EVALUATION OF INVESTMENT ATTRACTIVENESS INDICATORS OF REGIONS IN UKRAINE

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Abstract. The theoretical and methodological principles for assessing the investment attractiveness of the regions _are the subject of the research. The aims of the research_ consist in improving the existing approach for measuring the level of investment attractiveness of territorial systems in the direction of taking into account the possible multicollinearity and determining the share of investment attractiveness factors in the aggregate indicator on the basis of calculated values of determination coefficients, which respectively provide to distinguish the priority directions in the formation of regional investment policy aimed at raising the level of investment attractiveness of regions of Ukraine. _Methodology._ The article deals with the research of theoretical and methodological approaches to the definition of investment attractiveness of Ukrainian regions by means of general scientific methods of analysis: systematization and generalization, induction, deduction. _Results._ To assess the investment climate in the regions of Ukraine, an improved existing approach for measuring the level of investment attractiveness of territorial systems is proposed in the direction of taking into account possible multicollinearity and determining the share of factors of investment attractiveness, which is based, in particular, on the selected indicators, in particular: the volume of direct foreign investments per capita (FORINV); per capita net exports (NETEXP); the number of economically active enterprises per 10 000 population (ENTRP); volumes of industrial production (PROM); population income (REV); volume of retail trade turnover per capita (TOV); volume of completed construction work (BUD). It is proved that the priority and intensity of influence on the indicator of investment into fixed capital per capita of factors of investment attractiveness varies for different regions of Ukraine, therefore, according to the conducted analysis, the investment attractiveness of the researched regions are determined by such factors as the volume of direct foreign investments per capita, the volume of net exports per capita, the number of economically active enterprises per 10 000 population, volumes of industrial production, population income, and volume of completed construction work. The dynamics of values of general indicators of investment attractiveness for five regions of Western Ukraine are determined, which allowed substantiating the absence of a stable positive tendency in any of the regions to change the values of the general indicator of investment attractiveness, as well as establishing the existence of negative trends accumulation in the formation of investment attractiveness factors, which leads to a decrease of indicators of volumes of foreign investments per capita and volumes of investments in fixed capital per capita during the researched period. _Practical significance._ The use of the proposed approach made it possible to obtain competitive, scientifically substantiated results, which could become a methodological basis in the process of planning and practical implementation of the measures to create the investment attractiveness of regions and their territorial systems. The possibility of identifying the priority areas of influence on factors of investment attractiveness in order to increase the volume of investments attraction into the regional economic system is the determining positive side of the proposed approach.

Key words: investment attractiveness, region, evaluation, indicators.

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1. Introduction

In general, investment climate of regional system is characterized by two main components: the investment attractiveness of a region with the following characteristics such as investment potential and regional investment risks, as well as the activity of investment processes in the region. Investment activity in a region is the intensity of investments attracting into the real and financial capital of the subjects of the regional economy. Investment attractiveness of a region is a set of objective conditions, means, opportunities, and restrictions that determine the intensity of investments attracting into the capital of subjects of the regional system. Accordingly, identification of effective levers of management and regulation of processes in social and economic systems that can provide the improvement of the level of investment attractiveness of the respective systems is a priority task in the process of forming a favourable investment climate within a region, as well as the whole country.

2. Analysis of recent research and publications

The main problems and prospects of development for increasing the investment attractiveness of the regional economy were investigated (Bagautdinova N.G. and others, 2014), while they interpreted investments as not only as a source of economic growth but also as a factor of competitiveness of a regional economy. The authors examined the impact of investment attractiveness on the formation of competitive advantages of a territory and have identified the following factors: resource base, climatic conditions, consumer market, legislation (tax, customs, budget etc.), state of the economy, willingness of state authorities for cooperation, availability of necessary infrastructure, protection of investors' rights, administration of guarantees and so on and so force. In order to attract investments in any state, region or municipality, the authors note one of the most important conditions, that is, effective regulation of investment activity and protection of the investors.

