THE PROBLEMS OF IMPROVING THE METHODS OF CURRENT CAPITAL MANAGEMENT AND DIAGNOSTICS WITH THE HELP OF INTEGRAL INDICES AND OPTIMIZATION MODELS

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The article proves the importance of the problem of managing the current capital of enterprises and sets the problems that should be solved in the process of improving the methods of diagnosing the situation at the enterprise using the rational values of financial coefficients and optimizing its current assets.

These are the following groups of economic indices characterizing the activity of the enterprise:

♦ basic (income, cost value, profit);

♦ evaluating the overall condition of the enterprise;

♦ the efficient use of the capital: main current, owner's one;

♦ the cost of financial assets;

♦ the produced added value.

They are all used while implementing the procedure of diagnostics. The indices of the first and third group are important for comparing the economic condition of different enterprises, as well as one and the same enterprise in different time moments.

The second group of indices makes it possible to define financial stability of enterprise and liquidity of its assets, the possibility of loss and reconstruction of solvency, its demands in money and etc.

The indices of the fourth group are used while diagnosing the sources of financing as well as while restructuring and selling the enterprise.

And, finally, with the help of the indices of the last group it is possible to evaluate whether the enterprise is in the stage of economic growth and how its economic input into national economy is changing.

In order to accomplish the diagnostics, the dynamics of the above mentioned indices are usually considered; their average value, quadratic mean deviation and other statistic characteristics are calculated.

However it is not always possible to evaluate the overall economic condition with the help of private indices. In this case integral indices are used that at present are mainly applied for evaluating the rating of the enterprise. At the same time there are a number of other problems of diagnostics that we think are possible to solve using integral indices.

The first one is uniting the enterprises in groups depending on the level of financial indices in order to have the possibility to distinguish the group of branch leaders due to these indices. It is clear that there should be enterprises with close values of integral indices in the group. Such a problem can be solved by dividing the whole diapason of the change of integral index into the intervals, the width of which is equal to quadratic mean deviation from the average value of integral index and by including in one group the enterprises from one interval.

The second problem is revealing the leader of technological group with the help of financial indices. While dividing the metallurgical enterprises into technological groups, it is possible to use the indices examined in the work as grouping characteristics, i.e. production volume and production range, and make the division into the intervals inside the technological group due to the above-mentioned method.

The third problem is in evaluating the general level of the values of financial coefficients or satisfying the restrictions on financial coefficients. While forming the integral indices the increase of each private coefficient usually leads to the growth of the overall value of integral index, finding solution to this problem is close to solving the first one. It is evident that the higher the number of the group (where there is the value of integral index) is, the higher values of some financial indices can be achieved on the examined enterprises. Therefore the number

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of the group with the calculated value of integral index can be treated as the overall level of the values of financial coefficients.

As one of the aims of the diagnostics is the timely revealing of disfunction, simultaneously with the above-mentioned problems it is necessary to solve the fourth problem - the problem of predicting integral indices. But as the integral index contains private indices calculated using the enterprise balance and the report on profit and losses, the fourth problem comes to predicting the balance of enterprises and indices that are contained in the report on profit and losses.

It is evident that the most important indices characterizing the activities of the enterprise are its profit and assets liquidity. These indices correlate significantly with the values of main and turnover assets of the enterprise mainly because of the influence of scale factor. The corresponding values of correlation coefficients, calculated on the data of 216 balances and forms of public reports of metallurgical enterprises for the period 1999-2007, recalculated in the prices of the last year are represented in Table 1.

Source information is taken from the journal "Expert RA" and the sites of metallurgical enterprises on the internet.

