

# Assessment of Economic Security of Regions. The Case of Ukraine

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## Abstract

*The authors propose to assess the level of economic security of regions by means of calculating the integral index of security. The proposed approach includes six consecutive steps: definition of the system of indicators affecting the level of economic security of a region; formation of a statistical array of estimated indicators; standardization of estimated indicators; calculation of weighting coefficients for each of the indicator using the expert method; determination of the intermediate and integral index of the level of economic security of a region; interpretation of the results of assessment and rating of regions by level of economic security. The proposed method was developed on the data of Ukrainian regions.*

**Keywords:** economic security, economic development, quality of life of the population, integral index of region's security

**JEL:** C65, F52, R11, R58

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## Introduction

Today, there is no doubt that the economy is a fundamental area of society, and the content of the concept of "economic security" is not limited only to the aspects that relate to economic processes taking place in a region or in the country as a whole. Economic security is an important component of the national security of the country. Therefore, in this context, on the one hand, it is determined by the level of development of productive forces and the state of social and economic relations, by the development of scientific and technological progress and the use of its achievements in the economic complex. On the other hand, economic security is the foundation for food security, energy, environmental and other types of security. Taking into account the fact that economic security and sustainable development of regions are the basis of national security, it should be noted that it is the features of regional development of regions that determine the general state of economic security of the state. The study of issues of assessing the economic security of regions and the need to identify its level determine the relevance of the study.

The works of Abalkin (1994), Arkhipov, Gorodetskii and Mikhailov (1994), Bukhvald, Glovatskaia and Lazurenko (1994), Medvedev (1997), Senchagov (2002), Samsonov (1994), Tatarkin et al. (1997), and others are devoted to the studies of economic security, and some aspects of the regional level of economic security are in the works of Abalkin (1994), Liubimtsev and Logvina (1998), Senchagov et al. (2005), Tatarkin et al. (1996), and others. Some aspects of the assessment of economic security have been highlighted in the works by such scholars as Heiets et al. (2006), Kapustyn (1999), Lisenko and Lopatovskii (2004), Muntiyani (1999), Pasternak-Taranushenko (2003),

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Polushkin (2005), Sudakova (2007), and others, and the emphasis in their works is put on the global, international and national levels of economic security.

Despite the significant amount of the scientific works in the field of economic security assessment, there is no unanimity of scientists related both to the set of indicators for assessment and to the way they are aggregated. Therefore, particularly, the matters of search for universal tools for an adequate assessment of the real level of economic security of the region becomes more actual. In view of the above, the purpose of this study is to develop the methodological tools for assessing the level of economic security of regions, on the basis of which they can be ranked and, by grouping them, to choose the basic development strategies.

## 1 Presentation of the main research material

The economic security of a region is traditionally determined by the level of economic independence, stability and sustainability of the economy, as well as the ability of the region to self-development. Social and economic development for each of the regions of Ukraine has its own unique features, primarily due to the geographical location and the presence of the certain resource potential (minerals, water, forest resources, human resources, etc.), as well as the specialization of a region and it's participation in social division of labor.

Contemporary authors most often identify the following determinants (criteria) of economic security: standard and quality of life; inflation rate; unemployment rate; economic growth; budget deficit; the activities of the shadow economy; state of ecology. However, this is not an exhaustive list of possible groups of indicators that reflect the level of economic security. Depending on the area of economic security under study, it is advisable to select the appropriate groups of indicators that most accurately and fully reflect the level of economic security.

The rating assessment technique can be chosen for the analysis of social and economic development and for the elaboration of measures aimed at stabilizing and increasing the overall level of economic security of regions. We, therefore, propose to determine the sequence of assessing the level of economic security of the regions (fig. 1). The first stage of the assessment is to identify a system of indicators that affect the level of economic security of a region. The proposed indicators for assessing the level of economic security of a region are presented in table 1 (on page 62).

The group of indicators for assessing the level of economic development of a region contains partial indicators for assessing economic, innovative, investment, foreign economic, financial and credit security. At the same time, we associate the indicators of assessing the quality of life of the population of a region with the assessment of demographic, food, environmental and social security. In addition, it should be noted that some of the indicators, which we have proposed, positively affect the level of economic security, and in connection with this they received the attribution of

