

INTEGRATED ASSESMENT OF THE FINANCIAL SECURITY OF THE ENTERPRISE

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***Abstract.** In the article it is proposed to calculate the integral indicator for evaluation the level of financial security of enterprise based on the use of the Harrington desirability function, that is the universal and comfortable way of construction of the generalized indicators. The proposed methodology of evaluation the level of financial security is tested in practice on the example of the Privet joint stock company "Zaporizhkoks". The correspondence of the assesment results to the results of the assesment of the financial security of the enterprise was proved based on the analysis of its financial condition, which proves the practical utility of the proposed method.*

Keywords. Financial security, integral indicator , scale of desirability, coefficient, function of part.

Formulation of the problem. In the conditions of market economy the level of efficiency of activity of any enterprise straight depends on the state of his finances, that, in turn, makes the problem of systematic providing of financial security one of the most important questions of financial management of a business entity.

The issue or ensuring the financial security of an enterprise has become especially relevant in the context of a global pandemic. The pandemic resulted in fundamental changes of factors of external and internal environment of functioning of managing subjects, partial or complete stop of activity, break of productive-sale chainlets, shock of solvent demand, crisis of advancement, increase to the level of financial risks and others like that.

In turn, an important value in providing of financial security of an enterprise plays the complex evaluation of her level, that gives an opportunity to educe existent problems in the state of financial security of enterprise or sign of their origin and, accordingly, take measure in relation to their warning and overcoming.

For this reason questions of evaluation of financial security of domestic enterprises and in a theoretical, and in practical plan are very actual and timely.

It is worth nothing that most of the methods for assessing the financial security of an enterprise are rather complicated from the point of view of their application.

Therefore, it becomes necessary to further improve methods for assessing the financial security of the enterprises based on bringing the factors that characterize financial security to a single integral indicator.

Analysis of Recent Research and Publications. The issues of assessing the financial security of an enterprise are devoted to researches of such domestic and foreign scientists-economists, as: Blank I.O., Baranovskyi O.I., Horiacheva K.S., Yermoshenko M.M., Illiashenko S.M., Krakos Yu.B., Kuzenko T.B., Papekhin R.S., Poida-Nosyk N. N., Shamrai M.I., Shelest V.V. and others.

Despite the theoretical and practical significance of scientific research in the field of assessing the financial security of an enterprise, the issue of determining indicators and methodical approaches to assessing its level are still debated. In particular, we are talking about the formation of complex methods for assessing the financial security of domestic enterprises.

In this regard, the purpose of the submitted article is to substantiate the possibility of applied use of an integral methodology for assessing the financial security of an enterprise, built on the use of the Harrington desirability function.

Research Results. The concept of "financial security" is a rather complex category, which leads to a varied interpretation of its economic essence. The absence of a single scientifically grounded and officially approved approach to the concept of the essence of "financial security of an enterprise" predetermines the need to determine the most optimal meaning of this concept. Therefore, it is advisable to compare the scientific opinions of scientists on this issue, which in the future will help to avoid misunderstandings regarding the interpretation of the essence of financial security, in particular, as an object of analysis.

The study of scientific economic literature on the problems of ensuring the financial security of an enterprise makes it possible to assert that there are several points of view regarding the interpretation of the essence of the concept of "financial security of an enterprise" namely:

- from the point of view of the position of the financial condition of the enterprise;
- from the point of view of stability and resilience of the enterprise;
- in terms of the degree of efficiency in the use of the enterprise's resources.

Thus, in our opinion, under the financial security of an enterprise it is advisable to understand a certain financial condition of the enterprise, which is characterized by its ability to withstand existing and emerging threats, that is provided by constant monitoring and diagnostics of its level, as well as the formation of a set of preventive and control measures.

Similarly, with the absence of a single point of view regarding the interpretation of the studied category, it should be noted that there is no single approach to assessing the level of financial security of an enterprise.

Various methods of its assessment are considered in the scientific literature today.