The realization of an objective assessment of the investment attractiveness of the territories for the potential investors (Shaykheeva D. and others, 2016) disclosed through the use of special geographic information systems (GIS). The authors pay attention to the lack of tools for the real attraction of investments, which facilitate the improvement of the economic competitiveness of Russian regions. Thus they propose a methodology for integrated assessment of investment attractiveness of rural and urban areas of the Republic of Tatarstan using geographic and information technologies.

In the classification of national and regional resources that determine social and economic opportunities of territories, (Mustafakulov, 2017) explores the priority directions of ensuring the social and economic development and assesses the value of investment attractiveness of regions with a long-term historical specialization in agricultural production.

Whereas investments are a major factor of regional and municipal development (Damborský M. and others, 2009) point out that the arrival or departure of a significant foreign investor can have a significant impact on the entire city, regional, possibly even national economy. Due to the investment attractiveness, problems of investors' arrival and decision-making processes that are related to them are important, as well as the problems of so-called "rooting", for example, of inflow of direct foreign investment into the Czech Republic.

Simultaneously (Kharlamova, 2014) analyses investment opportunities and potential of regions of Ukraine. At the same time, the regions are estimated by the level of investment potential and the degree of investment risks, as well as by the experience of previous investment activity in a region. The author proposed the so-called territorial investment marketing, based on results of complex monitoring of the regional investment climate in Ukraine.

(Nikolova L. and others, 2013) considered the effectiveness of the investment process, which, together with the investment risk and investment potential, determines the investment attractiveness of a region and, therefore, the investment climate, characterize the growth of the gross product of a region by investing in physical and human capital. The authors determine the investment attractiveness of a region by comparing two parameters that reflect the conditions of investors' activity: investment potential and investment risk.

Thus, in researching the investment opportunities and assessing the investment attractiveness of the territories for potential investors, first of all, the authors focused on the efficiency of the investment process in terms of the correlation between the investment risks and investment potential, while scientific research is rather fragmentary in determining the level of influence of investment attractiveness factors of the regions in Ukraine on the indicator the amount of investments in fixed capital per head with the determination of the weight coefficients of each factor; determination of dependency model, as well as appropriate values of determination coefficients for factors of investment attractiveness of the regions in Ukraine; the determination of the weight of each of the factors of investment attractiveness in the aggregate indicator on the basis of the calculated values of the determination coefficients; the determination of the priority directions in the formation of regional investment policy directed to raising the level of investment attractiveness of the regions.

The purpose of the research is to determine the weightings values of each of the factors of investment attractiveness in the aggregate indicator based on the calculated values of the determination coefficients,

which, accordingly, will allow distinguishing the priority directions in the formation of a regional investment policy directed to raising the level of investment attractiveness of the regions.

3. Methodological approaches for assessing the investment attractiveness of regions

Aimed at obtaining quantify assessment of the level of investment attractiveness of the Western Ukraine's regions, we have calculated the general indicators of investment attractiveness. Similarly, as in the research (Pil'ko, 2015), index of investment attractiveness of a region was determined using the formula of a multidimensional average as the following:

$$InvAttr_i = \frac{\sum_{j=1}^{n} k_j \, p_{ij}^{\text{н}}}{\sum_{j=1}^{n} k_j} \quad i = \overline{1, m} \qquad (1)$$

where $InvAttr_i$ – index of investment attractiveness
i – the name of a region;
m – number of regions researched ($m = 5$);
k_j – weight factor j – the indicator taken to assess the investment attractiveness of a region;

$p_{ij}^{\text{н}} = \dfrac{p_{ij} - \overline{p_j}}{\sigma_j}$ – normalized value, j – an indicator of

investment attractiveness, i – name of a region;
$\overline{x}_j$ – average arithmetic value, j– features;
σ_j – average square deviation value, j – features.

At the first stage of the research, for the purpose of assessing the investment attractiveness of the Western Ukraine's regions, we have selected the following indicators: the volume of direct foreign investment per head (FORINV); the volume of net exports per head (NETEXP); the number of economically active enterprises per 10 000 of population (ENTRP); the volumes of industrial production (PROM); population income (REV); volume of retail commodity circulation per head (TOV); the volume of completed construction work (BUD).

