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## SCIENTIFIC AND METHODOLOGICAL APPROACH TO THE ASSESSMENT OF DIAGNOSTICS OF THE ECONOMIC SECURITY OF ECONOMIC

### ABSTRACT

The purpose of the article is to develop a scientific-methodical approach to the assessment of diagnostics of the economic security of economic entities on the example of the city of Kyiv and the calculation of an integral indicator that makes it possible to summarize the characteristics that reflect the most important properties of the presented research object. It has been proven that the negative consequences of socio-political transformations in Ukraine, the long-term depletion of resources of economic entities in the conditions of permanent structural changes of the national economy, require practical measures to ensure the appropriate level of economic security of the business. It was concluded that the multifaceted scientific views on the essence and methods of diagnosing economic security, which can also be applied to economic entities, actualize the issue of researching key approaches to its assessment, where the subject of assessment is: directly the object of research (the activity of sub "business entities of the city of Kyiv); factors affecting the object of the relevant study (external and internal threats); the system of ensuring economic security: measures that contribute to the stabilization of the functioning of all the presented components of the research object. The methodology for assessing the level of protection of economic interests is based on the criteria of the efficiency of the functioning of agricultural production, namely: the ability of participants in agricultural production to optimally distribute and effectively use resources (resource component); opportunities to ensure at an appropriate level the needs and goals of consumers of agricultural products, provision of labor resources (social component); support of national interests of agricultural production under the influence of globalization processes (market component); intensification of agricultural production development (innovative component). It is proposed to use a functional-systemic approach, which allows forming of a universal algorithm for diagnosing the economic security of business entities and calculating an integral indicator that makes it possible to summarize the characteristics that reflect the most important properties of the presented object of research. According to the results of the study, it was concluded that the business entities of the city of Kyiv are in the zone of probable danger. The level of economic security of economic entities of the city of Kyiv in this zone reflects the intensity of their systematic destruction, which, first of all, requires urgent measures aimed at restoring the normal state of the identified crisis indicators.

**Keywords:** diagnostics, economic security, economic interests, integral indicator, crisis indicators, national economy, economic entities

**JEL Classification:** G00, H00

### INTRODUCTION

To ensure the efficient functioning of the national economy in the face of the development of economic entities, it is reasonable to assess their economic security. Negative consequences of social and political transformations in Ukraine and the long-term resource depletion of economic entities in the context of permanent structural changes in the national economy require practical measures to ensure a proper level of business economic security. Resolution of economic entity destabilization problems primarily includes the establishment of a system of conceptual principles for ensuring economic security and their diagnostics. The state plays a crucial role in ensuring the economic

security of economic entities. However, national economic entities have not yet provided the expected result, have not contributed to the sustainable increase in the amount and efficiency of production processes, and have not ensured the rational use of their resource potential and, consequently, the state's economic security. The lack of conditions for the efficient development of economic entities in current globalization conditions requires the development of scientifically grounded conceptual principles of diagnosing their economic security in order to design appropriate support and management mechanisms in the future.

## LITERATURE REVIEW

The foundation of the scientific opinion about the economic security of entrepreneurship in Ukraine is made up of the works of Y. Ananieva, O. Baranovskyi, K. Voloshchuk, M. Bondarchuk, O. Gribinenko, V. Melnyk, H. Reverchuk, V. Rudenko, B. Samorodov, etc [1-8]. Foreign experience in ensuring the economic security of business entities is concentrated in the works of Allianz, Frenkel, Gamerman, Samuel, Taylor, and others [9-13]. A significant contribution to the research of general problems of the development and formation of entrepreneurship, the introduction of innovations, and the improvement of business competitiveness was made by well-known Ukrainian scientists, in particular: Z. Varnaliy, B. Gubsky, O. Gonchar [14-16]. The theoretical and practical foundations of the domestic methodology of economic and mathematical studies of economic security are reflected in the works of T. Kizima, D. Lukjanenko, R. Snishenko, V. Grinchutsky, and others [17-19].

## AIMS AND OBJECTIVES

The purpose of the article is to develop a scientific-methodical approach to the assessment of diagnostics of the economic security of economic entities on the example of the city of Kyiv and the calculation of an integral indicator that makes it possible to summarize the characteristics that reflect the most important properties of the presented research object.

## METHODS

The work uses a number of methods based on modern theoretical and methodological approaches, which allows ensuring the conceptual unity of this study, in particular: systemic and structural analysis - used to identify the relationship between the indicators of the assessment of the economic security of economic entities of the city of Kyiv; comparative and factor analysis - when studying the dynamics of economic safety diagnosis assessment; economic-mathematical modeling - in the structural interpretation of the methodical approach to assessing the economic security of economic entities; mathematical and statistical method - when analyzing and summarizing statistical data; method of graphic visualization - for clarity of information, etc.