There are such approaches to assessing the level of financial security of an enterprise as: an assessment of financial security based on an analysis of the financial condition of an enterprise, when indicators of financial strength liquidity, business activity, profitability and other indicators are compared with the boundary values of financial indicators; indicator approach; resource-functional approach; approach based on the use of the criterion of the «minimum total loss that is inflicted on security» ; an approach that proceeds from the sufficiency of working capital (own

and loan) to carry out production and sales activities; program-targeted approach; ranking method; strategic targeting approach; structural analytical methods; comprehensive threat assessment; comprehensive assessment of the economic and financial potential of an enterprise; bankruptcy forecasting methods; financial security analysis based on STEP- analysis, SWOT- analysis, SPACE- analysis and others [2; 5].

At the same time, given the fact that the financial security of an enterprise is a complex systemic category, to assess its level, there is a need to take into account a variety of indicators (coefficients) that will serve as the basis for determination values of the integral indicators of the financial security of an enterprise.

Based on the analysis of economic literature [1; 2; 4; 6], we will determine the coefficients for assessing the level of financial security of an enterprise, proposed for inclusion in the calculation of the integral indicator of its level with justification of the expediency of inclusion in the calculations selected indicators:

1. Property status indicators:

- fixed assets usefulness ratio (R_{fau}), which shows part of the fixed assets, suitable for exploitation, that directly influences on efficiency of economic activity of an enterprise and, consequently, level of its financial security.

2. Business activity indicators, which represent the level of efficiency of the use of resources of an enterprise, in particular its fixed assets and working capital, carry out direct influence on the size of net income from sales; can lead to the release of part of the financial resources, which directly affects the financial security of an enterprise. The last indicators included in the model allows to take into account and correct the balance or cash flows during settlements with commercial lenders and debtors, which has a positive effect on the level of financial security of an enterprise:

- return on assets (RA);

- turnover ratio of current assets (R_{tca});

- payables to receivables ratio (R_{pr}).

3. Liquidity and solvency indicators, which characterize possibility of an enterprise quickly to transform assets into cash with the aim of payment of the current liabilities. Problems in the field of financial security will be evidenced by the fact that the need for liquid assets exceeds their actual availability. Therefore, it is advisable to include such liquidity indicators in the financial security assessment mode:

- total liquidity ratio (R_{tl});

- absolute liquidity ratio (R_{al}).

4. Financial strength indicators that, foremost determines financial independence of subject of manage from the loan sourcings of his activity. Also, the financial security is greatly influenced by the provision of the enterprise with its own working capital and the maneuverability of its own funds, which characterize the ability of a business entity to finance the total volume of working capital at the expense of its working capital and determine the efficiency of the company's equity capital:

- autonomy ratio (R_a);

- finance strength ratio (R_{fs})

- equity ratio (Re)
- equity capital flexibility ratio (Recf).

5. Profitability indicators that reflect the company's ability to generate profit in the course of its business activities, and therefore cannot be included in the model for assessing the financial security of an enterprise:

- return on assets ratio (Rra);
- return on equity ratio (Rre);
- profitability ratio (Rp).

6. Investment attractiveness:

- the Beaver ratio (Rb), which allows for an express analysis of the financial condition, and hence the financial security of the an enterprise, based on the identification of the unsatisfactory structure of the enterprise's balance sheet.

After determining the list of indicators for assessing the level of financial security of an enterprise, one should determine the approach to calculating the integral indicator of the financial security of an enterprise, which, at the same time, must be universal, simple and easy to calculate.

Therefore, we consider it appropriate to calculate the integral indicator based on the assessment of the above indicators to use the generalized Harrington desirability function, which is a universal and convenient way to construct a generalized indicator.

The specified function is a quantitative, unambiguous, single and universal indicator of the quality of the object under study, characterized by such properties as adequacy, efficiency and statistical sensitivity, which allows using it as an optimization criterion. The construction of this generalized function is based on the idea of converting the natural values of individual indicators into a dimensionless form. Then it is followed by taking into account the partial functions on the Harrington scale and the integral indicator for assessing financial security of an enterprise (D) (formula 1) [3, p. 69]:

$$D = \sqrt[n]{\prod_{i=1}^n d_i}, \quad (1)$$

$$d_i = \exp(-\exp(-y_i)), \quad (2)$$

де n –amount of indexes that is used for the evaluation of financial strength security;

d_i –function of part (desirability of part), that is determined in accordance with the scale of Harrington;

y_i – an indicator of financial safety is in a dimensionless kind.

