

Technique Development of the Complex Diagnostic Analysis of Enterprise Activities

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Abstract. Modern business entities face a significant number of problems, which ultimately lead to crises and unprofitability. In many ways, these states are due to insufficient amount of operational information for making management decisions. The role of this kind of information is difficult to overestimate in a market economy with its characteristic high level of instability, uncertainty of the business environment. Considered circumstances increase the relevance of such a tool of scientific research as a comprehensive diagnostic analysis of the enterprise results.

This type of research is an important part of the tactical and strategic management of the enterprise ensuring its sustainable development and competitiveness. At the same time, an important task of analysts is the formation of a "methodological field" of a system of methods and approaches to the diagnostic analysis of indicators characterizing the performance of an enterprise and its potential. The purpose of this article is to develop an algorithm for the method of integrated diagnostic analysis of the results of an enterprise. The proposed technique is based on clarifying the content of such areas of diagnosis as: financial, economic diagnostics and rating assessment of the company's position in the market. It also includes the study and definition of a resulting indicators system that takes into account net cash flows and fuller reflects the effectiveness of the enterprise. In the framework of this methodology, a system of indicators characterizing various business processes of the enterprise has been formed.

The advantages of the refined methodology of the complex diagnostic analysis are that it allows the researcher to study the effectiveness of the enterprise activity in a fairly short time and give objective conclusions on the state of the object of study, taking into account both the internal and external conditions. It can determine the threshold values of environmental indicators affecting the performance of the enterprise. The proposed research algorithm makes it possible to identify the position of an enterprise concerning other, similar, market participants according to a system of resulting indicators or another system of indicators formed in accordance with the objectives of the analysis.

1. Introduction

Modern conditions of functioning of enterprises in various fields of activity are characterized by a high degree of instability, variability and uncertainty of business environment factors. The continuous

volatility of such environmental parameters as exchange rates, prices and tariffs for energy resources, tax rates, interest rates on loans, further increase the risks of financial and economic instability of enterprises. The decline in financial results, solvency, and unstable positions in the market is largely due to management decisions not supported by sufficient reliable information on the current state of business, lack of objective assessments of the influence of the internal and external environment factors on the enterprise performance [26].

Despite its importance, analysis and diagnostics occupy a small proportion in the work of the economic services of enterprises compared with other functions of the management system. For example, an assessment of the quality of analytical procedures showed that most specialists analyze in insufficient amount (limited to comparing planned value indicators with actual values that are current with previous ones studying dynamics and structure), using outdated methods, and small enterprises have completely abandoned the analysis.

In other words, a significant part of entrepreneurs prefer a one-time approach to management (tasks are solved as they become available), rather than strategic (based on forecasting methods, analysis of factor space). This leads to the adoption of insufficiently substantiated management decisions, inaccurate forecasts, mistakes and miscalculations, unrealized potential, and a decrease in competitiveness. The amount of unprofitable organizations in Russia in January-February 2019, according to Rosstat, increased compared to the same period in 2018 by 1.1 percentage points and amounted to 28.5%. In particular, the number of companies that ceased operations due to bankruptcy liquidation increased by 4.2%. For comparison, the indicator of bankrupt companies in the United States was 0.58% [21].

2. Objective

In this situation, the tools of effective management which make it possible to identify hidden potential and “sore” points of business, are of particular relevance. Such high-performance tools include diagnostic analysis of the analyzed indicators sensitivity to changes in environmental factors, increase the objectivity of their assessment, and also has a precautionary and controlling nature expressed in the justification of plans and management decisions, the possibility of implementing corrective actions on previously taken management decisions. Modern methods of analysis and diagnosis should be actively developed and improved in accordance with the needs of business and international requirements. Therefore, development of complex diagnostics algorithm of the results of enterprise activities, as a mandatory element of an effective management system, is an important and necessary process.