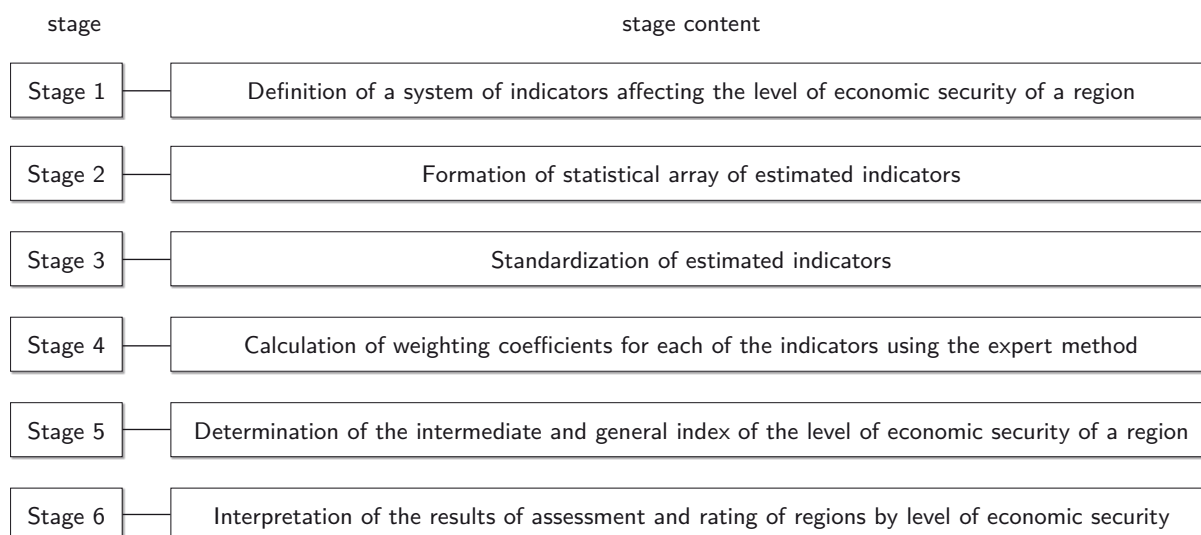


Fig. 1. The sequence of assessing the level of economic security of a region

“incentives”(„stimulus”), while other indicators, on the contrary, negatively affect the level of economic security and their growth in the region is undesirable (“destimulus”).

The next stage is the formation of a statistical array of estimated indicators. The source of information is the official data of the State Statistics Service, on the basis of which the reference values of all thirty indicators are calculated. In this context, the assessment should be carried out for the respective calendar year on the basis of systematic statistical data.

As far as the proposed indicators of assessment of the level of economic security of the region have different dimensions and cannot be aggregated into an integral coefficient, it is necessary to apply the standardization (unification) procedure. The options for standardizations values are quite diverse and suggest several variants for unification: to the maximum value, average value, standard, etc.<sup>1</sup> Since in the methodology we use only indicators — incentives, the growth of which is desirable for the development of the economic system, and disincentives, the growth of which negatively affects the level of the economic system, then in the calculation we will use the standard approach, which is represented by the tools of mathematical statistics.

Moreover, among all values of statistical data on changes in time of a given indicator, the minimum  $x_{\min}$  and the maximum  $x_{\max}$  values are found. For incentives standardization, is carried out according to the following formula (Voloshchuk 2009, 17–25):

$$(1) \quad z_{ij} = \frac{x_{ij} - x_{\min}}{x_{\max} - x_{\min}},$$

where:

$z_{ij}$  — is the standardized value of the  $i$ -th indicator in the  $j$ -th region,

$x_{ij}$  — value of the  $i$ -th indicator in the  $j$ -th region,

$x_{\min}$  — the minimum value of the  $i$ -th indicator for all regions, and

$x_{\max}$  — the maximum value of the  $i$ -th indicator for all regions,

provided that  $z_{ij} = 0$ , when  $x_{ij} = x_{\min}$ , and  $z_{ij} = 1$ , when  $x_{ij} = x_{\max}$ .

If the increase in the indicator leads to a decrease in the level of economic security, that is, it refers to indicators- disincentives, then the standardization is carried out according to the formula:

$$(2) \quad z_{ij} = \frac{x_{\max} - x_{ij}}{x_{\max} - x_{\min}},$$

provided that  $z_{ij} = 0$ , when  $x_{ij} = x_{\max}$ , and  $z_{ij} = 1$ , when  $x_{ij} = x_{\min}$ .

