IMPROVEMENT OF THE METHODOLOGY FOR INTEGRATED ASSESSMENT OF ENTERPRISE INVESTMENT ATTRACTIVENESS

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Abstract. The article presents an improved methodology for integrated assessment of investment attractiveness (IA) of an enterprise. The main scientific approaches and methods for assessing enterprise IA are considered. The accumulated experience of researchers in the field of assessing enterprise IA is integrated and an improved mathematical model for assessing enterprise IA is proposed. **The aim of the study** is to improve the methodological approach to assessing enterprise IA. This can be achieved by combining internal quantitative and qualitative indicators of activity of an enterprise and the indicators of attractiveness of the sector and region in which it operates into a single integrated assessment model. **Results of the research**: It is found that the available models and methods for assessing enterprise IA are limited to using either qualitative indicators or quantitative ones. Moreover, the territory (region) and sector in which an enterprise operates have a direct influence on attractiveness of the enterprise. Assessment of attractiveness of the sector and region is carried out by means of individual methods and models. Within the framework of the study there revealed the absence of a single mathematical model that would take into account all the factors that influence enterprise attractiveness. The fact that numerically presented information is easier to perceive determined the construction of an improved mathematical model for assessing enterprise IA.

Keywords. Investment attractiveness, assessment model, integrated assessment, integration,

Introduction

Recently a number of studies have been conducted to assess attractiveness of individual enterprises, regions, and countries. To date, not only countries but also regions, cities, and individual enterprises are striving to improve their investment attractiveness (IA). It should be noted that enterprise IA is determined not only by indicators of economic activity but by factors that influence IA of the city, region, or sector in which it operates as well [1]. Research projects focusing on inflows of foreign direct investment into specific areas are carried out by both academic economists and world leading consulting companies, such as Ernst & Young (the United Kingdom). Some problems associated with IA are considered in [2]. Researchers speak about the importance of IA of an individual enterprise as the key component of IA of each region and country. Competitiveness of a particular sector as well as the entire country depends on IA of the enterprises operating in them. It is the basis of the European Union's economy [3]. Fluctuations in the economy have forced businesses to change traditional methods of organization and management and search for new tools, knowledge, resources, and competencies in order to strengthen their positions and ensure their competitiveness. It is not enough to pay attention only to IA of an enterprise, since its competitiveness also depends on attractiveness of the sector and the region in which it operates [3]. Since the scope of research in the field of enterprise IA is expanding, the methods and models for its assessment should also be presented more extensively. In this regard, scientists pay special attention to the need to improve the methodological approaches for assessing enterprise IA. As far as discussions in the field of studying the methodological principles of assessing IA continue, this problem remains relevant. The struggle for investment is a kind of a beauty competition among applicants for investment. The selection criteria in this competition are different indicators. The task of science is to answer the question of how these indicators can be combined into one integrated model for assessing enterprise IA. To achieve the task, at the first stage of the study, the methodological approaches developed by academic economists are generalized and their views on the solution of this problem are present.

The aim of the research is to improve the methodological approach to assessing enterprise IA and develop an integrated mathematical model.

Related Work

To achieve this aim, the following tasks are set:

- analyzing the main scientific approaches and methods for assessing enterprise IA, summarizing the accumulated experience of researchers in this area;

- proposing a calculation method that would allow for combining quantitative and qualitative indicators (the method of data normalization);

- introducing into the methodology for integrated assessment of IA of an enterprise the indicators of attractiveness of the sector and region in which it operates.

To achieve the aim, the following general scientific and special research methods and techniques are used:

- theoretical generalization, analysis and synthesis — to study the theoretical foundations of and approaches to assessing enterprise IA;

- data normalization – to bring all values of the indicators into the same region of variation to further combine them into an integrated model;

- the methodology for integrated assessment – to develop an integrated model for assessing enterprise IA through combining internal quantitative and qualitative indicators with the indicators of attractiveness of the sector and region in which the enterprise operates;

- abstract-analytical method – for generalization and formulation of conclusions.