When refining the method of complex diagnostic analysis, the works of such domestic economists as M. I. Bakanov, K. V. Baldin, Yu. M. Bakhramov, A. S. Vartanov, G. P., Gerasimenko, L. T. Gilyarovskaya, A. I. Ginzburg, M. M. Glazov, V. V. Glukhov, A. I. Goncharov, A. V. Grachev, V. A. Dolyatovsky, D. A. Endovitsky, V.V. Kovalev, N.P. Lyubushin, E.V. Negashev, D.A. Pankov, V. Sh. Rapoport, G. V. Savitskaya, G. K. Tal, Ya. A. Fomin, Yu. I. Chernyak, A. D. Sheremet, G. B. Yun, et al. [2, 4, 10, 11, 12, 15] were analyzed and the basis of the methodological recommendations was formed.

The study took into account the foreign experience presented in the works of I. Adizes, L. A. Bernstein, Z. Bodi, Y. Brigham, B. Koluss, C. F. Lee, S. Ross, J. G. Siegel, J. AND. Finnerty, D. Hassi, K. Hedderwik, E. Helfert, J. K. Shima, M. Ehrhardt and others. They defined the essence of economic diagnostics, its place in the management system, and investigated diagnostic methods. [3, 13, 22, 25, 27, 28].

Despite the presence of various approaches and types of diagnostics, the method of complex diagnostic analysis is not sufficiently developed, and the system indicators, methods of complex diagnostic analysis needs to be refined and clarified. The problems that analysts encounter in its fulfilment determine the relevance of this research topic.

3. Content's refinement of the main areas of integrated diagnostic analysis of the enterprise results

Diagnosis is one of the important functions of the analysis process. Its essence is in a detailed study of the deviations causes from target parameters and identifying signs of inconsistency between the actual state of the object and the planned one. Characteristic features of the diagnosis are speed, continuity, comprehensiveness [1]. Diagnostic analysis allows quickly formulation a "diagnosis", i.e. identifying the most "weaknesses" using the assessment of deviations on indicators [17, 18]. The information obtained should be detailed and subjected to a complex of analytical procedures allowing establishing and measuring causal relationships of the current enterprise state.

The study of this issue has allowed specifying the situation, upon the occurrence of which it is imperative to conduct a diagnostic analysis. They appear during the development of the strategic plan of the enterprise, in identifying negative trends in the main resultant indicators of the enterprise (identification of problems at an early stage will prevent the formation of a crisis situation), in the study of the potential for business revitalization, in the period of active growth, business development (with the aim of ensuring a balanced development), during the change of management staff; before restructuring, in a crisis.

Comprehensive diagnostic analysis should be considered as a set of three basic areas that include in their content a variety of research methods: financial diagnostics (express financial analysis, scoring analysis, operational analysis), economic diagnostics (rapid assessment of business processes, heuristic analysis methods, factorial analysis) and the company's rating on a specific market segment (inter-production comparative analysis, benchmarking) [5, 23]. Their purpose and content is considered in more detail.

1. In the conditions of tough competition, it is extremely difficult to keep financial state stable. It should be borne in mind that the standard analysis of the financial condition of the organization does not cover the whole range of issues necessary to identify problem areas of financial results for each assortment range of products (services) sold [7].

However, it is specific business processes in the assortment plan of the study that ultimately forms the final financial result of the activity of any commercial enterprise. In this regard, we note that the procedure of financial diagnostics should be supplemented with operational analysis as one of the effective tools of financial analysis which allows not only to identify the problem, but also to simulate the most acceptable way of doing business and building business processes.

Diagnostic analysis carried out using operational analysis indicators, such as operating leverage (OL), amount of coverage (AC) and coefficient of amount of coverage (CAC), break-even point (BP), profitability threshold (PT), allows assessing the level of prospects and losses of the type of the enterprise' activity under study, even when achieving negative results. If for unprofitable products the ratio of the amount of coverage is significantly greater than the weighted average for the enterprise as a whole, and the break-even point is not passed, then for this type of product one can offer a price reduction to increase sales volumes.