To ensure the comparability of valuable indicators in space and time, they were taken into account in the analysis conducted at comparable prices. Corresponding

values of the pair correlation coefficients calculated on the basis of statistical information (Website of the State Statistics Service of Ukraine) in five regions between the factors of investment attractiveness and the volume of investments in fixed capital per head in the respective regions are given in Table 1.

As the results of calculations, the priority and intensity of influence on the indicator of the investment amount in fixed capital per head factors of investment attractiveness vary for different regions. In particular, the indicator of the volume of direct foreign investments is decisive in the formation of investment attractiveness for Ivano-Frankivsk and Ternopil regions. At the same time, this indicator has the smallest impact on the indicator of the volume of investments in fixed capital per head in the Chernivtsi region. The indicator of net exports is decisive in determining the investment attractiveness of Ivano-Frankivsk region, and it is significant for Transcarpathian region and practically does not determine the volume of investment inflows in Ternopil region. The impact of a number of economically active business entities on the indicators of volumes of investment in fixed assets is significant only for Ivano-Frankivsk region, and it is moderate for Transcarpathian, Chernivtsi, and Ternopil regions, and it is very weak for Lviv region. An indicator of volumes of industrial production is crucial for the formation of investment attractiveness for all the researched regions. A similar conclusion can be made regarding the indicators of the volume of construction work, commodity circulation per head, and income level of the population.

Previously conducted correlation analysis of the selected indicators calculated on the basis of relevant statistical information for the period of 2010–2016 in Lviv, Ivano-Frankivsk, Transcarpathian, Ternopil, and Chernivtsi regions showed a close linear relationship between the indicator of retail commodity circulation and the rest of the selected indicators. In order to obtain objective information about the level of investment attractiveness of the researched regions, paying a special attention to the unconditional significance of this indicator in the process of research and analysis of investment attractiveness of a region, but taking into account the presence of obvious multicollinearity in the

Table 1
Level of influence of investment attractiveness factors on the indicator of investments volume in fixed capital per head for the period of 2010–2016

Indicator \ Region	Ivano-Frankivsk	Lviv	Transcarpathian	Ternopil	Chernivtsi
FORINV	0,953578	0,637224	0,712734	0,856981	0,314745
NETEXP	0,878385	0,451838	0,702651	0,171373	0,528961
ENTRP	0,716765	0,236998	0,512683	0,617231	0,655
PROM	0,837307	0,758836	0,9015	0,881197	0,840663
BUD	0,648143	0,938307	0,983799	0,924228	0,777479
TOV	0,894129	0,763858	0,903224	0,873514	0,727303
REV	0,82418	0,788102	0,906775	0,940229	0,811318

array of factors, caused by this indicator, we decided to exclude this indicator from the further analysis.

In other words, according to the analysis conducted, the investment attractiveness of the researched regions is determined by such factors as the volume of direct foreign investments per head, the volume of net exports per head, the number of economically active enterprises per 10 000 population, volumes of industrial production, the size of incomes, and the volume of construction works.

As the weights values of each of the selected indicators, the values of the determination coefficients between the volume of investment in fixed capital per head and these indicators were taken. In this case, the determination coefficient was calculated on the basis of a model that best approximates the actual distribution to the corresponding form of analytical dependence. Accordingly, in order to determine the investment attractiveness indicator of each of the researched regions, the individual weightings coefficients of each of the factors of investment attractiveness in the aggregate indicator have been calculated. As the results of the analysis showed, the weighting coefficients of each of the factors of investment attractiveness have different meanings depending on a region. This is our conclusion after approximating the actual distributions of the values of the investment attractiveness factors and the values of indicators of investment in fixed assets to different forms of analytical dependencies. To choose the form of such dependences, an approximation to the linear, exponential, degree, quadratic, logarithmic, and polynomial curves of 3 and 4 orders was made. A model that is best to describe the interdependence researched was selected based on logical and statistical compliance requirements. Taking into account the nature of the models' behaviour, which is given by polynomial dependencies of higher orders, they were not used in the analysis.