Generalizing various scientific research by the problem of diagnostics of the economic security of economic entities, we can identify two main methods for calculating the total integral indicator. The first one includes the upgraded Euclidean metrics that allow defining Euclidean distances for each indicator of the economic security  $x \in \left\{1, 2, \dots, n\right\}$  at certain coordinates from the set points to possible minimum  $a_x = \min \left\{a_{x1}, a_{x2}\right\}$  and maximum values,  $a_x = \max \left\{a_i | i = 1, n\right\}$  which allows calculating the integral index properly, as well as presenting its lower and upper optimal values [6]. It is viable to apply this method in the context of little variation in the given values of different assessment indicators. Based on the second method, it is viable to compare each presented functional component of the economic security of economic entities in Kyiv and assess its contribution to the general level of economic security. The assessment of the level of economic security of economic entities in Kyiv ( $F(x)$ ) using this method can be presented by the formula (1):

$$F(x) = \frac{\sum_{i=1}^n w_i E_i}{\sum_{i=1}^n w_i} \quad (1)$$

where  $n$  is a number of the given functional components (resource, market, social and innovative) that will form the economic security of economic entities;  $i = 1, 2, \dots, n$ ;  $w_i$  is the value of each  $i$  functional component of the economic security of economic entities in Kyiv;  $E_i$  is the value of each functional component of the economic security of economic entities in Kyiv.

The obtained result of the level of economic security of economic entities in Kyiv can be characterized depending on the defined ranges of the obtained values, which we suggest defining by clear proportional intervals from [0;1] or using Harrington's scale that has a more general-purpose character and can be used in different modifications to assess quality indicators [1-2]. Adapting the presented methods to our research object, we obtain the following value ranges (Table 1).

**Table 1. The value ranges of the level of economic security of economic entities in Kyiv according to Harrington's scale.** (Source: systematized and adopted based on [24])

Value ranges, %	Characteristics
From 80 to 100	Stability
From 62 to 79	Moderate danger
From 37 to 62	Probable danger
From 20 to 36	Danger
From 0 to 20	Critical condition

Note: the key feature of assessing the level of economic security of economic entities in Kyiv using the presented algorithm is the fact that its practical implementation allows satisfying the interests of both economic entities in Kyiv and their established sub-levels. The value of the impact of each given initial indicator on the total integral indicator of the economic security of economic entities in Kyiv by each defined functional component will be determined using the method of the main components.

To calculate the resource functional component of the economic security of economic entities in Kyiv (Table 2), we defined the optimal values of indicators of the condition of the resource component of the economic security of economic entities in Kyiv using a similar method. Based on the obtained indicators and the definition of optimal values, we conducted their standardization.

Such a shift from absolute to standardized values of indicators allows measuring them on a scale from 0 to 1 or in a percent: i.e., 0 means 0%, and 1 is 100 %. Thus, the obtained standardized value of indicators characterizes the level of closing to the defined optimal value [4].

**Table 2. Dynamics of indicators of the resource component of the economic security of economic entities in Kyiv in 2016-2020.** (Source: systematized by the authors based on the official data of the State Statistics Service of Ukraine [23])

Indicators	Years				
	2016	2017	2018	2019	2020
Number of employees of economic entities, thousand people	1916	1987	2042	2177	2155
Volume of sold products (goods, services) of economic entities by region, thousand UAH	2688251461.6	3384440738.1	4153562624.9	4365438342.7	4549151792.7
Labor productivity per 1 employee	1403.0	1703.3	2034.1	2005.3	2110.9
Personnel salary expenses, thousand UAH	131351485.4	173123099.3	218328356.9	267359659.9	290339157.3
Net profit (loss) of economic entities, million UAH	11277.8	93777.9	137282.5	243609.2	-14367.8
Salary fund efficiency, %	8.6	54.2	62.9	91.1	-4.9
Consumer price index	114.0	113.4	108.8	103.9	105.8
Industrial production index	104.2	95.1	97.8	96.6	97.1

The impact of the presented factors is defined by the total share of dispersion on the integral indicator. After the rotation of factor axes according to the well-known Varimax method, we increased the value of the given factor loads of the main components on the result indicator and proved (Table 3) that the share of the total dispersion of factor  $F_{1fg}$  28.14% after rotation, and the factor itself is formed by the following primary indicators: number of employees, labor productivity and salary fund efficiency. Besides, the total dispersion of the second factor ( $F_{2fg}$ ) includes the consumer price index and

industrial production index. The total dispersion of this factor on the integral indicator is 26.94%. The third factor ( $F3_{fg}$ ) is defined by the following primary indicators: personnel salary expenses and net profit (loss) with the dispersion of 23.48%. The fourth factor ( $F4_{fg}$ ) forms indicators of the volume of sold products and explains 21.44% of the total dispersion on the integral indicator [24-25].