Thus, to assess the financial security of an enterprise based on the Harrington desirability function, it is necessary to convert the system of indicators selected for analysis into dimensionless form, and then calculate the values of the partial functions by the formula (2).

Formulas for reducing the coefficients to dimensionless form are (3) and (4):

$$y_i \uparrow(\text{max}) = \frac{k_i}{k_{kpm}}, \quad (3)$$

$$y_i \downarrow(\text{min}) = \frac{(1-k_i)}{k_{kpm}}, \quad (4)$$

де k_i – calculation value of index;

k_{kpm} – critical value of index;

max/min – criterion of maximization (minimizations) of the got index.

To interpret the obtained characteristics of the level of financial security, use the Harrington desirability scale.

The scale of desirability refers to psychophysiological scales. Its purpose is to establish a correspondence between physical and psychophysiological parameters. Physical parameters mean possible responses that characterize the functioning of the investigated object. These may include aesthetic and even statistical parameters. Psychological parameters are understood as purely subjective assessments of the experimenter's desirability (priority) of one or another response. To obtain a scale of desirability, it is convenient to use ready-made developed tables of correspondences between priority ratios in empirical and numerical (psychological) systems (Table 1) [7].

Table 1

Scale of desirability of Harrinhton

Value of function	Estimations are on the scale of desirability
1,00 – 0,81	Very well
0,80 – 0,64	Well
0,63 – 0,38	Satisfactorily
0,37 – 0,21	Badly
0,20 – 0,00	Very badly

Means the estimates given in table 1, we propose to use it to characterize the level of financial security of the analyzed enterprise.

Let's check in practice the proposed methodology for assessing financial security using the example of the Private joint-stock company «Zaporizhkoks». It is one of the largest producers of coke for metallurgy (about 10 percent of the total coke produced in Ukraine) and one of the largest exporters of chemical products in Ukraine.

So, at the first stage, in accordance with the chosen methodology, 14 indicators were calculated, which from different sides characterize the state of the financial security of the enterprise (Table 2).

Table 2

There are indexes of evaluation of financial safety of the Private joint-stock company «Zaporizhkoks» during the period 2017-2019 .

Name of index	Datains			Criterion of optimization	
	2017 y.	2018 y.	2019 y.		
Rfau	0,63	0,60	0,95	0,5	max
Ra	4,72	11,01	7,54	3	max
Rtca	1,75	1,33	2,33	5	max
Rpr	1,35	1,41	2,81	1,00	max
Rtl	1,31	1,53	2,86	1,00	max
Ral	0,002	0,06	0,02	0,25	max
Ra	0,33	0,44	0,72	0,5	max
Rfs	0,48	0,79	2,63	1,00	max
Re	0,24	0,35	0,65	0,1	max
Recf	0,62	0,64	0,51	0,5	max
Rra	0,18	0,13	0,01	0,1	max
Rre	0,39	0,30	0,02	0,1	max
Rp	0,12	0,12	0,01	0,1	max
Rb	0,17	0,21	-0,07	0,2	max

After calculating the values of the coefficients that characterize different aspects of the financial security of the analyzed enterprise, we will bring them to a dimensionless form in accordance with the proposed methodology. For this, each indicator is compared with the value of the established optimization criterion (Table 3).

Table 3

Dimensionless values of indexes of financial safety of the Private joint-stock company «Zaporizhkoks» during the period 2017-2019

Index	2017 y.	2018 y.	2019 y.
Rfau	1,26	1,2	1,9
Ra	1,573333	3,67	2,513333
Rtca	0,35	0,266	0,466
Rpr	1,35	1,41	2,81
Rtl	1,31	1,53	2,86
Ra	0,008	0,24	0,08
Ra	0,66	0,88	1,44
Rfs	0,48	0,79	2,63
Re	2,4	3,5	6,5
Recf	1,24	1,28	1,02
Rra	1,8	1,3	0,1
Rre	3,9	3	0,2
Rp	1,2	1,2	0,1
Rb	0,85	1,05	-0,35

At the last stage, one should calculate the partial functions of desirability and calculate the integral level of financial security of the enterprise based on determining the value of the Harrington function for each of the analyzed years (Table 4).

