

Anna V. Agapova, Assistant of Economics, organization and management of enterprises Krivoy Rog Technical University

The economic – mathematical model evaluation of the economic condition of the enterprise using classification levels of dependence on integrated indicator

The mathematical model and classification levels of economic enterprise, depending on the value of the integral index of assessing the economic condition of the company that will provide adequate assessment for all information users.

Economic modeling, evaluation of the economic condition of the enterprise, the scale of Harrington, the level of economic enterprise.

In practice, managing a broad range of approaches, which allows assessment of the enterprise. The manner and method of analytical procedures is determined by many factors, above all, the purpose of the assessment, the circumstances in which it is held, the need for full analysis, information that has analyst and others.

The issue of assessment, diagnosis and management now have dedicated their work following domestic economists: M. I. Bakanov, T. G. Ben, A. I. Blank, A. S. Galushko, S. B. Dovbnya, I. Podderohin, G. V. Savitskaya, V. T. Savchuk, A. M. Turylo, M. G. Chumachenko. Along with issues of national experts studied the issue was covered with colleagues: K. Adams, I. T. Balabanov, E. F. Brihhem, I. Syroyezhyn, R. Kaplan, E. Nile, A.D. Sheremet, E. Helfert.

Choosing a method of assessment should carefully analyze the feasibility of using complex analytical procedures. That is why there is a need detailed consideration of methods that exist to assess the economic situation, given the need for an unambiguous conclusion about the economic situation of the enterprise.

1. Convenient and effective method is integrated, which provides for the formation of a single criterion. The method is characterized by simplicity of the resulting conclusion is based on it can with some degree of accuracy to answer the question, what is the economic situation of the enterprise: normal or unsatisfactory, and whether to take measures for its improvement.

2. Techniques that offer to use the rating synthesis rate by offsetting some indicators can be used only if justified formation of a set of selected indicators that remains unresolved challenge.

3. Rankings – the process of determining grades, quantitative estimates of relative degrees of differences in qualitative characteristics. The method of ranks is used when it is impossible or inexpedient immediate evaluation. This ranking objects contains only information on the best of them and does not contain information about how or how many times one object better than the other. The advantage of this method – simplicity, lack – a practical impossibility with sufficient accuracy to rank sites, whose number exceeds 15–20; can not answer the question: How far apart are objects of study for their relevance.

4. The matrix method allows a comparative analysis of company management in the dynamics and determine the value of the generalized indicator of management

efficiency. This method gives not only a generalized description of the enterprise and the dynamics of its development, but also allows to determine changes in the process and work to identify resources needed to increase production efficiency. Application of this method in assessing the management of the company limits the fact that it applies only for evaluation of production and financial activities.

5. The method of expert evaluations – one of the major classes of scientific and practical methods of forecasting, based on the assumption that on the basis of expert opinion can build an adequate model prediction of the future development of the object. The starting information here is according to experts involved in research and development in a predictable area.

6. The method involves the commission of expert group discussions to develop common views on the future behavior of projected objects. The disadvantage of this method – the lag (conservative) views of experts on the predicted behavior of the object.

7. Break-even method is based on the role of operational leverage in shaping the performance of the enterprise management capabilities for its costs and benefits to achieve the required performance hurdle production. This method includes a basic aspect of the enterprise – and the break-even closely related to the management costs, but he does not agree with such party evaluation of the company as its competitiveness, credit, market and business activity.

8. Equilibrium method based on the concept of liquidity and economic assessment of the company. This method is widely used in world practice. However, it does not allow to take into account the state of the enterprise in a competitive, business, credit and market environment.

9. Methods for evaluating companies that do not use accounting data.

These methods are based on the principles of change in time value of money and accounting risk. It is widely used as discounting and calculating compound interest.

After reviewing existing approaches to the selection of indicators for the calculation of integral index in assessing the economic system of state mining company, using logic and method of expert evaluations, given the principle of non-duplication of indicators has been developed to a system that meets the following requirements: the possibility of its components must form a dynamic range that the current value of their directly or indirectly affect the value of other indicators. The chosen system should allow to assess not only the end result, but also suggest measures to improve the defining parameters. All figures should be subjected to affirmative action for each of them can provide important regulatory and industry factors. Also they should be selected so that they could vary the maximum.

To estimate the economic condition of the enterprise is necessary to develop economic and mathematical models to be used for managerial enterprise in determining the state of the company at the moment and to anticipate.

The main objective of assessing the economic condition of the enterprise is to develop an integrated assessment to ensure the needs of both internal and external users.