In [4], to determine the IA of an enterprise, it is proposed to use a systems approach and analyze the entire set of factors influencing the state of financial and economic activities (FEA) of the enterprise. This approach is quite common. It implies assessing IA of an enterprise with the use of economic and mathematical analysis, which considers a set of indicators characterizing performance of the enterprise. But the issue of applying integrated assessment is unresolved in the work. The most objective assessment of attractiveness can be achieved rather by using integrated assessment than by analyzing a large number of individual indicators that can be interpreted in different ways. Determining enterprise attractiveness without applying integrated assessment is suggested in the group of studies [5–7].

In work [5], it is proposed to abandon the analysis of FEA and focus on investment funds. The findings of the study concern "investment efficiency" as the end result of implementing capital investments to be used. Work [6] supports the findings of study [5]. It summarizes the main 5 traditional methods for assessing IA. A similar opinion is presented in study [7], the result of which is the development of an approach that is closer to the European one. As the most versatile method for assessing enterprise IA there proposed considering enterprise IA in terms of efficiency and feasibility of investing with the use of traditional methods. Among such methods study [7] mentions discounted cash flow (DCF), namely, net present value (NPV), and internal rate of return (IRR). The researchers of this group consider assessment of IA from the standpoint of profitability of investing a

certain amount of money, which is not always relevant. Therefore, the issue of integration of the entire set of indicators that determine enterprise IA remains unresolved.

In contrast to studies [5-7], the author of work [8] claims that for investors the innovation component is of importance but not the sum of investments or the current state of the enterprise's FEA. It is justified that it is reasonable to assess the importance of innovation and only then speak about the amount of investment. In this regard, the study suggests carrying out, first, quantitative assessment of the innovation component of an enterprise and then comprehensive assessment in order to objectively determine its IA. To carry out comprehensive assessment of the innovation component, it is proposed to use the concept of innovation potential. But even though the study is comprehensive, investments are not always made into innovative enterprises and not always enterprise IA is considered only in terms of innovations. When developing a versatile methodology for assessing enterprise IA, this approach is inexpedient.

Research [9] proves that the presence of the innovation component is absolutely not important. The author states that the main indicators that investors pay attention to are those of business activity, since they reflect real capabilities of an enterprise, and offers the integrated "Model for business activity assessment". This model is quite simple to use, but it has a drawback – it considers enterprise IA only in terms of business activity. As part of assessment of enterprise IA, the integration of this set of indicators is insufficient. For an adequate assessment, the model must contain a sufficient number of indicators that comprehensively describe attractiveness [10]. It is this approach that is used in studies [11-12]. In [11], to provide comprehensive assessment, it is proposed applying factor analysis combined with an individual approach, since each consumer, and, accordingly, investor has an individual taste and idea of attractiveness. The research results of [11] got further development in [12]. The study proves that it is necessary to develop a model for determining the level of enterprise IA based on factor analysis with the use of forecast estimates. These approaches are interesting but their using is to some extend inexpedient. First, within the framework of factor analysis it is impossible to combine quantitative and qualitative indicators into a single integrated model. Secondly, to obtain a reliable forecast estimate, there required a sample of data which are not always available within the required time range.

Based on the analysis of the methods for determining enterprise IA, we can conclude that scientists have different views on this problem. Some of them emphasize the importance of economic indicators. Others believe that each consumer, and, accordingly, investor, has an individual taste and idea of attractiveness. And some researchers focus on forecasts for the future. Attempts to carry out integrated assessment of enterprise IA are limited to either quantitative or qualitative

indicators of enterprise activity. It is a question of the influence of external factors [10], but no single integrated mathematical model within the framework of the methodological approach for assessing enterprise IA has been proposed so far. Considering the methodological approaches to assessing an investee's IA, it is possible to formulate the following disadvantages:

- a primary focus is on portfolio investment;

- assessment is carried out based on qualitative and quantitative factors separately;

- attractiveness of the external environment beyond the framework of the integrated model is taken into account;

- the lack of a single approach to determining enterprise IA on the basis of economic and other indicators.