The following indices are considered in the Table:

Π - profit;

$K_{абс.ликв.}$ - the coefficient of absolute liquidity;
$K_{пр.покр.}$ - intermediate liquidity coefficient;
$K_{общ.покр.}$ - overall liquidity coefficient;
d_1 - monetary means;
d_2 - short-term financial investments;
$R_{о1}$ - accounts receivable;
Z - reserves;
$R_{о2}$ -s other turnover assets;
S_{oc} - all turnover assets;
F - fixed assets;
$F_{проч.}$ - other non turnover assets;
F_s - total non turnover assets;
$Ц_{абс.}$ - "absolute value of assets". It is necessary to mention that "absolute value of assets" is calculated due to the formula

$$Ц_{абс.} = \sum \alpha_i \cdot A_i,$$

where weight coefficients α_i make: 0,3 - for fixed and non material assets; 0,6 - for unfinished capital investments, long-term financial investments and other assets, reserves and expenditures; 0,9 - for loaded merchandise, paying debtors, short-term financial investments; 1,0 - for monetary assets.

For the index "profit" correlation coefficients are in the diapason from 0,56 to 0,93, and for the coefficients of absolute liquidity - in the interval 0,48-0,81. The index "profit" correlates greatly with liquidity coefficients. In particular, correlation coefficient between this index and the coefficient of absolute liquidity is 0,74.

Table 1

The matrix of correlation coefficients

Indices and factors	Π	$K_{абс.ликв}$	$K_{пр.покр}$	$K_{общ.покр}$	d_1	d_2	$d_1 + d_2$	$d_1 + d_2 + R_{о2}$	$R_{о1}$	Z	$R_{о2}$	S_{oc}	F	$F_{проч}$	F_{Σ}	$Ц_{абс}$
Π	1,00	0,74	0,71	0,62	0,86	0,72	0,88	0,89	0,86	0,85	0,71	0,93	0,8	0,56	0,77	0,90
$K_{абс.ликв}$	0,74	1,00	0,90	0,80	0,63	0,65	0,81	0,81	0,6	0,61	0,48	0,75	0,49	0,52	057	0,78
$K_{пр.покр}$	0,71	0,90	1,00	0,94	0,58	0,56	0,71	0,71	0,62	0,56	0,44	0,69	0,45	0,46	0,52	0,67
$K_{общ.покр}$	0,62	0,80	0,94	1,00	0,49	0,46	0,59	0,59	0,51	0,48	0,36	0,58	0,37	0,38	0,43	0,56
d_1	0,66	0,63	0,58	0,49	1,00	0,22	0,64	0,65	0,57	0,51	0,54	0,64	0,51	0,42	0,53	0,64
d_2	0,72	0,66	0,56	0,46	0,22	1,00	0,89	0,88	0,64	0,65	0,45	0,81	0,56	0,51	0,61	0,77
$d_1 + d_2$	0,88	0,81	0,71	0,59	0,64	0,89	1,00	0,99	0,77	0,75	0,60	0,94	0,68	0,60	0,72	0,91
$d_1 + d_2 + R_{о2}$	0,89	0,81	0,71	0,58	0,65	0,88	0,89	1,00	0,79	0,78	0,66	0,95	0,72	0,61	0,75	0,92
$R_{о1}$	0,86	0,80	0,62	0,51	0,57	0,64	0,77	0,79	1,00	0,90	0,77	0,93	0,82	0,56	0,78	0,90
Z	0,85	0,61	0,56	0,48	0,51	0,65	0,75	0,78	0,90	1,00	0,82	0,92	0,88	0,60	0,84	0,90
$R_{о2}$	0,71	0,48	0,44	0,36	0,54	0,45	0,60	0,86	0,77	0,82	1,00	0,78	0,84	0,52	0,77	0,79
S_{oc}	0,93	0,75	0,69	0,58	0,64	0,81	0,94	0,95	0,93	0,92	0,78	1,00	0,63	0,64	0,83	0,97
F	0,80	0,49	0,45	0,37	0,51	0,56	0,68	0,72	0,82	0,88	0,84	0,83	1,00	0,56	0,89	0,95
$F_{проч}$	0,55	0,52	0,46	0,38	0,42	0,51	0,6	0,61	0,56	0,6	0,52	0,64	0,56	1,00	0,88	0,79
F_{Σ}	0,77	0,57	0,52	0,43	0,53	0,61	0,72	0,75	0,78	0,84	0,77	0,83	0,89	0,88	1,00	0,83
$Ц_{абс}$	0,90	0,73	0,67	0,56	0,64	0,77	0,91	0,92	0,90	0,90	0,79	0,97	0,85	0,79	0,93	1,00

In order to answer the question what assets - fixed or turnover have major influence on profit and assets liquidity in a short-time period, we have studied two groups of regression equations. The first group of equations uses all assets of aggregated balance that characterize both fixed and turnover assets.

