

The Generalized Stability Indicator of Fragment of the Network. IV Corporate Impact Degree

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Abstract

The work is devoted to research the generalized stability indicator of the enterprise-node that is functioning and has a network of homogeneous companies with regard to their interaction and influence on each other. In addition, we introduce the concept of corporate impact degree. It is an integral characteristic, which reflects the impact of policy of redistribution of resources within the corporation.

Keywords: Generalized stability, directive impact, corporate network, critical performance event

1 Introduction

The set of all nodes (Fig. 1) in a common network somehow affecting the stability of the nodes, divided into four groups: direct vendors of P_0 , component group H subnet with priority higher than the priority of the node P_0 , node group N subnet with a lower priority and a group of nodes with equal priority. The work is based on research [1-6].

2 Algorithm of calculating the generalized stability of node in the subnet of homogeneous nodes

Coefficient of instability \bar{p}_0 is the sum of the probabilities of independent critical performance elementary event. Hence the generalized stability indicator of node P_0 in subnet H is

$$p_0 = 1 - \bar{p}_0 = 1 - \sum_{\text{critical } N} \left(\prod_{l=1}^{i_m} (p_{1l}^{\varepsilon_l} v_{1l}^{\varepsilon_l}) \right) \cdot \left(\prod_{k=0}^{j_3} q_k^{\delta_k} \right)$$

Here v_{1l} – strength of links between nodes P_0 и P_{1l} ,

$$p_{1l}^{\varepsilon_l} = \begin{cases} p_{1l}, & \text{if } \varepsilon_{1l} = 1 \\ 1 - p_{1l}, & \text{if } \varepsilon_{1l} = 0 \end{cases}, \quad q_k^{\delta_k} = \begin{cases} 1 - q_k, & \text{if } \delta_k = 1 \\ q_k, & \text{if } \delta_k = 0 \end{cases},$$

where q_k – the probability of occurrence of force majeure on the node.

Condition of criticality elementary event $(\varepsilon_1, \varepsilon_2, \dots, \varepsilon_{i_m}, \delta_0, \delta_1, \dots, \delta_{j_3})$, where

$$\varepsilon_i = \begin{cases} 0, & \text{if homogenous node } P_{1j} \text{ has an accident,} \\ 1, & \text{if homogenous node } P_{1j} \text{ has no accident,} \end{cases}$$

$$\delta_j = \begin{cases} 0, & \text{if there are any directive redistribution} \\ 1, & \text{if there are no directive redistribution} \end{cases}$$

was defined in previous part of present paper “The generalized stability indicator of fragment of the network. II. Critical performance event.”

3 Corporate impact degree

A natural question arises: how does the node priority change its stability as a result of the impact of policy-making? We introduce the quantity that will reflect the difference in the change of stability factor node, depending on the amount of the reserve, in the absence and presence of policy impact.

We denote by $S(x)$ area of the figure cut off by the reference point, the node stability coefficients change in the absence and presence of policy impact and the vertical line passing through the point x (Fig. 2). Clearly

$$S(x) = \int_1^x f_1(x) - f_2(x) dx, \text{ where}$$

$f_1(x)$ – function represents changes the node stability coefficients in the absence of policy impact;

$f_2(x)$ – function represents changes the node stability coefficients in the presence of policy impact;

Let $S(x)$ call the corporate impact degree of influence on the stability of the node P_0 .

The results of some numerical experiments on the computation of the individual factors of stability of nodes in the network structure of homogeneous companies, as well as generalized stability coefficients of entire subnets are listed in the following section.

3 Experiments

During playback, the production scenario will consider the network fragment corporation with three homogeneous groups of nodes enterprises (fig. 1).

We investigate how much the stability coefficient of some node in the network depends on, the ability to influence decision-making (under the legislative action will be understood, first of all, the reallocation of resources), the stability of neighboring businesses. Probability of such effects use a value of 0.2.

Next in the course of experiments, we investigated confer node P_0 consistently low, medium and high priorities as it shown in fig 1.

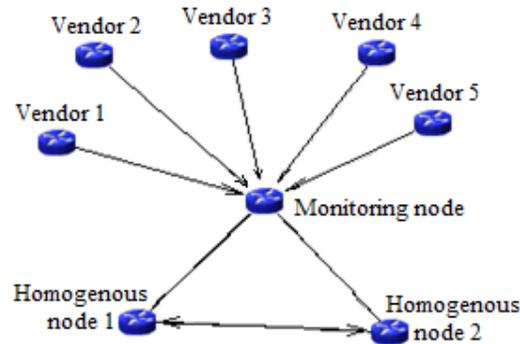


Fig. 1. A fragment of the network with three homogeneous groups of nodes-enterprises

Note that given the directive redistribution of resources, we really only increase the probability of an elementary event to be critical. Indeed, in situations where the monitoring node P_0 harm the vendors - and this is critical elementary event - a policy of redistribution of resources in favor of P_0 does not happen, and when neighboring plants in cases of force majeure, the resources at P_0 perhaps only taken away. This implies that the graph $f_2(x)$ is always lower than the graph $f_1(x)$. So, all the tome the growth of $S(x)$ - the degree of influence of policy impact - means a decrease in the node stability as a result of enterprise policy impact.