There are a set of indicators and the tendency of their change with negative values of the profit from sales, financial strength in the case that the sales volume does not match the permissible critical values reflected through the threshold of profitability (TP). Consider a combination of key indicators of operational analysis, which can be used to select a promising option with negative financial results:

1) A prospective version of the analyzed, will be obtained if the amount of coverage (AC) - max; coverage ratio (C_{ac}) - max; profitability threshold (in sales units) (PT) - achievable; operating lever (OL) - max.

2) An unpromising option from those analyzed will be obtained if the amount of coverage (AC) is min; coverage amount ratio (C_{ac}) - min; profitability threshold (in sales units) (PT) - unachievable; operating lever (OL) - min [9].

The behaviour of such an indicator as an operating lever allows prediction the possible rate of loss reduction and increase the positive financial result. When choosing a promising option, as can be seen, this ratio of revenue indicators, variable and fixed costs is determined, which leads to an increase in

operating leverage and, consequently, allows quickly achieving a break-even level. The criterion for selecting such an option is, first of all, the possibility of increasing the volume of sales to the value specified in the forecasts.

The operating lever for diagnostic purposes is considered through the module of the obtained numerical value (i.e. the mathematical sign “minus” is not taken into account). Thus, it is necessary to talk about the restriction introduced into the interpretation of the calculations: the operating lever should not be less than 1.0, since the interdependence of changes in the volume of sales and financial result speaks only of increasing financial difficulties.

The operating lever in the module is less than one ($OL < 1.0$), this situation reflects the impossibility of increasing positive financial results. That is, for the successful management of the financial results of an enterprise, it is advisable, first of all, to determine the minimum possible amount of reduction in fixed costs (excluding the increase in the cost of services). For this, the criterion for selecting options should be considered the limitation on the minimum possible value of the operating lever, which, in our opinion, should be necessarily more than 1.0 ($OL > 1.0$). Thus, financial diagnostics should be based on two systems of indicators: indicators characterizing the financial condition; indicators used in the operational analysis (OL, PL, BP, PT, C_{ac}) [8, 24].

2. Economic diagnostics should have a special place in the analysis of the economic activities of enterprises. Knowing and evaluating deviations, their causes and forms of manifestation it is possible with a certain degree of confidence to determine the nature, place and time of deviations from the specified parameters.

Economic diagnostics is an effective means of justifying decisions on the regulation of production, and information base for planning and forecasting. The need for the development of its methodology is associated with the abundance of external and internal information received by the company and a high degree of uncertainty in the conditions of operation. This direction of diagnostics is aimed at assessing the economic condition of an enterprise, determining deviations of indicators' indexes from the normal (specified) level determining their causes, justifying forecast decisions, which is achieved through procedures for identifying the most important factors of the business environment, forming a system of indicators' indexes and building forecast models describing the relationship between the resulting indicators and indicators' indexes [1,5, 6].

The procedure of forming an indicators structure is subjective in nature and carried out taking into account the sector specificity of the activity, conditions of functioning, goals and objectives pursued by management during the conduct of a comprehensive diagnosis. For these purposes, a group of experts may be formed. It may include leading experts with higher education and work experience of at least 5 years in the industry. The task of experts is to mark the most important environmental factors [19] in accordance with its system of preferences.

In the course of an expert survey of specialists of motor transportation enterprises (ATE) of Omsk, diagnostic directions were obtained, taking into account the main business processes of an enterprise, forming its results and a system of indicators (with deviation boundaries) for the economic diagnostics [23]:

1) Production diagnostics includes the following indicators of integrated economic diagnostics: the level of capacity utilization (the critical value is reached if the indicator is 50%); resource cost standards; equipment wear standards; production volume (planned value).

2) According to experts, the marketing (sales) sphere should include the following key indicators of economic diagnostics: customer commitment (a negative factor is a reduction in the number of regular customers by 10-15%); customer satisfaction (a negative factor is a decrease in the number of satisfied customers in their total volume by 10%); dynamics of sales volumes to the major customers (a negative trend is a decline in the share of sales to large customers).