**Table 3. Matrix of factor loads to standardized coefficients for the resource component of the economic security of economic entities in Kyiv in 2016-2020.** (Source: calculated by the authors using the Statistica 8.0 package)

Indicators	Legend	Factors			
		$F1_{fg}$	$F2_{fg}$	$F3_{fg}$	$F4_{fg}$
1	2	3	4	5	6
Number of employees of economic entities, people	X1	-0.890112	0.092762	0.360780	0,297306
Labor productivity, per 1 employee	X2	0.798868	0.19803	0.279923	0,396614
Salary fund efficiency, %	X3	0.932877	0.20917	-0.05845	0,138286
Consumer price index	X4	0.400993	-0.83454	-0.24275	0,28372
Volume of sold products (goods, services) of economic entities by region, thousand UAH	X5	0.381724	0.16572	0.124193	-0,85323
Personnel salary expenses, thousand UAH	X6	0.198969	0.094556	0.929858	0.216257
Net profit (loss) of economic entities, million UAH	X7	0.038460	0.229074	-0.85153	0.398104
Industrial production index	X8	0.061754	0.875505	-0.20502	0.412299
Own values		3.365371	2.653985	2.439368	2.962068
Share of dispersion, %		28.14	26.94	23.48	21.44

If taking the total dispersion as one, then the trend in the impact of factors on the resource component of the economic security of economic entities in Kyiv can be described by the following equation:

$$I_{fg} = 0,28 F1_{fg} + 0,26 F2_{fg} + 0,23 F3_{fg} + 0,21 F4_{fg} \quad (2)$$

where  $F1_{fg}, F2_{fg}, F3_{fg}, F4_{fg}$  are basic factors (main components) constructed out of numerous indicators  $[X1...X8]$  of the resource component.

The results of the calculation of coefficients for such initial indicators will be obtained based on calculations of the dispersion of the main components and factor loads for each presented indicator to the own main component (Table 4).

**Table 4. Calculation of the specific weight of indicators of the resource functional component of the economic security of economic entities in Kyiv in 2016-2020.** (Source: calculated by the authors using the Statistica 8.0 package)

Indicator	Factor				$f_{1i} \sum f_{1i} * 0,36$	$f_{2i} \sum f_{2i} * 0,3$	$f_{3i} \sum f_{3i} * 0,36$	$f_{4i} \sum f_{4i} * 0,26$	Weights
	$F1_{fg}$	$F2_{fg}$	$F3_{fg}$	$F4_{fg}$					
X1	-0.88	-	-	-	-0.11	-	-	-	-0.11
X2	0.82	-	-	-	0.12	-	-	-	+0.12
X3	0.95	-	-	-	0.12	-	-	-	+0.12
X4	-	-0.85	-	-	-	-0.12	-	-	-0.12
X5	-	-	-	-0.85	-	-	-	0.14	+0.14
X6	-	-	0.93	-	-	-	-0.14	-	-0.14
X7	-	-	-0.84	-	-	-	-0.14	-	-0.14
X8	-	0.87	-	-	-	+0.13	-	-	+0.13
Sum	2.59	2.59	1.77	-	-	-	-	-	-

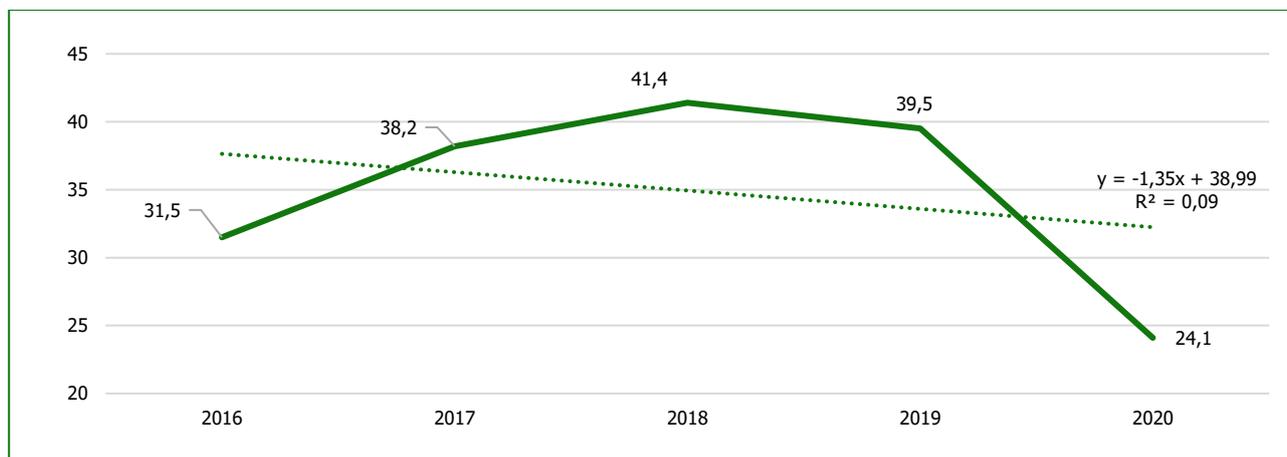
Thus, we suggest diagnosing the economic security of economic entities in Kyiv using the equation:

$$I_r = -0,11X_1 + 0,12X_2 + 0,12X_3 - 0,12X_4 - 0,14X_5 + 0,14X_6 - 0,14X_7 + 0,13X_8 \quad (3)$$

where  $X_1$  is the number of employees of economic entities, people;  $X_2$  is labor productivity, per 1 employee;  $X_3$  is salary fund efficiency, %;  $X_4$  is the consumer price index;  $X_5$  is the volume of sold products (goods, services) of economic entities by region, thousand UAH;  $X_6$  are personnel salary expenses, thousand UAH;  $X_7$  is net profit (loss) of economic entities, million UAH;  $X_8$  is the industrial production index [7-8].

