, the northern - by Zhytomyr, the southern - by Mykolayiv, the western - by Ivano-Frankivsk, and the eastern - by Sumy oblasts.

An integrated assessment of the regional economic security levels is applied, based on combined indicative and functional methods. The formed system of indicators has been categorized according to economic security meso-economic, investment and innovation, foreign economic, financial, social and demographic components [17]. Information and analytical support for assessment are based on statistical information about the regional socio-economic development.

The analysis results of the selected regional economic security level (Fig. 1) have indicated that the economic security highest integral index during analysis period was in Ivano-Frankivsk oblast (increase from 0.622 in 2012 to 0.64 by 2016).

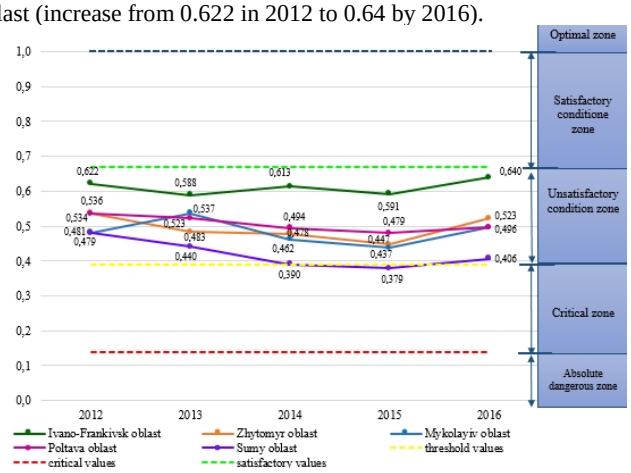


Fig. 1. Dynamics regional economic security integral indices in 2012-2016. Calculated and constructed by the author according to [16, 17, 19, 20]

In general, the growth trend of the economic security integral index can be observed in 2016 compared to 2012 in Ivano-Frankivsk (0.640 vs. 0.622) and Nikolaev (0.496 vs. 0.481) regions. However, there was its decrease in Zhytomyr (0.536 vs. 0.523), Poltava (0.534 vs. 0.496) and Sumy (0.479 vs. 0.406) oblasts. In general, economic security integral of each analyzed ob-

last was in the poor condition zone, however, for Sumy oblast in 2014-2016it was to the critical state zone.

As a result of the regional economic security and its indicators integral index comprehensive analysis, all components of regional economic security most indicators values deviation due to the powerful destabilizing and disincentive factors influence has been established, which should be considered as a threat to the regional economic security.

Despite the significant number of indicators that are considered in the process of the regional economic security assessing, not all of them significantly affect the regional economic security state. To substantiate the significant factors influencing the regional economic security level, the sensitivity of integral sub-indices of economic security individual components changes in relevant indicators has been studied.

To assess economic security indicators relativity, correlation analysis is used. The significance of the correlation coefficients is checked by Student criterion. The actual values of Student criterion for each correlation coefficient are calculated by the formula

$$t_i(j_1, j_2) = \sqrt{\frac{r(j_1, j_2))^2\ (PT-2)}{1-(r(j_1, j_2))^2)}} \quad (1)$$

where r is the correlation coefficient, P is the number of studied regions, T is the duration of the study period.

The correlation coefficients with the criterion actual values that are not less than the critical values corresponding to the probability belief of 0.95 and the number of degrees of freedom PT-2 = 23, are significant.

Thus, each indicator influence on the integral subindex is determined by the corresponding component of economic security (Table 1).

Table 1: Economic security indicators and integral sub-indices correlation

Economic stability index	Economic stability component	Correlation coefficient of normalized EBITDA and economic security component integral sub-index	Student criterion actual value	Student criterion tabulated value	Conclusion of correlation coefficient significance
local government revenue	financial	0,935	12,65	2,069	Significant
Income efficiency	financial	0,455	2,451	2,069	Significant
Budget payments index (including transfers)	financial	0,109	0,529	2,069	Insignificant
Correlation of tranfers total sum and local government revenue	financial	0,702	4,723	2,069	Significant
Correlation of tax and tax-free local government revenue	financial	0,211	1,038	2,069	Insignificant
Tax local government revenue percentage in the total local government revenue	financial	-0,517	2,899	2,069	Significant
Official transfers percentage in the total local government revenue	financial	-0,705	4,761	2,069	Significant
Transfers from local budget (as a percentage of GRP)	financial	0,953	15,186	2,069	Significant
Correlation of average wage and substance minimum	social	0,221	1,088	2,069	Insignificant
Correlation of regional average wage and country average wage	social	0,368	1,902	2,069	Insignificant
Unemployment rate of working age population (by ILO methodology)	social	0,696	4,655	2,069	Insignificant
Long-term unemployment rate of working age population	social	0,541	3,086	2,069	Insignificant
Population group below the poverty line	social	0,098	0,476	2,069	Insignificant
Percentage of community facilities spend in the total CPE	social	0,351	1,798	2,069	Insignificant
Total budget spending to health care	social	-0,214	1,052	2,069	Insignificant
Total budget spending to education	social	0,305	1,533	2,069	Insignificant
index of gross national product	mezoeconomical	0,947	14,175	2,069	Significant
index of gross national product percentage per one economically active citizen	mezoeconomical	0,508	2,828	2,069	Significant
Percentage of economically active population	mezoeconomical	0,111	0,539	2,069	Insignificant