All the above mentioned suggests that it is expedient to conduct a study aimed at improving the methodological approach to assessing enterprise IA. Such improvement is possible by combining internal quantitative and qualitative indicators with the indicators of attractiveness of the sector and region in which the enterprise operates into a single integrated mathematical assessment model.

Description of the experiment and analysis of the results

Integration of scientific approaches to assessing enterprise IA

The elaboration of models for assessing IA contributes to scientific development. It is easier to understand the result when it is presented quantitatively, and data obtained by integrated assessment are especially easy to perceive.

In this study, a number of methods and models for assessing and analyzing IA of business entities with the use of financial indicators are considered. It should be noted that their main features are as follows:

- they are based on a large number of indexes united in certain groups by areas of analysis;

- indexes characterizing profitability, property and financial status of an investee are taken into consideration;

- a lot of methods include analysis of indexes of investment risk and bringing the value of different economic indicators to their present value by means of the system of discounting;

- determination of relative significance of certain indexes by means of ranking or determination of their share;

- combination of various indexes into a single system for assessing IA through

determination of one or several integral indexes [1].

All of them are based on integrating indicators, but none of the presented methods consider enterprise IA based on integration of quantitative and qualitative indicators with the indicators of attractiveness of the sector and the region in which the enterprise operates.

The study takes into account all the shortcomings and gaps in this area and proposes an improved methodological approach to assessing enterprise IA (Fig. 1).

Introduction of the indicators of attractiveness of the sector and region to improve the methodology for assessing enterprise IA

Further, the study considers step by step the improved methodology for assessing enterprise IA (Fig. 1) based on integration of quantitative and qualitative indicators with the indicators of attractiveness of the sector and the region in which the enterprise operates.

Preparatory stage. For a successful implementation of any project within the framework of enterprise management, information support is necessary [13]. At this stage the information on both quantitative and qualitative indicators of enterprise activity can be collected. The basis for obtaining such data can be open information resources and statistical information received from the enterprise.

Then the internal indicators of activity of enterprises and organizations are calculated on the basis of the data collected at the first stage (quantitative and qualitative indicators). An important condition is that the increase in each of the indicators should suggest a positive trend. The greater its value is, the better condition it indicates.

Investors are looking for a relatively cheap, geographically attractive region or city [14] with adequate resources (logistics, human resources, market size, economic and political stability, and operating expenses) [15].

Based on the availability of public information on activities of enterprises [16] and publicly available statistical data [17], it is possible to determine the entire set of indicators necessary for integrated assessment. These are indicators which form the factors:

1) property status;

2) financial independence;

3) financial stability (solvency);

4) liquidity of assets;

5) profitability;

6) business activity [1];

7) attractiveness of the economic sector;

8) attractiveness of the region (territory).