## RESULTS

Graphical representation of the integral indicator of the resource component of the economic security of economic entities in Kyiv in 2016-2020 is shown in Figure 1. Based on the obtained diagnostics results, we found out that the level of economic security in terms of the resource component in 2020 reached the critical level. Measures taken in Kyiv in 2016-2019 to ensure economic security allowed keeping the level of moderate danger. However, in 2020, the resource component of the economic security of economic entities in Kyiv has a rapid negative trend, which requires an immediate response from city managers. First of all, we should pay attention to the results of activities of economic entities and the industrial production index, as well as develop an action plan to resolve the crisis situation.



**Figure 1. Dynamics of the integral indicator of the resource component of the economic security of economic entities in Kyiv in 2016-2020.**

Similarly, we calculate the level of economic security of economic entities in Kyiv in terms of the social component (Table 5).

**Table 5. Dynamics of indicators of the social component of the economic security of economic entities in Kyiv in 2016-2020.** (Source: systemized by the authors based on the data of the State Statistics Service of Ukraine [4])

Indicators	Years				
	2016	2017	2018	2019	2020
Gross regional product per person, UAH	216574	238687	283175	320897	311912
Migration increase (decrease) of population (thousand people)	13.3	4.2	13.9	17.2	0.2
Share of employees in the total number of employees at enterprises in Ukraine, %	26.9	27.3	28.1	27.9	27.8
Debt of wages, million UAH	78.5	97.6	161.6	213.9	338.6
Unemployment rate of the population aged 15-70 years, %	6.7	6.9	6.2	5.8	6.8

The calculations (Table 6) showed that the significant influence of indicators conceptualizing the social component of the economic security of economic entities in Kyiv is carried out by three groups of factors, which explain 93% of the total variation of each represented component in the actual factor load [9-10].

**Table 6. Matrix of factor loads of the social component of the economic security of economic entities in Kyiv in 2016-2020.** (Calculated by the authors based on the data [23-24])

Indicators	Legend	Factors		
		F1 <sup>s</sup>	F2 <sup>s</sup>	F3 <sup>s</sup>
Gross regional product per person, UAH	S1	0.854747	0.025426	-0,421099
Migration increase (decrease) of the population (thousand people)	S2	0.028113	0.012074	-0,996057
Share of employees in the total number of employees at enterprises in Ukraine, %	S3	0.963028	-0.028926	0,282672
Debt of wages, million UAH	S4	0.247365	0.863361	-0,311665
Unemployment rate of the population aged 15-70 years, %	S5	0.258923	0.812101	-0,390497
Own values		1,646187	1.406025	1.493427
Share of total dispersion, %		0,399220	0.281205	0.298685

The influence factor  $F1_s$  is formed by the following indicators: gross regional product per person and migration increase of population. This factor has the greatest impact on the level of economic security of economic entities in Kyiv for the social component – 39%.

The influence factor  $F2_s$  is presented by the following indicators: debt of wages and an unemployment rate of population aged 15-70 years. The accumulative impact of these indicators is 28%.

The influence factor  $F3_s$  is characterized by the share of employees in the total number of employees at enterprises in Ukraine and amounts to 29%.

If taking the total dispersion as 1, then the trend in the impact of factors on the economic security of economic entities in Kyiv in terms of the social component can be described by the following equation (4):

$$I_s = 0,39F1_s + 0,28F2_s + 0,29F3_s \quad (4)$$

where  $F1_s, F2_s, F3_s$ , are basic factors constructed out of the aggregate of obtained indicators [S1... S5] of the economic security of economic entities in Kyiv.

The calculated dispersion of the main components and factor loads of certain obtained indicators allow us to assess the value of weighting coefficients for the social component of the economic security of economic entities in Kyiv (Table 7).

The data given in Table 7 show that the main indicators include: gross regional product per person, UAH, and share of employees in the total number of employees at enterprises in Ukraine.

**Table 7. Calculation of the share of indicators of the social component of the economic security of economic entities in Kyiv.**

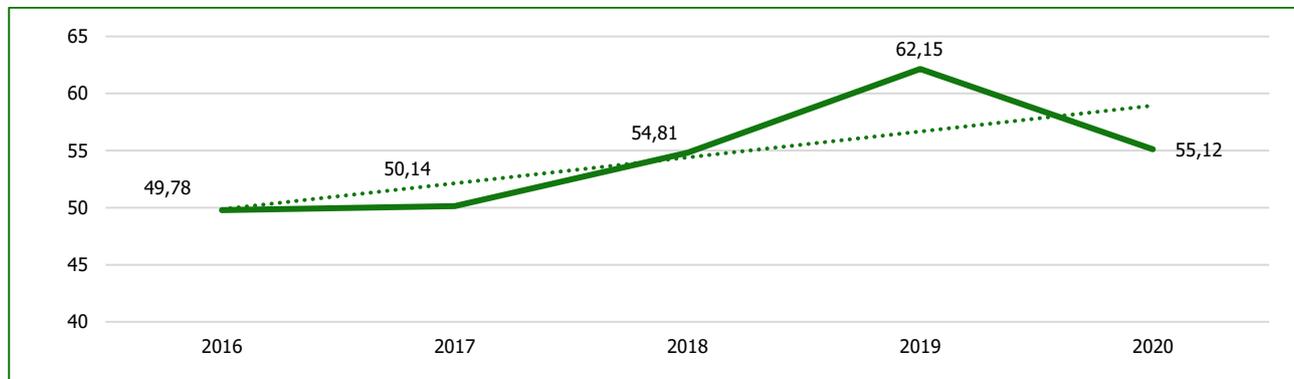
Notation	Factors			$f_{1i} \sum f_{1i} * 0,54$	$f_{2i} \sum f_{2i} * 0,46$	$f_{3i} \sum f_{3i} * 0,32$	Weights
	F1 <sub>s</sub>	F2 <sub>s</sub>	F3 <sub>s</sub>				
S1	0.86	-	-	0.26	-	-	0.26
S2	-	-	-0.986	-	-	-0.33	-0.33
S3	0.96	-	-	0.20	-	-	0.20
S4	-	0.87	-	-	0.17	-	0.17
S5	-	0.83	-	-	0.15	-	0.15
Sum	1.82	1.70	0.986	-	-	-	-