The dependency models, as well as the corresponding values of the determination coefficients for investment attractiveness factors, are as follows:

Ivano-Frankivsk region:

$y = 0,041x_1^2 - 0,23x_1 + 0,008, \quad R^2 = 0,979$

$y = -0,051x_2^2 + 0,014x_2 + 0,05, \quad R^2 = 0,806$

$y = 10^{-7}x_3^2 - 0,001x_3 + 0,11, \quad R^2 = 0,694$

$y = 5 * 10^{-6}x_4^2 - 0,0001x_4 + 0,003, \quad R^2 = 0,744$

$y = 0,004x_5^{0,713}, \ R^2 = 0,405$

$y = 7 * 10^{-5}x_6^{1,152}, \quad R^2 = 0,721$

Lviv region:

$y = 0,158x_1^2 - 0,174x_1 + 0,052, \quad R^2 = 0,427$

$y = 0,011x_2^2 + 0,009x_2 + 0,006, \quad R^2 = 0,587$

$y = -3 * 10^{-10}x_3^3 + 10^{-6}x_3^2 - 0,002x + 0,604, \quad R^2 = 0,152$

$y = 3 * 10^{-6}x_4^2 - 0,0001x_4 + 0,007, \quad R^2 = 0,623$

$y = 0,001x_5^2 - 0,001x_5 + 0,004, \ R^2 = 0,891$

$y = 2 * 10^{-6}x_6^2 - 0,001x_6 + 0,012, \quad R^2 = 0,823$

Transcarpathian region:

$y = 0,373x_1^2 - 0,237x_1 + 0,039, \quad R^2 = 0,859$

$y = 0,008x_2^2 + 0,004x_2 + 0,002, \quad R^2 = 0,748$

$y = 10^{-10}x_3^{2,404}, \quad R^2 = 0,289$

$y = 0,001e^{0,018x4}, \quad R^2 = 0,825$

$y = 0,002\ln(x_5) + 0,001, \ R^2 = 0,978$

$y = 5 * 10^{-7}x_6^2 - 5 * 10^{-5}x_6 + 0,001, \quad R^2 = 0,889$

Ternopil region:

$y = 8,582x_1^2 - 1,092x_1 + 0,037, \quad R^2 = 0,825$

$y = -0,252x_2^3 - 0,007x_2^2 + 0,007x_2 + 0,003, \quad R^2 = 0,225$

$y = 2 * 10^{-10}x_3^{2,304}, \quad R^2 = 0,445$

$y = 0,0001x_4^{0,835}, \quad R^2 = 0,788$

$y = 0,001x_5 + 0,001, \quad R^2 = 0,854$

$y = 3 * 10^{-7}x_6^2 - 10^{-5}x_6 + 0,002, \quad R^2 = 0,9$

Chernivtsi region:

$y = -1963,9x_1^3 + 443,64x_1^2 - 33,18x_1 + 0,82, \quad R^2 = 0,824$

$y = 0,628x_2^3 - 0,007x_2 + 0,002, \quad R^2 = 0,64$

$y = 4 * 10^{-9}x_3^3 - 10^{-5}x_3^2 + 0,012x_3 - 4,237, \quad R^2 = 0,528$

$y = 3 * 10^{-5}x_4 + 0,001, \quad R^2 = 0,707$

$y = -0,0002x_5^2 + 0,002x, \ R^2 = 0,691$

$y = 2 * 10^{-5}x_6 + 0,001, \quad R^2 = 0,658$

where y – the volume of investments in fixed capital per head; x_1 – the volume of direct foreign investments per head; x_2 – the volume of net exports per head; x_3 – the number of economically active enterpises per 10 000 population; x_4 – volumes of industrial production; x_5 – the amount of income of the population; x_6 – the volume of completed construction work.

Based on the calculated values of the determination coefficients, we determined the real proportions (weights) of each of the factors of investment attractiveness in the aggregate indicator (Table 2).