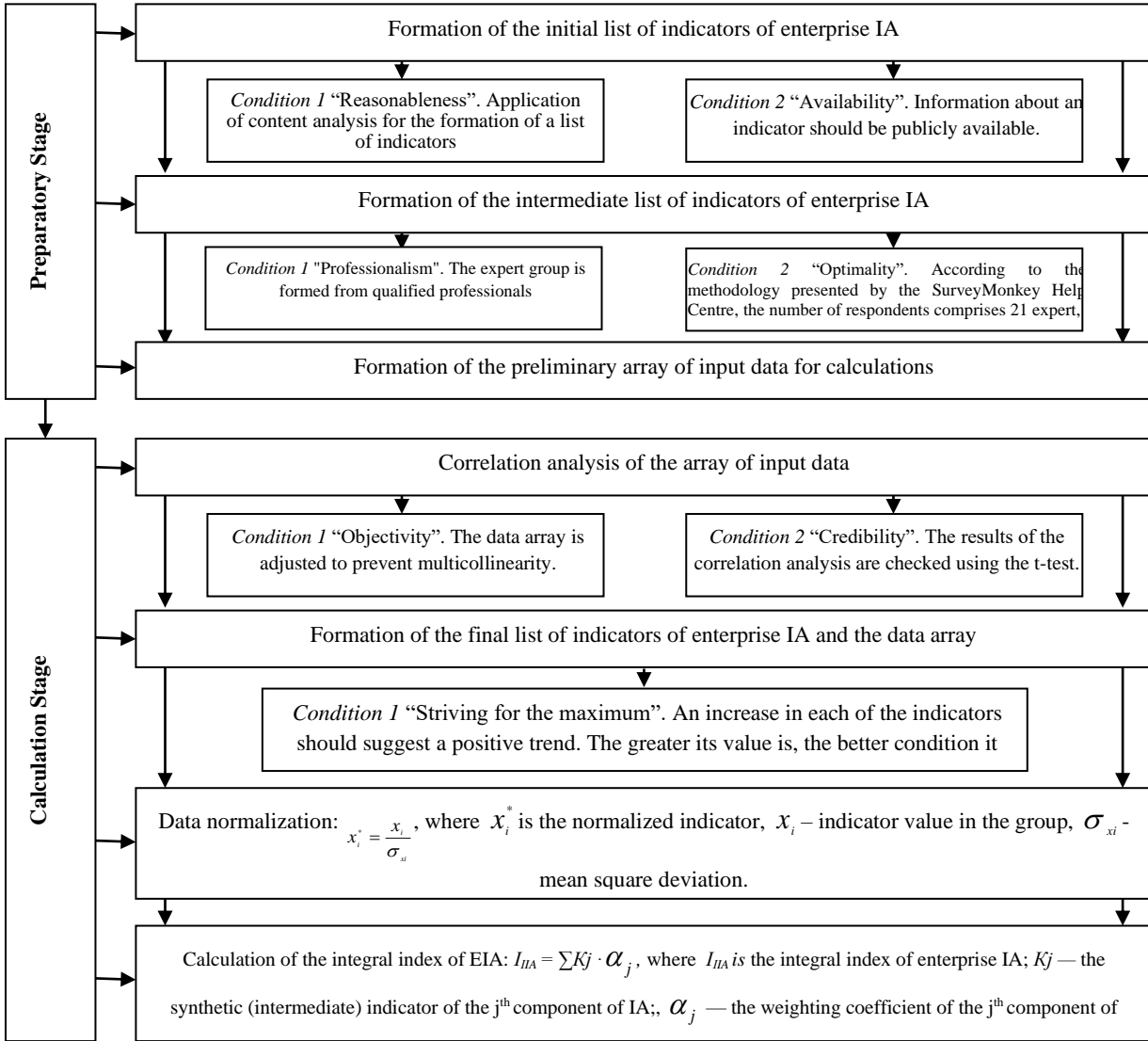All the indicators can be calculated based on available reliable data.

Fig. 1. Methodology for integrated assessment of enterprise IA (developed by the authors)

Calculation stage. The final list of quantitative and qualitative indicators of enterprise activity used to form the model of enterprise internal IA is formed based on the results of the correlation analysis of the initial data set [18].

As mentioned above, each person has his/her own idea of attractiveness, and, accordingly, of the weight of each component of the model for assessing enterprise IA.

To determine the weighting coefficient of the above mentioned factors, it is proposed to break them down into primary and secondary ones. The main factors include those that have a decisive influence on IA. The breakdown of factors into primary and secondary occurs in accordance with their significance or degree of influence. The choice of these indicators is proposed on the basis of an audience survey conducted among industry experts and highly qualified researchers in this field.

The audience survey was conducted on a sample of 21 experts. This number was determined based on the Calculate the Number of Required Respondents You NEED methodology, presented by the SurveyMonkey Help Centre. The structure of the experts is presented in Table 1.