We suggest diagnosing the economic security of economic entities in Kyiv in terms of the social component using the following equation:

$$I_s = 0,26S1 - 0,33S2 + 0,20S3 + 0,17S4 + 0,15S5 \quad (5)$$

where  $S_1$  is the gross regional product per person, UAH;  $S_2$  is the migration increase (decrease) of population (thousand people);  $S_3$  is the share of employees in the total number of employees at enterprises in Ukraine, %;  $S_4$  is the debt of wages, million UAH;  $S_5$  is the unemployment rate of population aged 15-70 years, %.

The dynamics of the integral indicator of the level of economic security of economic entities in Kyiv in terms of the social component is presented in Figure 2.



**Figure 2. Dynamics of the integral indicator of the level of economic security of economic entities in Kyiv in terms of the social component in 2016-2020.**

The value of the integral indicator is in the zone of probable danger. The analyzed period shows quite positive dynamics of the level of economic security of economic entities in Kyiv in terms of the social component with a slight decrease in 2020.

Let's calculate the level of the market component of the economic security of economic entities in Kyiv (Table 8).

**Table 8. Dynamics of indicators of the market component of the economic security of economic entities in Kyiv in 2016-2020.** (Source: systemized by the authors based on the data of the State Statistics Service of Ukraine [24])

Indicators	Years				
	2016	2017	2018	2019	2020
Level of profitability of enterprise operating activities, %	8.7	10.2	9.4	13.5	4.5
Growth (decline) rate of import of goods, %	112.5	122.9	120.1	109.5	87.5
Growth (decline) rate of export of goods, %	108.6	115.6	103.4	122.4	98.8
Index of physical volume of retail turnover of retail trade enterprises	104.5	108.3	102.7	114.6	106.9

The market component of the economic security of economic entities in Kyiv according to the rock fall criterion is formed by three key factors explaining 87% of the total variation of each component in the integral indicator load (Table 9).

**Table 9. Matrix of factor loads of the market component of the economic security of economic entities in Kyiv in 2016-2020.** (Source: calculated by the authors using the Statistica 8.0 package)

Indicators	Legend	Factors	
		$F_{1y}$	$F_{2y}$
Growth (decline) rate of import of goods, %	P1	0.712468	-0.528977
Growth (decline) rate of export of goods, %	P2	0.718857	0.108441
Level of profitability of enterprise operating activities, %	P3	0.947936	-0.257376
Index of physical volume of retail turnover of retail trade enterprises	P4	-0.001229	0.746375
Own values		2.378032	0.068463
Share of dispersion, %		0.451595	0.238709

If taking the total dispersion as one, then the trend in the impact of factors on the level of economic security of economic entities in Kyiv in terms of the market component can be described by the following equation:

$$I_p = 0,45F1_y + 0,23F2_y \tag{6}$$

where  $F1_y, F2_y$  are basic factors constructed out of numerous obtained indicators [P1... P4] of the economic security of economic entities in Kyiv.

The first group of factors of influence on the market component of the economic security of economic entities in Kyiv (F1) is formed by the following indicators: Growth (decline) rate of import of goods, %; Growth (decline) rate of export of goods, %; Level of profitability of enterprise operating activities, %. The cumulative level of influence of these indicators on the integral indicator characterizing the market component of the economic security of economic entities in Kyiv is the highest and amounts to 45%.

The calculation of values to define the weighting coefficients of the given indicators will be based on the dispersion of the main components and factor loads of all indicators. The weight of influence of each of the presented indicators on the market component of the economic security of economic entities in Kyiv is shown in Table 10. The data given in Table 7 show that the level of profitability of enterprise operating activities has the greatest impact on the economic security of economic entities in Kyiv in terms of the market component.

