MANAGEMENT OF THE VALUE ADDED MADE BY THE ENTITY USING SIMULATION MODELING

УПРАВЛЕНИЕ ДОБАВЛЕННОЙ СТОИМОСТЬЮ, ПРОИЗВОДИМОЙ ПРЕДПРИЯТИЕМ, С ПРИМЕНЕНИЕМ ИМИТАЦИОННОГО МОДЕЛИРОВАНИЯ

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Abstract: *The main issues are considered in this topic: choice of corrective actions; monitoring of values of key indicators and corrective actions; assessment with use of a simulation modeling of an expectation of values of key indicators and the operating influences during the specified periods; determination by means of simulation modeling of change of sizes of corrective actions for transition from "crisis" by the "successful" periods of work of the entity.*

KEYWORDS: *SIMULATION MODEL; VALUE ADDED; THE SLIDING VARIATION COEFFICIENT; ESTIMATING VECTOR*

1. Introduction

The research is directed to implementation of automated control systems for economy of the entity. Three stages of the solution of this task are allocated. The first stage – forming and the forecast of the integrated indicator characterizing an economic condition of system. The second stage – creation of the estimative vector allowing to divide in dynamics an array of initial information into two parts relating to the satisfactory and pre-crisis periods of work of the entity. And the final stage – stay using imitating modeling of the ranges of rational values of financial ratios.

2. Discussion of a problem

In the existing management systems for assessment of an economic situation only the integrated indicator which in principle can be considered in dynamics is calculated. Whether on value of an integrated indicator it is possible to estimate there is an economic situation in the entity in pre-crisis or satisfactory condition. But at the same time the method of determination of the corrective actions allowing to transfer the entity from pre-crisis to satisfactory condition isn't specified. For the solution of this problem in this work, the estimative vector allowing to divide pre-crisis and crisis conditions of the entity is entered, and values of corrective actions are determined by the found characteristics of distributions for satisfactory condition of the entity.

3. Diagnostics of an economic condition of the enterprise with use of a value added

The value added of products made by it is considered a key indicator of a financial and economic condition of the entity. The value added is a source of economic growth and income formation of owners and employees of the entity and also state. For owners optimization of value added is expressed in a possibility to solve problems of development of the entity.

By determination the value added of S_{VA} is estimated based on the ratio of [1]:

$$S_{VA} = NR - M, \qquad (1)$$

where NR – the cost of products made by the entity; M – market value of the materials and services spent in case of production.

By simple transformations the formula (1) can be given to the following type:

$$S_{VA} = EBT + S_{SF} + DA + TAX, \qquad (2)$$

where EBT – sales profit; S_{SF} – a compensation phot; DA – depreciation; TAX – the amount of the taxes paid from cost value.

From the given constituting S_{VA} its distribution is clear:

- the employee – the salary and other expenses on compensation;

- to the state – the income tax and assignments on social needs;

- to the persons which provided the equity – dividends, including according to the shares belonging to subsidiary companies;

- remain at the disposal of the company – depreciation and retained earnings.

Essential importance of an indicator of S_{VA} for the specified categories determining this cost follows from told. And for all of them maximization of an indicator of S_{VA}/M is desirable.

We will return to a formula (1). From this formula we receive:

$$\frac{S_{VA}}{M} = \frac{NR}{M} - 1 \qquad (3)$$

The equivalence of tasks of maximization of indicators of S_{VA}/M and NR/M follows from a ratio (3) [2]. It is established that there is very high correlation of an indicator of NR/M with coefficient of turnover of current assets (K_{CAT}) and current liquidity (K_{CR}):

$$K_{CAT} = \frac{NR}{S_{CA}} \text{ and } K_{CR} = \frac{S_{CA}}{K_t + R_P},$$

and also with indicators $\pi 1$, $\pi 2$, $\pi 4$ – the characteristics determining the strategy of management of current assets of the entity [3]:

$$\pi_1 = \frac{S_{CA}}{NR},$$

$$\pi_2 = \frac{B - I_S - K_T}{S_{CA}} = \frac{K_t + R_p}{S_{CA}}, ,$$

$$\pi_4 = \frac{K_T}{B},$$

where S_{CA} – amount of current assets; B – a balance sheet total; K_t – short-term loans; R_p – an accounts payable; K_T – long-term loans; I_S – own means.