3) Under personnel is implied the study of such indicators as: level of labour productivity (positive dynamics should be observed); the share of highly qualified personnel (education should be equal to 90%); staff turnover rate (negative factor - the achievement of this indicator is 20-30%).

4) Organizational and managerial direction of diagnosis involves the study of the following values: interchangeable equipment downtime (deviation from the standards of the enterprise by more than 20%); working time ratio (deviation from the standards of the enterprise by more than 10%); the level of professionalism of managers, i.e. Compliance with the managers' education position (compliance should be 90%).

5) The innovative direction of diagnosis should be aimed at studying: the share of new technologies in their total volume; equipment wear / wear ratio (a wear coefficient value of more than 50%, and therefore, coefficient of validity of less than 50% is a negative fact); the share of new goods, services (positive is the growth of this indicator).

3. Rating of the enterprise on the market. This is one of the most effective diagnostic analysis tools, which, unlike the previously reviewed research methods, is based on monitoring the external environment, which makes it possible to put into practice the most important principle that determines business success - the ability of managers to adapt an enterprise to the requirements and rapidly changing environmental conditions. To achieve your goals, you can use the method of inter-production comparative analysis. Its use allows us to conclude about the market position of the enterprise under study, among others of the same industry or sub-sector, and also to determine its competitiveness [10].

Stages of the study implementation and its content are defined as follows. This diagnostic study begins with the refinement or formulation of its goals (search for innovations, individual ways to improve financial and economic health, reserves for improving efficiency, and assessing possibilities of reaching a larger market share). The next stage is the development of a research program. As a result, a matrix of analytical indicators is formed: data are collected and processed for the period being assessed (a matrix of standardized indices is created; a comparison base is calculated: the arithmetic average of the index for each enterprise I_{cpai} and for the group of enterprises I_{group}).

Then we make a comparison regarding the selected base (the arithmetic average index of each enterprise with the base index for the group of enterprises I_{group}), grouping and ranking of the enterprises (if the condition $I_{cpai} > I_{group}$ is met - then the enterprise can be classified as stable; if $1 - I_{group} \geq I_{cpai} \geq 0.9 I_{group}$ - then the company can be attributed to the problem group, if the condition $I_{cpai} < 0.9 I_{group}$ is met - then the company can be attributed to the group of crisis). As a result, we calculate indices of deviations, formulate a diagnosis, identify reserves of growth in the results of the activity of the enterprise under study, and prepare a plan for management measures [1].

This method allows to rank the compared enterprises by individual parameters, and to establish the place of everyone in the market segment under consideration, to evaluate the performance of the compared objects, to identify reserves for improving the efficiency of work. Such an approach helps understand the reasons for deviations from the indicators of enterprise leaders, optimizes management decisions aimed at eliminating the backlog, creates a basis for innovation and occupying leadership positions in the market [23]. In world practice, a comparative analysis of the performance of one company with the performance of others, more successful firms is known as benchmarking (English is the origin, standard, benchmark).

4. Development of the algorithm for the method of integrated diagnostic analysis of the enterprise results

For comprehensive diagnosis of the results of the enterprise, a technique is proposed, presented in the form of an algorithm (Fig. 1).

At the first stage, the purpose of the analysis is set. These goals are: improving the performance of enterprises, rationality of management decisions; competitiveness increase; achieving a leading position in the market [1].

The next step is to form a research program. One of the most important elements of this stage is the selection of a system of indicators that most fully characterize the results of the enterprise's activities. When choosing, it is necessary to be guided by the following requirements: quantitative measurability, simplicity of calculation; qualitative homogeneity; indicators should be in the interests

of managers and managers of the enterprise. It is proposed to select indicators of gross profit [GP], net profit [NP] as basic indicators characterizing the final financial results of the company, but calculated on the basis of cash-based indicator ($Y_1 = GP + A_d$; $Y_1 = NP + A_d$).