in the total population					
Index of industrial production	mezoeco-nomical	-0,239	1,179	2,069	Insignifi-cant
Index of agricultural production	mezoeco-nomical	0,608	3,678	2,069	Insignifi-cant
Index of retail turn-over	mezoeco-nomical	-0,271	1,350	2,069	Signifi-cant
Capital investments	mezoeco-nomical	0,438	2,339	2,069	Insignifi-cant
foreign direct in-vestment	investment-innovative	0,748	5,410	2,069	Signifi-cant
foreign direct in-vestment volume per one economi-cally active citizen	investment-innovative	0,996	57,382	2,069	Signifi-cant
Percentage of enter-prises providing innovations in the total amount of enterprises	investment-innovative	-0,198	0,972	2,069	Signifi-cant
Percentage of innova-tive prod-ucts in output sold	investment-innovative	-0,046	0,223	2,069	Insignifi-cant
Export surplus index	external-economic	0,576	3,377	2,069	Signifi-cant
dependence on export index	external-economic	0,631	3,898	2,069	Signifi-cant
Depend-ence on import index	external-economic	-0,388	2,021	2,069	Insignifi-cant
Enterprises with for-eign eco-nomic activity percentage	external-economic	-0,066	0,318	2,069	Insignifi-cant
Depopula-tion index	demographic	0,999	100,639	2,069	Signifi-cant
Birth rate index	demographic	0,867	8,356	2,069	Signifi-cant
Crude death-rate	demographic	0,792	6,226	2,069	Signifi-cant
Migration rate	demographic	-0,317	1,602	2,069	Insignifi-cant

For each safety component, two indicators are highlighted with the maximum correlation coefficients between the corresponding normalized indicators and the integrated assessment of the safety corresponding type. For financial security, these are indicators of transfers from the state budget and local budget revenues indicators; for social security - indicators of the able-bodied population unemployment rate and the long-term unemployment level; for mesoeconomic security - , indicators of the gross regional product index and agricultural product index; for investment and innovation security - volume indicators foreign direct investment per one economically active resident and foreign direct investment (% RP); for foreign economic security - the coefficient of export dependence and the export-import coverage ratio; for demographic security - the depopulation coefficient and the total fertility rate.

The equation of multiple linear regressions, reflecting the dependence of the integral estimates of the economic security various components on the above factors, are constructed. To test the significance of these equations, the coefficient of determination R2 and Fisher criterion are used. According to this criterion, the regression equation is significant if the actual value of the criterion exceeds its critical value.

A graphic image of the economic security components integrated assessments dependence on the most significant indicators is shown in Fig. 2-7.

The negative impact on the level of the inter-economic component of economic security has been caused especially by GRP size, production high energy and resource intensity, production equipment aging, fixed assets depreciation, low capacity utilization, their use reduced efficiency, decline in agricultural production, village destruction of production potential and social infrastructure, soil fertility reduction.

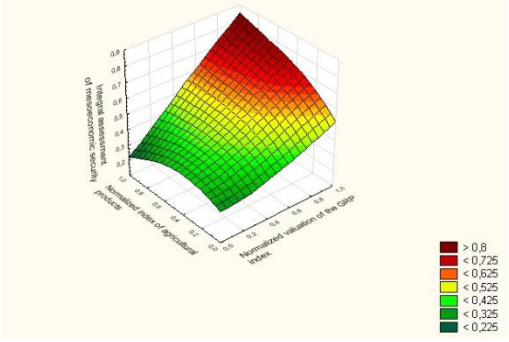


Fig. 2: Dependence of the mesoeconomic safety integrated assessment on the GRP index and agricultural product index

Investment activity in the regions of Ukraine is unbalanced and emphasizes regional potential disability to attract investors, national or foreign. Under the conditions of own investment resources lack, the foreign direct investment role in the regions is increasing, including per economically active resident, which stimulate the rates of regional economic growth, contribute to the new jobs creation, increase in labor productivity, and increase the population income level.

