Index of the Economic Interaction Effectiveness
between the Natural Monopoly and Regions.

II. Numerical Experiments

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Abstract

In this paper, we perform verification methodology for determining economic interaction effectiveness index. That indicator determines the quality of the interaction regions with natural monopolies, assessing the effect of the implementation of projects of the program interaction.

Keywords: Natural monopoly, interaction index

1 Introduction

Let’s consider the simplest case of the relationships among the sandwich-model (layered model) elements when interaction takes place within the selected elementary tube between two economic entities – nodes \( P_0 \) and \( P_1 \), lying on the different functional planes – the natural monopoly plane and the other economic entities plane, fig. 1.

The proposed method of the effectiveness index \( k \) calculation based on next factors: the revenue \( S_d^{(1)} \) from indirect lending of the node \( P_1 \); \( p_1 \) is the stability
factor \([1 - 9]\) of the involved enterprise; \(\DeltaV(1)\) is the total increase of the produced production volume at the invested enterprise \(P_1\) planned in the result of project implementation; \(\frac{\DeltaV(1)}{t}\) is the aftereffect, the measure of the expected benefits; \(D_{dep}\) is the possible guaranteed income; \(0 < \lambda < 1\) is the extent of linkage the invested project with other projects and programs of the region.

\[
k = \left[ \frac{1}{T} \sum_{i=1}^{\tau} \left( S_{d}^{(1)} + \alpha \cdot (\DeltaV^{(1)})_{i} \right) \right] \cdot \left[ \frac{1 + \lambda}{2} \right]
\]

2 Numerical experiments

It is easy to observe that the growth of the total sum profit \(\sum_{i=1}^{\tau} \left( S_{d}^{(1)} + \alpha \cdot (\DeltaV^{(1)})_{i} \right)\) of the node \(P_0\) (the natural monopoly) leads to the effectiveness ratio increase (fig. 2).
Here are the graphs of the proposed effectiveness index dependence not from the total sum profit but from its individual components – from the indirect lending income and from the measure of projects consequences (benefits from the project implementation) (fig. 3.a,b).

It should be noted that the effectiveness index depends from the measure of the project consequences in the same way.

Fig. 4 shows the surface over the definitional domain in coordinates (the direct income from the funds redirection; profit from an aftereffect). It is easy to see the ratio of the significance for the effectiveness index of the one and another argument. Let’s also note that the income from funds redirection is always a basically limited value, whereas the benefit from project aftereffect could be arbitrarily high.
The same qualitative dependence (effectiveness ratio increases with parameters growth) is available for the proposed effectiveness ratio relative to the stability factor of the implementer $p_1$ (fig. 5) and the linkage coefficient $\lambda$ (fig. 6). The effectiveness index increases with their growth. There are only linear dependences. However, one should notice that the effectiveness ratio linearity from these parameters is a subject of the following researches.

On the contrary, the greater the sum of guaranteed alternative income $\sum_{i=1}^{T} (D_{\text{dep}})_i$ is, the smaller value of the total effectiveness ratio $k$ is. The qualitative inverse dependence is shown at the fig. 7.
3 Conclusion

In conclusion it has to be noted that the carried out numerical experiments demonstrate the correspondence of the intuitive ideas about effectiveness of the one or another interaction and results received by means of the proposed method of effectiveness calculation.

References


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