In order to control the real possibilities of the further development of an enterprise, it is necessary to take into account whether the obtained financial result is confirmed by real money or not [23]. This necessitates the adjustment of net profit by the amount of depreciation. [11, 14, 16]. As a result, an indicator that takes into account net cash flows is formed.

Then the factor space of the enterprise under consideration is determined, groups of factors influencing the formation of the results of activity of this enterprise are identified using the methods of expert surveys. Taking the economic entity as an element of the macro system, the factors can be divided into external (macro and micro levels) and internal. At the stage of economic diagnostics, the most important factors are selected from the entire set of initially selected factors. As a result of the correlation analysis, the indicators that have the greatest impact on Y_1 and Y_2 Automobile Transport enterprise of Omsk were selected. Indices characterizing the internal environment: technical readiness ratio (Z_2), cash flow balance ratio (Z_6); indicators characterizing the external environment: the key rate of the Central Bank (X_2), the share of taxes in revenue (X_4).

The next stage involves the construction of economic and mathematical models describing the relationship between the resulting indicators and indicators of factors of the internal environment: $Y_1 = 2531.12 + 2744.53 * \ln(Z_6)$; $Y_2 = 2485.43 + 6451.38 * \ln(Z_6)$; environmental factors: $Y_1 = 3598.474 - 22159.2 * X_4$; $Y_2 = 4903.67 - 49855.1 * X_4$. In the course of this study, the factors hindering and contributing to the achievement of the desired financial results are identified. When interpreting, elasticity coefficients E_{x_j} are applied [29]. On the basis of the obtained results, the limiting values of indicators performance are determined, the level below which their value should not fall, since this will lead to negative performance results.

For these purposes, substituting various values of the results of the enterprise's activity into the regression equations, we obtain the corresponding values of the critical and desired estimated indicators. As a borderline (critical) level, zero values of the resulting indicators will be: according to the first resulting indicator (Y_1): $Z_6 \geq 1.15$; $X_4 \leq 0.03$; on the second resulting indicator (Y_2) $Z_6 \geq 1.145$; $X_4 \leq 0.03$. In addition, the level of the resulting indicators can be determined by their maximum value for the group of enterprises analyzed in this region (the results of the enterprise leader in the group in question). Then one should form a final system of assessment indicators (for subsequent diagnostic procedures): standard and planned values [20, 29, 30].