Assessment of economic situation of the enterprise can be described as a system that integrates analytical, control, Stimulating, indicative, forecast, management functions at the enterprise level.

To assess the economic condition of the enterprise is to provide the necessary knowledge to decide the subject of the use of different methodological instruments and apparatus for determining the state of the object management in an uncertain environment, functioning and development of measures to improve this condition, the possibility of comparing the economic status of other enterprises and the last period.

Note that a EECE should be based on generally accepted principles, the most important of which are: timeliness – assessment is required to create a bad situation, the first signs of failure, consider the dynamics of enterprise complexity – some phenomena and processes should explore together with all other associated phenomena, factors, objectives, scientific approach – assessment is conducted using research-based principles, concepts, categories, patterns, application of methodology and research methods; authenticity – the evaluation process is based on the immediate, accurate information accuracy – whether the real facts, goals and requirements that relate to the evaluation process, objectivity – an assessment should be developed by the research program, with clearly defined the basic parameters with a minimal impact factor of subjectivity, in the evaluation process should be used only facts, methods and measures to reduce inaccurate estimates; efficiency – making the assessment of enterprises need to constantly compare the positive and negative consequences of its conduct and costs associated with the process.

Given that almost all economic indicators of the enterprise is named variables, a necessary procedure technique is to bring performance to a single value. For this purpose it uses a generalized function Harrington [1].

Function Harrington is quantitative, unambiguous, unique and universal indicator of the quality of the object, and if you add qualities such as continuity, monotonicity, smoothness, adequacy, efficiency and statistical sensitivity, it becomes clear that it can be used as a criterion for optimization.

A modification of the universal scale of Harrington that solve the problem of quality grades of quantitative criteria, improving assessment of enterprises.

Criterion (or parameter) optimization – a response (feedback) effects of factors that determine the behavior of the study.

Economic practice already accumulated some experience and some types of econometric models used in macro-and microeconomic research. Let some of them.

1. Logarithmic:

$$y = \ln(x). \quad (1)$$

2. Polinomialna:

$$y = b_0 + b_1x + b_2x^2 + \dots + b_nx^k. \quad (2)$$

To determine the coefficients of regression equation are the values y of y in N points of the factorial space. The task of determining regression coefficients is typical for regression analysis. Based on this analysis, in relation to planning factorial experiment are that:

- Measurement results value y in N points in the factorial space are the realization of normally distributed random variable;

- Variance of equal to each other, y the variance does not depend on the absolute value of this quantity;
- Factors x_i independent values and are measured with negligible error compared with the error y in the values.

The coefficients of independent variables in the polynomial approximation indicate the degree of influence factors. Since perfectly accurate response function can not be established, it will be described by polynomials approximation (2), the order can be changed depending on the stage of modeling or specific problem that requires addressing.

This situation may arise when the polynomial coefficients due to the lack of true description of the function (2) can not be determined theoretically. In this case, they should determine through calculations on a computer, spending in alignment with fixed values y of factors.

Experimental systems research challenge aims to study the influence factors of the output value y, a factor analysis.

The methodology of processing the survey results based on the theory of random errors that are based on the assumption that when a large number of random measurement error of the same size but different sign occur equally often, large errors occur less frequently than small (probability of error decreases with increasing its size), with an infinitely large number of measurements of actual measurement value is equal to the size of the average value of all measurement results and the appearance of a given outcome as a random event is described by normal distribution.

The theory of random errors to evaluate the accuracy and reliability of measurement at a given number of measurements or to determine the minimum number of measurements to guarantee the required (given) accuracy and reliability of measurements. Along with this it is necessary to exclude a number of gross errors, to determine the accuracy of the data and so on.

For large sample and normal distribution law of evaluating characteristic dimension is the dispersion D and the coefficient of variation k_v :

$$D = \sigma^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n-1}; \quad (3)$$

$$K_v = \frac{\sigma}{\bar{x}}. \quad (4)$$

Dispersion describes the uniformity of measurement. The higher D , the greater the dispersion measurements. The coefficient of variation characterizes the variability. The higher k_v , the more variability of measurements averages k_v evaluate the fuzziness in the evaluation of multiple samples.