Table 2
Weights values of investment attractiveness factors in the aggregate index

Region	Weights values of investment attractiveness factors					
	x_1	x_2	x_3	x_4	x_5	x_6
Ivano-Frankivsk	0,225	0,185	0,159	0,171	0,093	0,167
Lviv	0,122	0,167	0,043	0,178	0,254	0,236
Transcarpathian	0,187	0,163	0,063	0,18	0,213	0,194
Ternopil	0,205	0,056	0,11	0,195	0,212	0,222
Chernivtsi	0.204	0,158	0,13	0,175	0,171	0,162

As we can see from Table 1, the indicators of values of foreign investment per head, net exports per head and industrial production are crucial in the process of forming the investment attractiveness of Ivano-Frankivsk region. In other words, the investors in the process of passing decisions about the choice of investment object in Ivano-Frankivsk region are oriented to export-oriented

types of economic activity, as well as activities, in which foreign investors are already working. At the same time, activities focused on the domestic regional and national market are not investment attractive in Ivano-Frankivsk region. Compared to other investigated regions, the level of investment attractiveness of Ivano-Frankivsk region is very sensitive to investing in export-oriented activities (18.5%) and amount of foreign investment per head (22.5%). The stimulation of export-oriented industries should become the priority of the formation and practical implementation of regional investment policy.

The indicators of the population's income, the volume of construction works performed, as well as the volume of industrial production will be determinative for the formation of the investment attractiveness of Lviv region. Accordingly, stimulation of development and investments attractiveness in activities directed to domestic (regional and national market), in particular, construction and industry will be the priority in forming the regional investment policy, aimed at raising the level of investment attractiveness of Lviv regional systems.

In the process of forming the investment attractiveness of Transcarpathian region, measures aimed at raising the level of populations incomes, increasing the volume of executed construction works, as well as the volume of direct foreign investments per head are a priority. In other words, the export potential of Transcarpathian region is used only partially, and accordingly, investments in export-oriented activities determine changes in the investment attractiveness of the region by only 16.3% after Ivano-Frankivsk and Lviv regions.

Almost the same situation takes place in Ternopil region. In the formation of investment attractiveness, the most important are the indicators of performance of construction works, the growth of population incomes and the volume of foreign investment per head. Accordingly, the actions that are directed to attracting foreign investment in construction and industry, which are oriented on the regional and national markets will have the most positive impact on the investment attractiveness of Ternopil region. Paradoxically, paying attention to the predominantly agrarian specialization of the region, the impact of investment attraction by the measures on export-oriented activities is very insignificant for the indicator of investment attractiveness (the lowest indicator from all 5 regions is 5.6%).

To form the investment attractiveness of Chernivtsi region, increase the volume of foreign investment per head, industrial production and population incomes should be the priority areas of regional policy. That is, again, the investment attractiveness of the region is currently determined by the types of economic activity that involve attracting of foreign capital and are oriented towards the domestic (regional and national markets). In other words, efforts of central bodies of state power, as well as local self-government in the direction of the formation of a strategy and practical measures for the implementation of investment policy, should be aimed at the activation and development of these factors and influence levers.

4. Evaluation results of investment attractiveness of regions of Western Ukraine

Calculated by the formula (1) the values of general indicators of investment attractiveness for five regions of Western Ukraine for 2010–2016 are shown in Table 3.

As it can be seen from the dynamics of the values of general indicators of investment attractiveness for five regions of Western Ukraine (Fig. 1-5), there is no established positive trend of changing the values of the general indicator of investment attractiveness in any region. Additional values of investment attractiveness indicator reveal a presence of a positive influence of the analysed factors of investment attractiveness on investment processes in the respective region. Negative values of the respective indicators reveal the negative influence of factors of investment attractiveness on processes of attracting investment resources to the region.
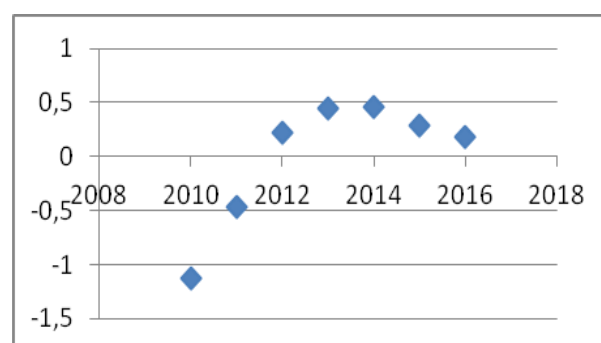

Fig. 1. Dynamics of values of investment attractiveness indicator of Ivano-Frankivsk region