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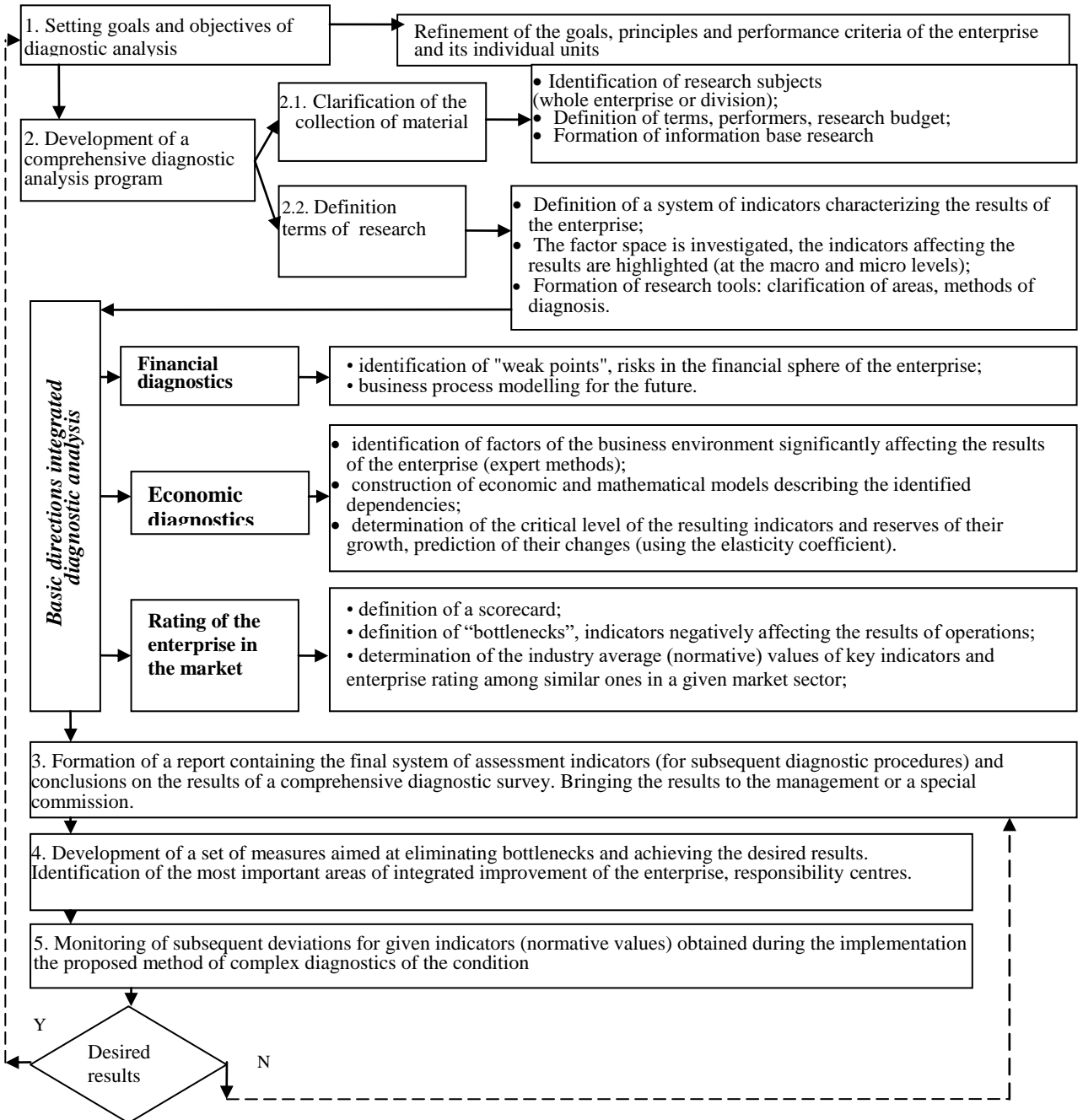


Figure 1. Algorithm of the integrated diagnostic analysis method of the results of the enterprise.

5. Conclusion

The rapidly changing environmental conditions and the instability of the internal environment, determine the need for practical application of diagnostic analysis techniques. The developed algorithm for comprehensive diagnostic analysis of the results of the enterprise is based on the formation of systems of resulting and factorial indicative factors, using data from the internal and external environment of the enterprise. The proposed method allows not only to conduct a comprehensive study of the current situation of an enterprise, but also to obtain an analytical assessment of its future state by simulating specified indicators using expert and economic-

mathematical methods, thereby reducing the risk associated with the uncertainty of the business environment.