The confidence interval is called values x_i who falls in real value x_d measured value with a given probability. Confidence probability (confidence) dimension is called the likelihood that actual measured values y fall in this confidence interval, y the zone $a \leq x_d \leq b$. This value is determined in units of fractions or percentages. Confidence probability pd defined by the expression:

$$p_d = [a \leq x_{\text{н}} \leq b] = \left(\frac{1}{2}\right) \left[\frac{g(b - \bar{x})}{\sigma} - \frac{g(a - \bar{x})}{\sigma} \right], \quad (5)$$

where $g(t)$ – Laplace integral function:

$$g(t) = \frac{2}{\sqrt{2\pi}} \int_0^t e^{-\frac{t^2}{2}} dt. \quad (6)$$

The argument of this function is the ratio of standard deviation to w

$$t = w / \sigma, \quad (7)$$

where t – coefficient of warranty;

$$w = b - \bar{x}; w = -(a - \bar{x}). \quad (8)$$

In processing the experimental data to exclude a number of gross errors (abnormal phenomena). The emergence of these errors is quite possible, and their presence significantly affects the measurement result. However, before you delete this or that measure, make sure that this is really gross error, not statistical deviation due to variation.

Statistical relationships between variables should be studied by using correlation analysis.

Correlation analysis to evaluate the regression function. As a prerequisite for the use of correlation analysis is the assertion that: random variables and have a normal distribution.

In our case, the relationship between x and y can be described by the correlation coefficient ρ . This ratio is defined as the Covariance between x and y within their RMS deviations:

$$\rho = \frac{\text{cov}(x, y)}{\sqrt{\text{var}(x) \text{var}(y)}}. \quad (9)$$

Thus, using the above methodological approaches to the construction of econometric models in general to assess the economic condition of the company can build a mathematical model:

$$L(x) = \begin{cases} \left[\frac{1}{\sqrt{2\pi}} e^{-\frac{t^2}{2}} \right] & \frac{h}{\sigma} n \text{ при } 0 \leq x \leq x_1, \\ D \ln(x) & \text{при } x_1 \leq x \leq x_2 \end{cases} \quad (10)$$

where $L(x)$ – evaluation of the economic condition of the enterprise;

h – optimum spacing;

D – general indicator of economic evaluation of the enterprise.

To determine the optimal spacing h , ie, when the interval range is built to biv too hromistkyy and at the same time would allow to identify the characteristics of the process under research, you can use the formula Sterdzhesa:

$$h = \frac{x_{\max} - x_{\min}}{1 + 3,32_2 \log n} = \frac{x_{\max} - x_{\min}}{1 + 3,32 \frac{\ln n}{2,3025_9}}, \quad (11)$$

where x_{\max} and x_{\min} – maximum and minimum options, respectively;
 n – total number of observations.

If h – a fractional number, then the value of the interval should be taken or the nearest integer or nearest simple fraction.

By beginning of the first interval is recommended to take the value:

$$a_1 = x_{\min} - \frac{h}{2}. \quad (12)$$

Beginning of the second interval coincides with the end of the first and is:

$$a_2 = a_1 + h. \quad (13)$$

Construction of intervals to be extended until the next interval in order not to be more x_{\max} .

Using the above mathematical model, we obtain a modified scale of Harrington, and that will serve as a criterion for assessing the economic condition of the enterprise.

Table 1

**Classification of levels of economic enterprise,
depending on the value of the integral index of assessing
the economic condition of the enterprise**

value	The level of economic status	Description of levels of economic status
1,0–0,75	different	The high level of profitability, optimal capital structure and assets, effective use of assets, active investment and innovation policy, the growth tempo performance, increase the market value of enterprises, employment of staff interest in quality performance work
0,74–0,55	good	Economic activity is good, but can not support it at this level for a long time. Indicators of the economic situation of enterprises are at an optimum level

Contunion table 1

value	The level of economic status	Description of levels of economic status
0,54–0,35	satisfactory	There is a clear tendency to worsening economic conditions of the company. High efficiency of capital, fixed assets, but the lack of solvency and financial stability, not a favorable investment climate

0,34–0,25	bad	Low efficiency of capital, capital structure is unstable, lack of liquidity, solvency and creditworthiness of the company
0,24–0,0	Very bad (crisis)	Unprofitable activity, lack of investment and innovation, the decline of value indicators, inefficient use of resources, dependence on external sources of funding

The mathematical model and classification levels of economic enterprise, depending on the value of the integral index of assessing the economic condition of the company that will provide adequate assessment for all information users.

List of references

1. Agapova A. V. Economic modeling estimates the economic condition of the company with the scale of desirability Harrington / A. V. Agapova // Economic Analysis. – № 8. – Part 2. – 2011. – P. 15–18.

Отримано 05.12.2011

Анотація

Математична модель і рівні класифікації економічних підприємств залежно від значення інтегрального показника оцінки економічного стану компанії, який забезпечує адекватну оцінку для всіх користувачів інформації.