Table 1. A sample structure of the questionnaire-based survey (%)

Area	Percentage of respondents (N = 21)
Science	57
Business	24
Public administration	19

The coefficient of concordance varies from 0 to 1. Since the table value of the Pearson criterion at the corresponding values of the degrees of freedom of each group does not exceed the calculated value, and the concordance coefficient approaches to 1 (much greater than zero), the consensus of expert opinions on the rank of factors of investment attractiveness is not coincidental.

The following criteria were chosen by the experts:

− *Balance sheet total,* which is the sum of all assets or all liabilities reflected in the balance sheet. The importance of this indicator is determined by a fairly broad area of its application in financial analysis. In addition, the balance sheet total determines whether the enterprise is subject to audit.

− *Coefficient of renovation of fixed assets,* which shows the share of new fixed assets in those available at the end of the reporting period. The higher the coefficient of renovation of fixed assets, the higher the technical potential is.

− *Coefficient of concentration of equity capital,* an indicator to the value of which investors and banks that issue loans pay special attention.

− *Coefficient of independence form borrowed funds*. The higher the value of this indicator, the more attractive the enterprise is for investors. It is also an indicator to the value of which investors and banks that issue loans pay special attention.

− *Current or total coverage ratio,* which allows investors to assess the ability of an enterprise to pay off its debts by using available funds.

− *Coefficient of financial stability.* This indicator is important for investors, since it shows the share of the sources of financing that the organization uses in its activity for more than a year.

− *Coefficient of absolute liquidity*. The importance of this indicator for investors is determined by the fact that it indicates enterprise solvency.

– *Working capital,* which gives investors an idea of the corresponding operating efficiency.

– *Coefficient of return on equity*. This indicator demonstrates the activity of money resources and is taken into account by the investor in determining the risk level.

– *Operating return on sales,* which shows investors the efficiency of the enterprise.

– *Coefficient of asset turnover.* This indicator is used by investors to assess the effectiveness of capital investments;

– *Turnover of working capital,* which is important for investors, since it shows how effectively the enterprise uses investments in working capital.

To determine IA of the sector, the experts selected for the analysis the following indicators:

- structure of production;

- trends in capital investment;

- foreign direct investment;

- financial performance of enterprises which work in it.

To determine IA of the region, the experts selected:

- production volume;

- trends in capital investment;

- foreign direct investments;

- financial performance of enterprises which work in it.

The subsequent step of the study is determining which of the presented set of quantitative and qualitative indicators is the most significant in assessment of enterprise IA (Tbl. 2).

Table 2. The results of implementing the hierarchy analysis method to determine the weighting coefficients for assessing enterprise IA

№	Factors influencing enterprise IA	Weighting coefficient
1	property status	0.1128
2	financial independence	0.1347
3	financial stability (solvency)	0.0597
4	asset liquidity	0.0749
5	profitability	0.0973
6	business activity	0.0802
7	attractiveness of the economy sector	0.2527
8	attractiveness of the region (territory)	0.1873

The introduction of data normalization to improve the method for assessing enterprise IA

The need for data normalization is due to the nature of the factors influencing enterprise attractiveness: they can vary greatly in absolute values (some indicators are qualitative, some quantitative, or individual indicators are measured in thousands while others – in hundreds). Data normalization allows to bring all the values of variables used into the same region of variation, so that it could be possible to combine them into one model. At this stage, we propose to normalize the data previously obtained by calculating the standard deviation of each indicator using descriptive statistics. The normalization is performed by dividing the value of the statistical indicator by the mean square deviation of the studied group.

$$x_i^* = \frac{x_i}{\sigma_{xi}} \quad , \qquad\qquad (1)$$

where x_i^* is the normalized indicator,

x_i – indicator value in the group,

σ_{xi} – mean square deviation.

When all the indicators are brought to a common unit of measurement, it becomes possible to combine them all into a single model.