Table 3

General indicators of investment attractiveness of Western Ukraine regions

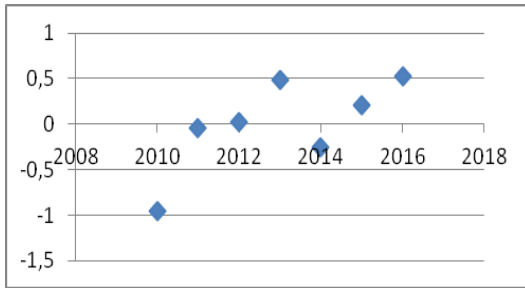| Region	2010	2011	2012	2013	2014	2015	2016
Ivano-Frankivsk	-1,126	-0,462	0,219	0,445	0,463	0,285	0,176
Lviv	-0,958	-0,037	0,021	0,492	-0,249	0,207	0,523
Transcarpathian	1,580	-0,424	-0,452	-0,269	-0,203	-0,436	0,204
Ternopil	-0,446	0,199	0,579	1,014	-0,038	-1,065	-0,354
Chernivtsi	-0,774	-0,039	0,546	0,739	0,242	-0,454	-0,258

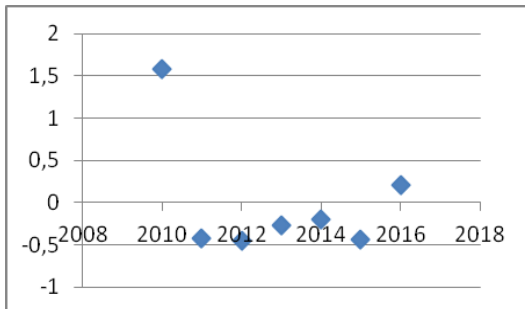**Fig. 2. Dynamics of values of investment attractiveness indicator of Lviv region**

Fig. 3. Dynamics of values of investment attractiveness indicator of Transcarpathian region

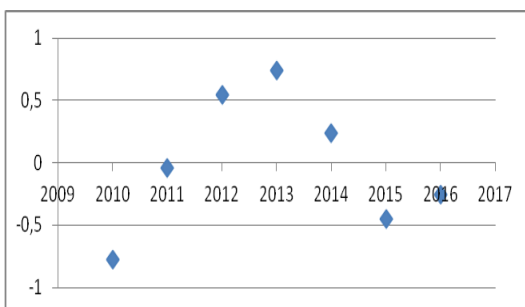**Fig. 4. Dynamics of values of investment attractiveness indicator of Ternopil region**

Fig. 5. Dynamics of values of investment attractiveness indicator of Chernivtsi region

The harsh deterioration of the value of generalizing investment attractiveness in 2014 and the presence of positive trends in improving the investment attractiveness, started in 2015 are the mutual feature for values dynamics of all regions without exception. The worst situation with investment attractiveness was in Transcarpathian region during the period of 2011–2015. Accumulation of negative tendencies in the formation of investment attractiveness factors has led to a decrease in the indicators of foreign investments volumes per head and volumes of investments in fixed capital per head during the investigated period.

5. Conclusion

1. As a result of researches, particular results of which are presented in this publication, the existing approach to measuring the level of investment attractiveness of the region has been improved and developed in order to take into account possible multi-colourarity and determination of the proportion of investment attractiveness factors. The use of the proposed approach has allowed obtaining the competitive scientific results that can become the basis for planning and practical implementation of measures for the creation of investment attractiveness of regions and their territorial systems. The possibility of identifying the priority areas of influence on investment attractiveness factors in order to increase the volume of the attraction of investments into the regional economic system is a determining positive side of the proposed approach.

2. It should be noted that the practical realization of measures to create the investment attractiveness of regions of Western Ukraine should be based on the following directions: increase in the investment's volume in fixed capital per capita; formation and dissemination of measures to attract foreign investment in construction and industry that are oriented to regional and national markets; increase in direct foreign investments per capita; stimulation of export-oriented production in the regions; increase in the investments in agrarian specialization of the regions.

3. Prospects for further development of the investment climate assessment of the regions of Ukraine will be based on ways formation to increase the investment attractiveness of the regions and to justify the concept of investment support for the development of regional economic systems.

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