**Table 10. Calculation of weighting coefficients of the economic security of economic entities in Kyiv in terms of the market component in 2016-2020.**

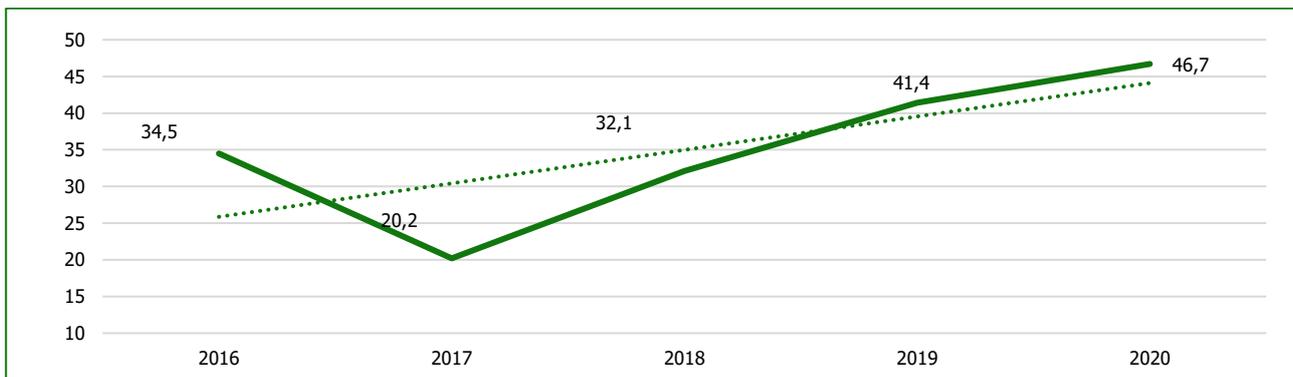
Legend	Factors		$f_{1i} \sum f_{1i} * 0,47$	$f_{1i} \sum f_{1i} * 0,37$	Weights
	F1 <sup>r</sup>	F2 <sup>r</sup>			
1	2	3	4	5	6
P1	0.71	-	0.120	-	0.16
P2	0.72	-	0.121	-	0.16
P3	0.95	-	0.159	-	0.25
P4	-	0.75	-	0.145	0.19
Sum	2.38	0.75	-	-	-

The calculation of the economic security of economic entities in Kyiv in terms of the market component can be described using the equation:

$$I_p = 0,16P1 + 0,16P2 + 0,25P3 + 0,19P4 \tag{7}$$

where P1 is the growth (decline) rate of import of goods, %; P2 is the growth (decline) rate of export of goods, %; P3 is the level of profitability of enterprise operating activities, %; P4 is the index of physical volume of retail turnover of retail trade enterprises.

The dynamics of the level of economic security of economic entities in Kyiv in terms of the market component within 2016-2020 is presented in Figure 3. The analyzed period shows the negative dynamics of the integral indicator of economic security of economic entities in Kyiv in terms of the market component with its shift from the level of probable danger to the range of danger. The lowest level was in 2017. However, in 2019-2020, we can see a better situation and a shift to the range of probable danger.



**Figure 3. Dynamics of the integral indicator of the level of economic security of economic entities in Kyiv in terms of the market component in 2016-2020.** (Source: calculated by the authors)

Similarly, we calculate the level of economic security of economic entities in Kyiv in terms of the innovative component in 2016-2020 (Table 11).

**Table 11. Dynamics of indicators of the innovative component of the economic security of economic entities in Kyiv in 2016-2020.**  
(Source: systemized by the authors based on the data of the State Statistics Service of Ukraine [4])

Indicators	Years				
	2016	2017	2018	2019	2020
Level of profitability of professional, scientific and technical activities, %	7.5	8.2	9.6	29.6	2.7
Volume of capital investments per person, thousand UAH	36.7	47.1	69.0	73.0	55.8
Percentage of sold innovative industrial products (goods, services), %	0.4	0.5	0.4	0.3	0.9
Share of capital investments in professional, scientific and technical activities, %	2.9	3.9	3.4	3.6	5.2

The quantitative calculation of the level of economic security of economic entities in Kyiv in terms of the innovative component in 2016-2020 shows that its indicators can be combined into two groups of factors, which will represent 95% of the total variation for each component in the factor load (Table 12).

If taking the total dispersion as one, then the trend in the impact of factors on the economic security of economic entities in Kyiv in 2016-2020 can be described by the following equation:

$$I_p = 0,57F1_p + 0,43F2_p \quad (8)$$

where  $F1_p, F2_p$  are basic factors constructed out of numerous obtained indicators [C1...C4] of the economic security of economic entities in Kyiv in terms of the innovative component in 2016-2020.

**Table 12. Matrix of factor loads of the innovative component of the economic security of economic entities in Kyiv in 2016-2020.**  
(Source: calculated by the authors using the Statistica 8.0 package)

Indicators	Legend	Factors	
		$F1_p$	$F2_p$
Level of profitability of professional, scientific and technical activities, %	C1	0.294754	0.958639
Volume of capital investments per person, thousand UAH	C2	0.721039	0.641292
Percentage of sold innovative industrial products (goods, services), %	C3	0.869887	0.470573
Share of capital investments in professional, scientific and technical activities, %	C4	0.513928	0.849571
Own values		2.541447	1.787970
Share of total dispersion, %		0.573574	0.436328

The weight of influence of each of the presented indicators on the integral indicator of the economic security of economic entities in Kyiv is given in Table 13, which shows that the percentage of sold innovative industrial products (goods, services), %, has a substantial impact on the innovative component of the economic security of economic entities in Kyiv in 2016-2020.