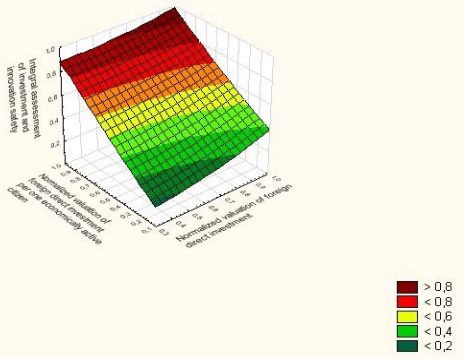


Fig. 3: Dependence of the integrated assessment of investment and innovation security on foreign direct investment and the amount of FDI per economically active person

Foreign trade irrational structure, limited possibilities of exports geographical diversification, the loss of foreign markets part, in particular, Russia and the Customs Union, lead to a deterioration in the foreign trade balance, decrease in foreign exchange earnings and, in fact, exporters economies financing. The predominance of raw materials, processing industries and agriculture products in the exports structure and dependence on energy imports hinder the production of high-tech and high-tech products. The high concentration of trade in certain types of goods increases dependence on external influences.

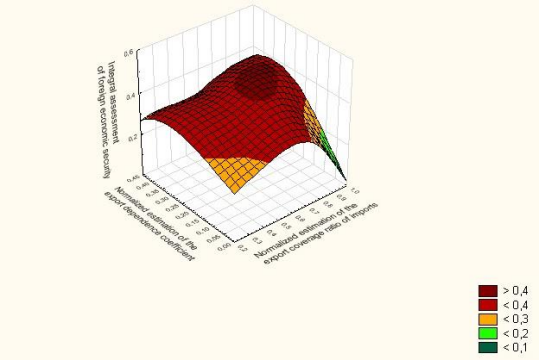


Fig. 4: Dependence of the foreign economic security integrated assessment on the ratio of export coverage of imports and the ratio of export dependence

Despite the increase in revenues of local budgets due to the process of budget decentralization, their volume remains limited and insufficient to ensure the implementation their own and delegated by local governments functions. The share increase of official transfers from the state budget provides additional funding for priority areas and territorial development programs. However, the orientation on transfer financing discourages local governments to search for their own sources of income in order to strengthen the fiscal potential of the territories and achieve financial viability of local budgets.

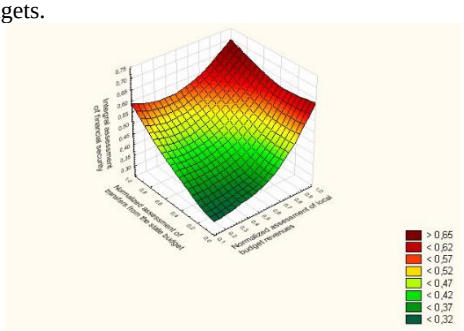


Fig. 5: Dependence of the integrated assessment of financial security on local budget revenues and transfers from the state budget

Unemployment is one of the negative factors that destabilize the regional economy and exacerbates social tensions causing a significant stress level at each workplace. Problems with employment mostly concern young people, people of pre-retirement age, women, rural residents have. Due to the enterprises low economic activity in the regions, new jobs are seldom created. It makes population to look for work in other regions of the country and abroad. Available vacancies in the regions are characterized by harsh working conditions, low wages, and backdated wages.

The problems of unemployment concern not only unemployed people number, but are aggravated by the low size of social benefits that do not enable to maintain adequate standard of living.

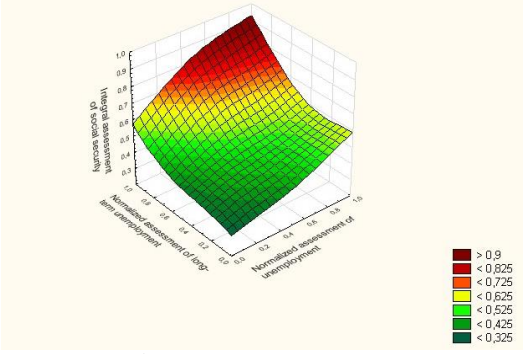


Fig. 6: Dependence of the social security integrated assessment on the unemployment and long-term unemployment levels

The demographic situation is complex and tense, primarily due to population decline, natural growth decline due to birth rate and lethal level increase, which leads to population decline.