The next procedure for assessing the level of economic security in a region is to establish the weighting coefficients of the estimated indicators. In practice, the most commonly used method is the expert method of establishing the weighting values of indicators, due to the relative simplicity of its application. However, this method is characterized by a high level of subjectivity and the complexity to collect results. We have invited ten experts (specialists in regional studies, employees of the Department of Economic Development, Industry and Infrastructure of the Khmelnytskyi Oblast State Administration) to determine the degree of significance of the indicators, that is, to establish the degree of their influence on ensuring the economic security of the region. The experts ranked all the indicators according to the degree of importance on a scale from 1 to 15 points (15 — the greatest impact, and 1 — the impact of this indicator is the smallest). As a result, we have calculated the weight of each indicator using the formula (Pituganov and Serdiuk 1980):

$$(3) \quad w_i = \frac{\sum_{j=1}^m s_{ij}/p_j}{m},$$

where:

$w_i$  — is the coefficient of weight of the  $i$ -th indicator,

$j$  — expert number,  $j = 1, 2, 3, \dots, m$ ,

1. The variants of the standardizations of economic indicators are described by Bielak and Kowerski (2018), and Stepashko et al. (2005, 8–12).

$s_{ij}$  — the score is assigned to the  $i$ -th indicator by the  $j$ -th expert, and

$p_j$  — the sum of points assigned by the  $j$ -th expert to all indicators.

The sum of the coefficients of weight of all indicators is equal to 1. The weighting coefficients we obtained during the calculations are presented in table 1.

In order to check the adequacy of the expert assessment, to determine the degree of objectivity of the weighted indicators, and to establish the degree of agreement on all parameters, the coefficient of concordance ( $K$ ) was used. The concordance coefficient takes values from 0 to 1. The bigger the coefficient of concordance, the higher the degree of consistency of experts' opinions. When  $K = 1$ , there is full consistency of experts' opinions; if  $K = 0$ , then consistency is virtually absent. The calculation of the coefficient of concordance for a group of indicators for assessing the

**Tab. 1.** Weight coefficients of indicators for assessing the level of economic security of a region

Indicator	$w_i$
<b>Indicators for assessing the level of economic development of the region</b>	
• gross regional product per 1 permanent resident of the region (thousand UAH / person) . I	0,0902
• volume of sales of industrial products per 1 permanent resident of the region (thousand UAH / person) . . . . . I	0,0799
• volume of capital investment per 1 permanent resident of the region (thousand UAH / person) . . . . . I	0,0840
• amount of depreciation of fixed assets (%) . . . . . D	0,0615
• profitability of business in the region (%) . . . . . I	0,0717
• export import cover rate (times) . . . . . I	0,0738
• costs of innovation per one innovation-active enterprise in the region (thousand UAH / unit) . . . . . I	0,0492
• number of industrial enterprises engaged in innovative activities in the region (units) . . . I	0,0451
• share of financing of internal costs for the implementation of scientific and scientific-technical work in the region in the gross regional product (%) . . . . . I	0,0799
• share of sold innovative products in gross regional product (%) . . . . . I	0,0697
• GRP energy intensity (kg of standard fuel / UAH) . . . . . D	0,0758
• the complexity of industrial production (%) . . . . . D	0,0635
• the ratio of net growth in direct foreign investment in GRP (%) . . . . . I	0,0574
• share of loans overdue in the total volume of loans provided by banks to residents of Ukraine (%) . . . . . D	0,0492
• gross fixed capital formation (% of GRP) . . . . . I	0,0492
<b>Indicators for assessing the quality of life in the region</b>	
• average salary in the region (UAH) . . . . . I	0,0884
• amount of total household income per one family member (UAH / person) . . . . . I	0,0863
• population with monetary incomes below the subsistence level (% of total population) . . . D	0,0602
• life expectancy at birth (years) . . . . . I	0,0823
• natural growth rate per 1 thousand of actual people . . . . . I	0,0783
• daily calorie intake of a person (thousand kcal) . . . . . I	0,0522
• employment rate in the region (%) . . . . . I	0,0602
• unemployment rate in the region (%) . . . . . D	0,0643
• inflation index (%) . . . . . D	0,0743
• crime rate (number of crimes per 100 thousand people) . . . . . D	0,0482
• volume of accumulated municipal solid waste per 1 permanent resident of the region (kg/person) . . . . . D	0,0442
• volume of emissions of harmful substances into the atmosphere per 1 permanent resident of the region (m <sup>3</sup> /person) . . . . . D	0,0482
• share of the elderly population in the total population, at the end of the reporting period (aging rate) (%) . . . . . D	0,0723
• demographic burden of the disabled population on the working age population (%) . . . . . D	0,0823
• share of expenditures on food products in household monetary consumption expendit. (%) D	0,0582

Indicator characteristic: I— incentive („stimulus”), D—disincentive (“destimulus”)

Note: In the journal European practice of number notation is followed — for example, 36 333,33 (European style) = 36 333.33 (Canadian style) = 36,333.33 (US and British style).—Ed.

level of economic development of the region (the actual value is 0,72) reveals a sufficient level of consistency of experts' opinions and the possibility of using the calculated weight coefficients to calculate integral indicators. A practically similar situation is observed for the group of indicators for assessing the quality of life of population of the region — the estimated value of the concordance coefficient is 0,68.