**Table 13. Weighting coefficients of the innovative component of the economic security of economic entities in Kyiv in 2016-2020.**  
(Source: calculated by the authors)

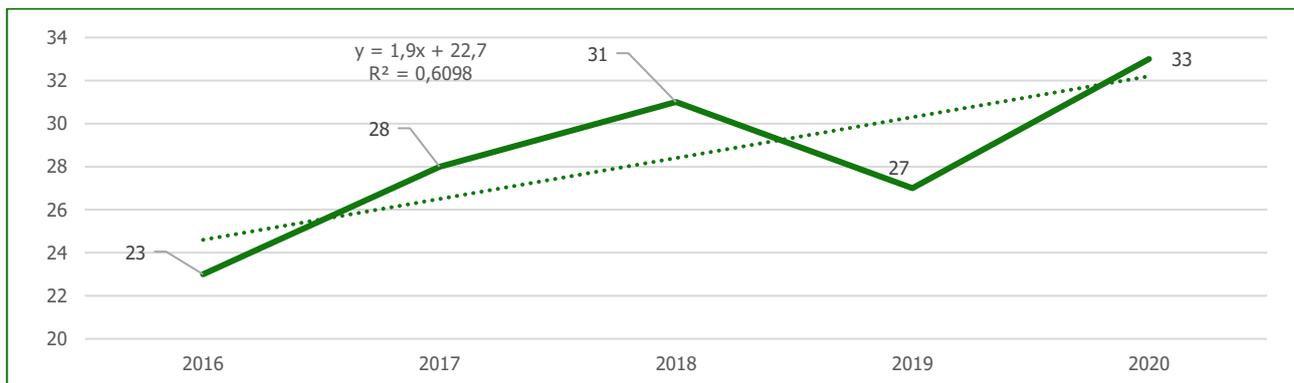
Legend	Factors		$f_{1i} \sum f_{1i} * 0,56$	$f_{2i} \sum f_{2i} * 0,44$	Weight
	$F1_p$	$F2_p$			
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
C1	-	0.95	-	0.23	0.23
C2	0.72	-	0.16	-	0.18
C3	0.87	-	0.19	-	0.25
C4	-	0.84	-	0.21	0.21
Sum	2.54	1.79	-	-	-

Thus, the level of the innovative component of the economic security of economic entities in Kyiv in 2016-2020 can be described using the equation:

$$I_c = 0,23C1 + 0,18c2 + 0,25c3 + 0,21c4 \quad (9)$$

where *C1* is the Level of profitability of professional, scientific and technical activities, %; *C2* is the Volume of capital investments per person, thousand UAH; *C3* is the Percentage of sold innovative industrial products (goods. services), %; *C4* is the Share of capital investments in professional, scientific and technical activities, %.

The dynamics of the level of economic security of economic entities in Kyiv in terms of the innovative component in 2016-2020 is presented in Figure 4. The Figure clearly shows that economic entities in Kyiv are in the range of danger in 2016. In 2017-2020 the innovative component of the economic security of economic entities in Kyiv is in the range of probable danger.



**Figure 4. Dynamics of the integral indicator of the level of economic security of economic entities in Kyiv in terms of the innovative component in 2016-2020.**

Adaptive search for model parameters and coefficients of their importance gives the prospect to obtain integral diagnostic models. allowing us to diagnose the economic security of economic entities and receive forecasts from retrospective data. Calculating quantitative values of the defined components of the economic security of economic entities in Kyiv, we can calculate the generalizing integral indicator ( $S_i$ ) by the formula:

$$S_i = \sum_{i=1}^n I_i \times w_i \quad (10)$$

Where  $w_i$  is a weighting coefficient for the *i* component of the economic security of economic entities in Kyiv;  $I_i$  are functional components (resource; social; market and innovative); *n* is the number of components that will form the economic security of economic entities in Kyiv ( $n=4$ ).

Weighting coefficients for the general integral indicator of the economic security of economic entities in Kyiv will be calculated using the method of the main components. Initial data to calculate the level of economic security of economic entities in Kyiv are presented in Table 14.

No.	Functional component	Legend	Years				
			2016	2017	2018	2019	2020
1	Resource	IR	31.5	38.2	41.4	39.5	24.1
2	Social	IS	49.78	50.14	54.81	62.15	55.12
3	Market	IP	34.5	20.2	32.1	41.4	46.7
4	Innovative	IC	23	28	31	27	33

The calculations conducted using the Statistica statistical analysis package allows us to suggest the model of the comprehensive assessment of the level of economic security of economic entities in Kyiv by components in 2016-2020. which can be described by equation (11).

$$S_i = 0,26R+0,23S+0,27P+0,24 \quad (11)$$

where  $S_i$  is the level of economic security of economic entities in Kyiv in 2016-2020;  $IR$  is a resource component.  $IS$  is a social component.  $IP$  is a market component.  $IC$  is an innovative component of the economic security of economic entities in Kyiv.

We calculate the level of economic security of economic entities in Kyiv by components using the equation (11), the results of which are presented in Figure 5.