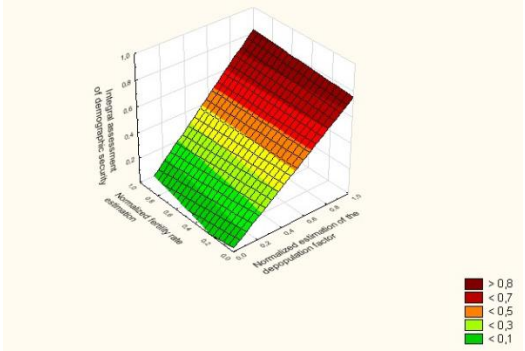


Fig. 7: Dependence of demographic safety integral estimation on depopulation coefficient and birth rate

The influence of the integral sub-indices Wi of the economic security components on the integral index W of the economic security of the regional economic security as a whole is investigated in the same way. The correlation coefficients between W and Wi, the corresponding actual and critical values of Student criterion are given in table 2.

Table 2: Influence of integral sub-indices of economic security components on the integral index of regional economic security

	Kind of risk	Correlation coefficient of W and W	Student criterion actual value	Student criterion critical value	Significance of correlation coefficient
1	Financial	0,161499	0,784824	2,068658	Insignificant
2	Social	0,404563	2,121593	2,068658	Significant
3	Mezoeconomic	0,084859	0,408442	2,068658	Insignificant
4	Investment-innovative	0,611979	3,711018	2,068658	Significant
5	Foreign economic	0,120342	0,581364	2,068658	Insignificant
6	Demofraphical	0,790805	6,196325	2,068658	Significant

Correlation coefficient of demographics and correlation coefficient of investment-innovative security are the highest. Multiple regression equation reflecting dependence of regional economic security integral estimation on investment-innovative security integral estimation, demographics security integral estimation and financial and social security integral estimation has been derived.

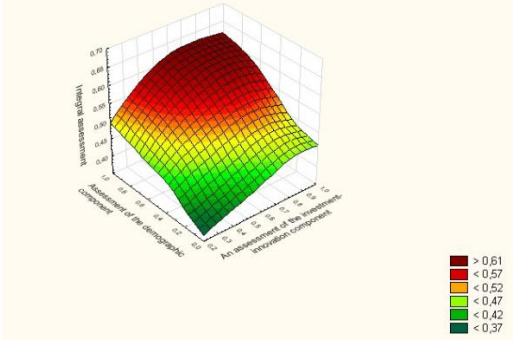


Fig. 8: Economical security integral index dependence on investment-innovative and demographical components

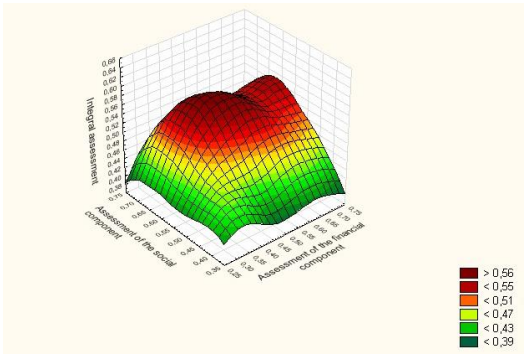


Fig. 9: Economical security integral index dependence on financial and social components

The study of trends to strengthen or weaken the correlation economic security components and monitoring and forecasting changes in indicators involves identifying potential threats at the stage of their origin and spread, apply effective measures to estimate real threats and neutralize them to ensure regional development security.

3. Conclusions

Dynamic changes in the modern economy, imbalance, and general political instability adversely affect regional economic security. Timely identification, monitoring, assessment of negative factors and threats impact on economic security and their implementation prevention are one of the regional policy priorities since state economic security directly depends on the individual territories security level and their economic potential development.

The proposed methodological approaches to the economic security level integrated assessment, containing proposals for a clear structuring of regional economic security concept content, provide justification for indicators normative values and the use of additional indicators that ensure the use of integral index multiplicative form and indicators correct rationing.

The proposed methodological approaches approbation to assess the regional economic security levels indicates an unfavorable state; a number of economic security indicators are in the danger zone. In the process of research, economic security indicators and components close relations were revealed. Direct dependence and the greatest negative impact on the regional economic security level caused investment and innovation security unsatisfactory level and demographic security extremely dangerous level. At the same time, in Ukraine there are no effective measures to increase the regional economic security level.

Research scientific novelty: using the proposed methodology for assessing regional economic security [monograph], the economic security level is identical for the selection criteria of the regions in Ukraine. The sensitivity the economic security components integral sub-indices to the integral index of the regional economic security as a whole is investigated using correlation analysis.

The obtained results practical application: the position to improve the scientific and methodological framework for assessing the economic security of the meso-level considering the economic security indicators and components, has been proven. The results are of practical importance for local governments in the formation of strategic and operational documents to ensure the economic security of territorial units.

The directions for further research in this area are connected with the development of effective security program for regional development.

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