Table 4

Function of part $d_i = \exp(-\exp(-y_i))$

Index	2017 y.	2018 y.	2019 y.
Rfau	0,753027	0,739934	0,861079
Ra	0,812733	0,974845	0,922196
Rtca	0,494263	0,464665	0,533921
Rpr	0,771638	0,783375	0,941571
Rtl	0,763517	0,805304	0,94434
Ra	0,370822	0,455378	0,397279
Ra	0,596395	0,660484	0,789048
Rfs	0,538599	0,635181	0,930458
Re	0,913275	0,970254	0,998498
Recf	0,748724	0,757269	0,697261
Rra	0,84764	0,761449	0,404608
Rre	0,979962	0,951432	0,440991
Rp	0,739934	0,739934	0,404608
Rb	0,652193	0,704732	0,24194
Harrington function	0,692381	0,725593	0,623342

According to the results of assessing the financial security of the Private joint-stock company «Zaporizhkoks» using the Harrington function in accordance with the Harrington desirability scale (Table 1), the analyzed enterprise had a good level of financial security during the period 2017-2018. But by the end of 2019 the situation worsened, the indicator dropped to a satisfactory level, as indicated by a decrease in the value of the Harrington function by 14,1 percent. These signals need to take urgent measures to restore the level of financial security of the enterprise.

We emphasize that the conclusions obtained on the basis of calculating the integral indicator of the assessment of the financial security of the enterprise fully confirm the results of the traditional assessment of the level of financial security of the Private joint-stock company «Zaporizhkoks» based on its analysis financial condition.

Thus, at the end of the period, the analyzed enterprise showed a significant deterioration in all profitability indicators against the background of strengthening financial strength and overall liquidity (along with constant problems with absolute liquidity). This happened due to the rapid decrease in the level of net profit in 2019 by 91,4 percent and became the main factor in the deterioration of the level of financial security of the Private joint-stock company «Zaporizhkoks».

Thus, the proposed methodology for the integral assessment of the level of financial security of an enterprise based on the Harrington's desirability function is fully effective. It is flexible enough and allows to detect threats to the financial interests of the enterprise and can be used as one of the criteria for making managerial decisions that relate to the areas of ensuring the necessary and sufficient level financial security of the enterprise.

Conclusions. Thus, the main stages of an integrated assessment of the level of financial security of an enterprise using the Harrington desirability function are:

1. Determination of the list of coefficients that would comprehensively characterize the level of financial security of the enterprise.

2. Calculation of the values of the selected coefficients for the corresponding period.

3. Bringing the calculated values of the coefficients to a dimensionless form with the further calculation of the values of the partial functions of desirability.

4. Calculation of a complex indicator of the level of financial security of enterprise.

Approbation of the proposed methodology for assessing the level of financial security of an enterprise using the example of the Private joint-stock company «Zaporizhkoks» during 2017-2019 rr. revealed a deterioration in the level of financial security from good (0,69-0,73 during the period 2017-2018) to satisfactory (0,62 in 2019), which corresponds to the results of the assessment of financial security based on the analysis of the financial condition of the enterprise. Based on the testing results, it was concluded that it is advisable to use the proposed methodology for assessing the level of financial security of domestic enterprises, based on the use of the Harrington desirability function, which is not difficult to use and allows to calculate the integral indicator of financial security based on a small amount of initial data contained in the financial statements of the enterprise.

In general, the proposed method for assessing the financial security of an enterprise based on calculating the integral indicator of financial security using the Harrington desirability function has real practical utility and can be used by domestic enterprises as a tool to prevent threats to the financial interests of the enterprise and to ensure the required level of its financial security.

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