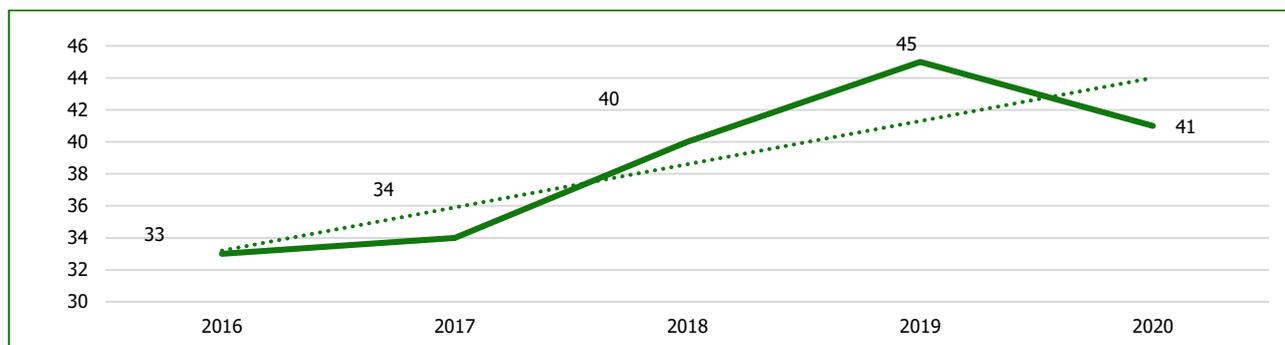


Figure 5. Dynamics of the complex integral indicator of the economic security of economic entities in Kyiv in 2016-2020.

Justifying the optimal range of the level of economic security of economic entities in Kyiv from 80% and above, we can see that the maximum value of the integral indicator for the studied period in 2019 is 45. Negative trends are reflected by the dangerously low value of the indicator in 2006 at the level of 33.

## DISCUSSION AND CONCLUSIONS

The development of a scientific-methodical approach to the assessment of diagnostics of the economic security of economic entities and the calculation of the integral indicator made it possible to generalize the characteristics that reflect the most important properties of the presented research object. Analyzing the dynamics of the integral indicator of the economic security of economic entities on the example of the city of Kyiv in 2016-2020, we can conclude that the economic entities of the city of Kyiv are in a zone of probable danger. Maintaining the level of economic security of business entities in this zone means the intensity of their systematic destruction, which primarily requires urgent measures aimed at restoring the general state of the identified crisis indicators. Therefore, the next step may be the development of a set of measures aimed at increasing the level of economic security of business entities and neutralizing probable and existing threats to their interests.

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## **НАУКОВО-МЕТОДИЧНИЙ ПІДХІД ДО ОЦІНКИ ДІАГНОСТИКИ ЕКОНОМІЧНОЇ БЕЗПЕКИ СУБ'ЄКТІВ ГОСПОДАРЮВАННЯ**

Метою статті є розробка науково-методичного підходу до оцінки діагностики економічної безпеки суб'єктів господарювання на прикладі міста Києва та розрахунку інтегрального показника, що дає змогу узагальнити характеристики, які відображають найважливіші властивості представленого об'єкта дослідження. Доведено, що негативні наслідки суспільно-політичних трансформацій в Україні, тривале виснаження ресурсів суб'єктів господарювання в умовах перманентних структурних змін національної економіки, потребують практичних заходів із забезпечення належного рівня економічної безпеки бізнесу. Зроблено висновки, що багатогранність наукових поглядів щодо сутності й методики діагностики економічної безпеки, які можна застосувати й до суб'єктів господарювання, актуалізує питання дослідження ключових підходів до її оцінки, де предметом оцінювання виступають: безпосередньо об'єкт дослідження (обрано для дослідження діяльність суб'єктів господарювання міста Києва); фактори впливу на об'єкт відповідного дослідження (зовнішні та внутрішні загрози); система забезпечення економічної безпеки: заходи, які сприяють стабілізації функціонування всіх представлених складових об'єкта дослідження. Методика оцінки рівня захисту економічних інтересів ґрунтується на критеріях ефективності функціонування аграрного виробництва, а саме: спроможності учасників аграрного виробництва оптимально розподіляти й ефективно використовувати ресурси (ресурсна складова); можливості забезпечити на належному рівні потреби та цілі споживачів аграрної продукції, забезпечення трудовими ресурсами (соціальна складова); підтримка національних інтересів аграрного виробництва в умовах впливу глобалізаційних процесів (ринкова складова); інтенсифікація розвитку аграрного виробництва (інноваційна складова). Запропоновано використовувати функціонально-системний підхід, який дозволяє сформулювати універсальний алгоритм для проведення діагностики економічної безпеки суб'єктів господарювання та обчислити інтегральний показник, що дає змогу узагальнити характеристики, які відображають найбільш важливі властивості представленого об'єкта дослідження. За результатами дослідження зроблено висновок, що суб'єкти господарювання міста Києва перебувають у зоні ймовірної небезпеки. Перебування рівня економічної безпеки суб'єктів господарювання міста Києва в цій зоні відображає інтенсивність систематичного їх руйнування, що насамперед потребує термінових заходів, орієнтованих на відновлення нормального стану виявлених кризових індикаторів.

**Ключові слова:** діагностика, економічна безпека, економічні інтереси, інтегральний показник, кризові індикатори, національна економіка, суб'єкти господарювання

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