The next stage involves determining the intermediate and overall index of the level of economic security of the region. First, it is necessary to calculate the integral indexes of economic development and quality of life and for this we propose to use formulas 4 and 5.

$$(4) \quad IDE_j = \sum_{i=1}^n we_i ze_{ij},$$

where:

$IDE_j$  — integral index of economic development of the  $j$ -th region,

$we_i$  — weight coefficient of the  $i$ -th indicator of economic development, and

$ze_{ij}$  — standardized value of the  $i$ -th indicator of economic development in the  $j$ -th region.

$$(5) \quad IQL_j = \sum_{i=1}^n wq_i zq_{ij},$$

where:

$IQL_j$  — integral index of quality of life of the  $j$ -th region,

$wq_i$  — weight coefficient of  $i$ -th indicator of quality of life, and

$zq_{ij}$  — standardized value of the  $i$ -th indicator of quality of life of the  $j$ -th region.

We propose to calculate the integral coefficient of economic security of the region by the usage of the multiplicative model according to formula:

$$(6) \quad IES_j = \sqrt{IDE_j \cdot IQL_j},$$

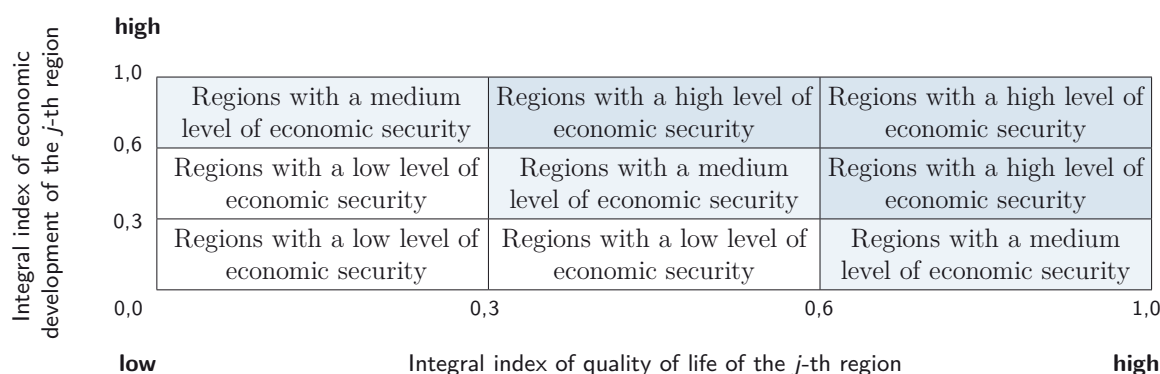
where  $IES_j$  is integral index of economic security of the  $j$ -th region.

For a more thorough interpretation of the obtained results, we propose to distinguish three groups of regions that fall under low, medium and high levels of economic security by means of interval distribution of the values of the integral indicator (tab. 2):

In addition, the obtained numerical values of the integral index allow ranking regions according to the level of economic security from the lowest numerical value (closest to 0) to the highest value (one that approaches 1). For simultaneous display of two calculated integral indices, we offer

**Tab. 2.** Grouping regions according to interval size

Interpretation of values of an indicator	
(0,00–0,33)	Regions with a low level of economic security
(0,33–0,66)	Regions with a medium level of economic security
(0,66–1,00)	Regions with a high level of economic security



**Fig. 2.** Matrix segmentation of regions in terms of economic security

additionally to use a matrix method and two-dimensional system of coordinates, each axis of which reflects the type of economic development and quality of life of the population in the region. For this purpose the matrix of economic security of regions is built (fig. 2). Taking into account that for each integral index we have defined three types of estimates (low, medium, high), the obtained matrix is divided into 9 squares, each of which corresponds to a certain type of economic security of areas.

The final procedure of assessment implies the establishment of the segment, to which the study area belongs, on the basis of the values of the obtained integral indices. In order to smooth the existing territorial disparities in the economic security of the respective areas the strategies of development with an appropriate system of measures related to their implementation can be developed.

## Conclusions and prospects for further research

Thus, the approach developed by us, is relatively simple to use. It allows the systematic monitoring of the level of economic security of the regions, followed by their rating and grouping in terms of the level of economic development and the quality of life of the population. This will allow further creation of the adequate and effective strategies for the social and economic development of territories.

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