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We compute $S(x)$ for a node P_0 , giving it consistently low, medium and high priorities. Fig. 3 shows a graph of the slowdown degree of negative policy impact to node $P_0 - S(x)$ depending on the amount of the reserve.

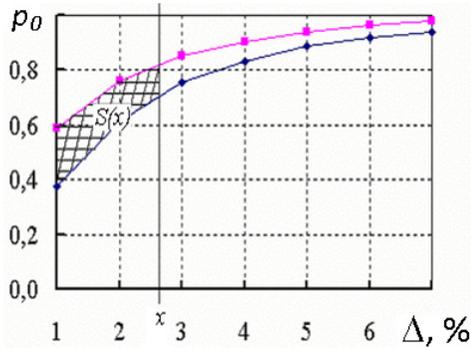


Fig. 2. The node stability coefficients ρ_0 in the absence and presence of policy impact

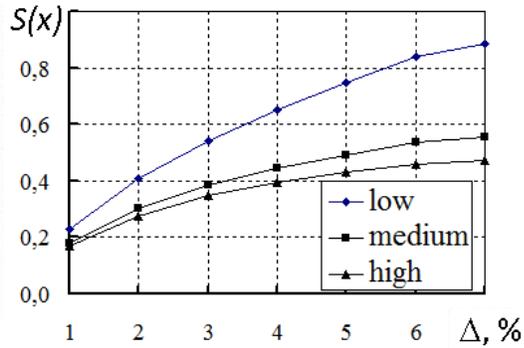


Fig. 3. Chart slowdown degree of negative impact of policy impact on node $P_0 - S(x)$ depends on reserve volume

Fig. 3 shows that most strongly influenced the directive impact low priority node P_0 . This is consistent with our intuition. Indeed, the node-enterprise with a low priority whenever you need resources to take advantage of nodes with higher priority. Note that for medium and high priority values $S(x)$ are close. However, and their stability coefficients under the influence of policy effects are reduced.

To understand the process of policy influence and impact of the resource reservation on corporate network node P_0 stability transform fig. 3, so that the vertical axis we plot the value $\Delta S(x) = S(x_{i+1}) - S(x_i)$.

Of course, reserving greatly reduces the impact of directive aimed at redistributing resources (Fig. 4).

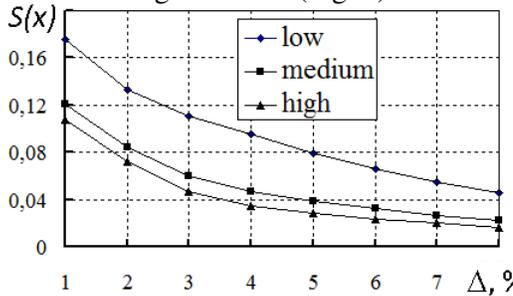


Fig. 4. Chart of weakening the influence of the degree of impact on policy priorities in the different nodes increase in reserves

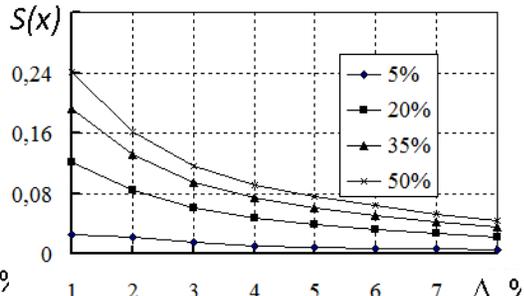


Fig. 5. Chart of weakening the influence of the degree of the impact of different levels of directive to the node with medium priority by increasing reserves

However, even the 5% reserve can not fully compensate for the directive influence on the node P_0 , while maintaining the required stability. The dramatic effect of reserving on the stability of a node when the policy impact is observed at a higher reservation. Thus, when the directive impact action to preserve the stability of the node P_0 it is way to set reserve limits equal to 7 - 8%. When planning the network administrator of the parent corporation of policy impact

(meaning the planned impact, and not a case of force majeure) node P_0 is required to increase the reserve in the development of the exchange acts (contracts).

Next, consider the extent to which the impact of policy on the node P_0 (endowed with medium priority) depending on the frequency of use policy of redistribution of resources (Fig. 5). The calculations established the following.

With the increase in reserves node P_0 influence policy impacts significantly slowed down. The most intense effect on the stability of the policy is reduced by exposure to 20%.

Here you can make a finding. When the policy impact, not to exceed 20%, with an average node priority can secure the required stability in exchange instruments in the amount of reserve 7 - 8%.

With strong influence policy-making in excess of 35%, compensation stability through resource reservation may exceed reasonable limits (say 20 - 30%).

In conclusion, it should be noted that the operation of the corporate network in the form of a flat network structure directive impact should be very limited, since the stability of the compensation components, enterprise network is provided by reserves, are laid in exchange instruments (contracts).

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