In works as [2, 4, 5] methods of nonlinear programming a number of tasks of optimization both an indicator of $/M$, and some corrective actions, in particular K_{CAT} indicator is solved. But the given approach to optimization of value added and finding of rational values of its corrective actions can be used in any one-time researches because of need of accounting of change of key indicators of the entity.

In automated control systems for economy of the entity the stay task in dynamics of rational values of the corrective actions providing maximization, for example, of a value added indicator needs to be solved using imitating modeling. The general scheme of this procedure is as follows. After the choice of the main economic indicator pass to finding of the vector determining its financial and statistical ratios, a so-called "estimative vector" $\overline{y} = y_1, y_2, \ldots, y_n$. In particular, for relative value added of S_{VA}/M the financial ratios provided above are chosen as components of an estimative vector: $K_{CAT} = y_1$, $K_{CR} = y_2$, and also indicator $\pi_4 = y_4$. From statistical coefficients the sliding variation coefficient (MSD) is used:

$$y_3 = MSD = \frac{\sigma}{M_x},$$

where σ – the moving standard deviation of size of relative value added (S_{VA}/M); M_x – expected value.

Further length of an estimative vector is determined:

$$\|y\| = \sqrt{y_1^2 + y_2^2 + \cdots + y_n^2}.$$

Coordinates of a vector are units and zero, that is $y_i \in \{1; 0\}$. Number 1 corresponds to a satisfactory situation, and number zero – unsatisfactory. The sizes y_i are determined from the following system of ratios:

$y_1 = 0$ in case of $K_{CAT} \leq K_{CAT}^{NORM}$ and $y_1 = 1$ otherwise;

$y_2 = 0$ in case of $K_{CR} \leq K_{CR}^{NORM}$ and $y_2 = 1$ otherwise;

$y_3 = 0$ in case of $MSD > 0{,}3$ and $y_3 = 1$ otherwise;

$y_4 = 0$ in case of $\pi_4 < \pi_4^{NORM}$ and $y_4 = 1$ in case of dissatisfaction of this condition.

Standard measure values are established by the entities. The given standard values often accept when calculating risk of the entity. As standard value π_4 it is possible to accept its average for the considered period.

The estimative vector allows to determine to what massif information obtained in every quarter belongs: to work of the entity in a pre-crisis or "satisfactory" situation. In the presence of four indicators if all of them are equal standard, the economic situation is assessed by number 2. If all four indicators don't correspond standard, the economic situation is assessed by number 0.

In work [6] as an expert way it is established that the pre-crisis situation steps in case of a deviation of length of an estimative vector from maximum on 30% and more. If the situation takes place three quarters in a row and longer, then it is considered crisis.

The final stage of calculations is finding of rational values of the specified financial ratios of K_{CAT}, K_{CR} and π_4 by imitating modeling. As a result of the performed procedures the used massif of basic data is divided into 2 parts: the specified massifs of satisfactory work of the entities and pre-crisis and crisis conditions. The left borders of the found differential distributions of satisfactory work of the entities are also the minimum values of required corrective actions. Parameters of distributions are estimated when using a packet of the application programs "Oracle Crystal Ball".

The given algorithm is implemented for several types of distributions: normal, logarithmic normal, logistic and also Beta. As critical values of corrective actions the maximum values of the left borders of their distribution for satisfactory condition of the entity are chosen.

4. Summary

As a result of the executed research the following results are received:

1. As the most important characteristic of an economic condition of the entity the value added of products made by it is chosen.

2. The general technique of quantitative assessment of an economic situation in the entity using the new operational characteristic – lengths of an estimative vector is offered. The technique includes the following main stages:

– determination of set of the financial ratios and their standard rates characterizing an economic situation in the entity;

– consideration of the estimated coordinates of the vector in which the relevant financial ratio is replaced by the unit if it meet the specified standards and zero otherwise;

– calculation of length of a vector;

– separation of the array of information into two parts – satisfactory and unsatisfactory conditions of the entity.

3. The research of the found data arrays relating to satisfactory and pre-crisis conditions of the entity with use of a packet of application programs "Oracle Crystal Ball, allows to establish the minimum values of rational corrective actions taking into account the left border of distribution of financial ratios for satisfactory conditions of the entities..

5. References

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