References

- [1] Kirnichniy V Yu, Biryukov V V et al. 2015 Current issues of scientific research of the XXI century: monograph Yu I Avadani et al. by ed. *Omsk: SibADI.*: 1315
- [2] Alekseeva O A 2008 “Application of diagnostic analysis in order to detect signs of a crisis state of an enterprise” *Bulletin of the North Caucasus State Technical University* **1** 110-114
- [3] Janster P, Hassi D 2016 Analysis of the strengths and weaknesses of the company Definition of strategic opportunities *M.: Williams* 368
- [4] 2014 Analysis and diagnostics of financial and economic activities of enterprises Textbook. Edited by Pozdnyakov V Ya Moscow: 365
- [5] Bachurin A A 2017 Analysis of production and economic activities of road transport organizations: a textbook for academic bachelor 4th ed., Corr. and add *M.: Publishing house Yurayt* 296
- [6] Bezhovets A A Economic diagnostics of an innovative organization *Discussion* **2(76)** 14-20
- [7] Blazhevich O G 2018 “Complex financial diagnostics of enterprises” *Scientific Herald: finance, banks, investment* **1(42)** 29-40
- [8] Brigham Y 2009 Financial management 10th ed. Transl. from English by ed. Dorofeev E A *SPb.: Peter* 960
- [9] Bulysheva A Yu 2015 “Five main tools of operational analysis The potential of the Russian economy and innovative ways of its implementation; materials of the international scientific-practical conference of students and graduate students”: in 2 parts Omsk branch of the Financial University under the Government of the Russian Federation 354-359
- [10] Buchinskaya E A 2018 “Rating risk assessment models *Economy and Society*” **11(54)** 221-223
- [11] Vartanov A S 2014 Economic diagnostics of the enterprise: organization and methodology: Textbook Manual *M.: Finance and Statistics* 326
- [12] Goncharov A I 2005 “Debt indicative methods of diagnostics and restoration of solvency of the enterprise *Economic analysis: theory and practice*” **4(37)** 40-46
- [13] Janster P, Hussey D 2003 Analysis of the strengths and weaknesses of the company: identifying strategic opportunities Trans. from English *M.: Publishing House "Williams"* 368
- [14] Kogdenko V G 2018 “Strategic modelling of the company's profits by the Monte-Carlo method *Economic analysis: theory and practice*” vol 17 **9(480)** 1622-1641
- [15] Barilenko V I 2019 Comprehensive analysis of economic activities: textbook and workshop for academic bachelors (Moscow) *Yurait Publishing House* 455
- [16] Makkaeva R S A 2018 “Analysis and evaluation of financial results of an enterprise” *Actual questions of science* **43** 51-56
- [17] Polyakova T V 2018 “Express-diagnostics as a tool of effective enterprise management” *Karelian scientific journal* vol 7 **4(25)** 113-115
- [18] Perevertova T A 2014 “Diagnostics of the sustainable development of business activity of business structures” Perevertova T A, Voropaev A A *Socio-economic phenomena and processes* **4(62)** 73-76
- [19] Skrynkovsky R N 2015 “Diagnostics of financial, production, labour, socio-economic, innovation and investment potentials. Analysis of potential risks of an enterprise in conditions of uncertainty” *Problems of the Economy* (Kharkiv) 186-193
- [20] Strinkovskaya A S 2017 “Diagnostics of the economic potential of the motor company *Innovation economy: prospects for development and improvement*” **7(25)** 205-210
- [21] The Federal State Statistics Service <http://www.gks.ru/> Up. from the screen
- [22] Jim Shim K, Siegel Joel G 1996 *Financial Management M.: Filin* 400
- [23] Eichler L V 2011 Diagnostic analysis of the performance of trucking enterprises in an unstable business environment *Monograph Omsk: SibADI* 158

- [24] Eichler L V 2018 “The use of operational analysis in managing financial results of the trucking organization” *Bulletin of the Siberian State Automobile and Highway University* vol 15 **1(59)** 149-157
- [25] Yun G B 2004 *Methodology of crisis management: Training-practical Textbook M.: Delo* 433
- [26] Yakubiv V 2015 “Accounting and analytical methods of diagnostics improvement for enterprises organizational development” *Ekonomichnyy chasopys* **3-4-1** 68-71
- [27] Garrison Ray 2007 *Managerial Accounting/ Ray Garrison/ McGraw-Hill*
- [28] Melnyk O, Adamiv M, Shpak Y, Sroka W 2017 “Information diagnostic support of enterprise under the conditions of uncertainty” *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis* vol 65 **4** 1403-1414
- [29] Mela C F, Kopalle P K 2002 The impact of co linearity on regression analysis: the asymmetric effect of negative and positive correlations *Applied Economics* vol 34 6 667
- [30] Maron M A 2018 *Diagnostics of projects European Research Studies Journal* vol 21 **1** 18-30