The model for determining the integral index of the enterprise IA is:

$$I_{IIA} = \sum Kj \cdot \alpha_j, \qquad\qquad (2)$$

where Kj — the synthetic (intermediate) indicator of the jth component of IA;

α_j — the weighting coefficient of the jth component of enterprise IA;

$$I_{IIA} = 0{,}1128*K_{GI} + 0{,}1347*K_{GII} + 0{,}0597*K_{GIII} + 0{,}0749*K_{GIV} +$$
$$+ 0{,}0973*K_{GV} + 0{,}0802*K_{GVI} + 0{,}2527*K_{GVII} + 0{,}1873*K_{GVIII}, \qquad (3)$$

where I_{IIA} *is* the integral index of enterprise IA;

K_{GI} — factor I;

K_{GII} – factor II;

K_{GIII} – factor III;

K_{GIV} — factor IV;

K_{GV} — factor V;

K_{GVI} — factor VI;

K_{GVII} — factor VII;

K_{GVIII} — factor VIII.

On the basis of the improved methodology for integrated assessment of enterprise IA, it is possible to measure the share (significance) of the components that determine such attractiveness. The hypothesis about the importance of introducing the indicators of sector-region attractiveness into integrated assessment of enterprise IA is justified. It is determined that the main indicators of enterprise IA are quantitative and qualitative internal indicators of activity of an enterprise and the indicators of attractiveness of the economic sector and region in which it operates.

Conclusions and Outlook

1. In the course of the study, the main scientific approaches and methods for assessing enterprise IA are analyzed, the accumulated experience of scientists is summarized. The analysis reveals that the existing methods and models for assessing enterprise IA imply the assessment of either quantitative or qualitative indicators of an enterprise; to assess attractiveness of the region and sector in which the enterprise operates, there used individual methods. It is established that the existing methods for assessing enterprise IA are rather labor intensive, time- and material-consuming.

2. The need to use a calculation method which can allow combining quantitative and qualitative indicators is proven. The application of data normalization, which makes it possible to combine such indicators into one integrated model, is proposed. The attention is focused on the fact that integrated assessment suggests a positive trend in its components (The greater its value of an indicator is, the better condition it indicates).

3. The introduction of the indicators of attractiveness of the sector and the region into the methodology for integrated assessment of enterprise IA is justified. This approach makes it possible to comprehensively assess enterprise IA. The expediency of carrying out the calculation with consideration for attractiveness of the sector and region in which the enterprise operates is proven. The quantitative, qualitative indicators and indicators of attractiveness of the sector and region in which the enterprise operates are combined into a single integrated mathematical model.

The improved methodological approach to assessing enterprise IA integrates the existing approaches and takes into account the best practices of researchers in this area. Since each investor has an individual vision of attractiveness, using this method is rather advisory than mandatory. The existing methods for assessing enterprise IA are time- and material-consuming. The issue of integrated assessment of enterprise IA is particularly important when it comes to evaluating a large number of applicants for investment. Which company is the most attractive for investment? An unequivocal answer to this question is provided by the improved method for assessing enterprise IA based on the integration of internal quantitative and qualitative indicators with the indicators of attractiveness of the sector and region in which the enterprise operates.

In the course of this study, attention is not paid to the influence of the factor of country attractiveness on enterprise IA, which is the main limitation of this study. To date, there exist a number of methods for determining attractiveness of a country. Researchers all around the world pay enough attention to this aspect. However, within the framework of this study it is impossible to complement the proposed integrated mathematical model with the indicator of country attractiveness. The presented methodology integrates coefficient indicators. The possibility to supplement the integrated model will arise in the event of developing a method for determining country IA with an effective coefficient indicator.

A prospect for further research in this area is the receiving of practical approval of the proposed methodology in enterprises of various sizes in different economic sectors. The presented methodology ensures an accurate assessment but it is labor intensive, thus the development of software to ensure assessing enterprise IA is quite acute and relevant.

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