Factors that are included in the equations of regression of the first and second group as well as the values of the coefficients of multiple correlation are represented in Table 2, 3.

fluctuation of "profit" and 71% of "absolute liquidity" is explained by the fluctuation of the values of company's turnover assets. So the main variables determining the change of company's profit and liquidity of its assets in short-term period are turnover assets.

The above mentioned equations of the second group show that the profit of enterprise and liquidity coefficients depend on the structure of turnover assets. It is known that the increase of the share of reserves creates the prerequisites for

Table 2

The characteristics of regression equations of the first group

Indices	The list of factors taken into account in regression equation	Coefficients of multiple correlation
Π	$d_1,\ d_2,\ Z,\ R_{o1},\ R_{o2},\ F,\ F_{np}$	0,949
$K_{абс.ликв}$	$d_1,\ d_2,\ Z,\ F$	0,852
$K_{пр.покр}$	$d_1,\ d_2,\ Z,\ R_{o1},\ F$	0,786
$K_{общ.покр}$	$d_1,\ d_2,\ Z,\ R_{o1},\ F$	0,710

Table 3

The characteristics of regression equations of the second group

Indices	The list of factors taken into account in regression equation	Coefficients of multiple correlation
Π	$d_1,\ d_2,\ Z,\ R_{o1}$	0,944
$K_{абс.ликв}$	$d_1,\ d_2,\ Z,\ R_{o1}$	0,843
$K_{пр.покр}$	$d_1,\ d_2,\ Z,\ R_{o1}$	0,778
$K_{общ.покр}$	$d_1,\ d_2,\ Z$	0,701

In order to compare the values of the fluctuation of the examined factors with the help of represented equations of the first and second group, the determination coefficients were calculated (Table 4).

Therefore, it is possible to conclude that excluding the equations of the values of company's fixed assets while transmitting from the equations of the first group to the equations of the second group leads to the decrease of the explained fluctuation of factors. But this decrease makes from 1 to 4%. Consequently, having studied the models it is clear that even without using any specific methods of constructing regression equations it is possible to get the correlation with the help of which 89% of the

profit growth, and increasing the share of monetary assets and short-term financial investments contributes to the increase of assets liquidity.

It is evident that the process of managing the whole system of turnover assets besides managing its structure should include the subsystems of managing the volumes, financing sources and the turn-around of turnover assets. It is not necessary to distinguish the last subsystem of managing the turnover assets, as it is closely related to defining the volumes of turnover assets.

At present time the following approaches devoted to diagnosing turnover assets are popular:

♦ The diagnostics of the provision of reserves and costs financing; determining the need in monetary assets;

Table 4

Determination coefficients of the equations of the first and second group

Factors	Coefficients of equation determination		Decrease of the explained fluctuation of factors, %
	Group 1	Group 2	
Π	0,90	0,89	1
$K_{абс.ликв}$	0,75	0,71	4
$K_{пр.покр}$	0,62	0,61	1
$K_{общ.покр}$	0,50	0,49	1

♦ The diagnostics of financial stability and company's solvency using financial coefficients;

♦ The analysis of the dynamics of financial coefficients.

♦ The diagnostics of managing the sources of financing the turnover assets.

The last method uses three models of diagnosing and managing these resources - aggressive, conservative, moderate. It is evident that similar models can be considered also while managing the volumes of turnover assets.

In order to accomplish the qualitative evaluation of managing models, let's introduce two variables characterizing the volumes of turnover assets and the sources of their financing. The first from them p_1 represents the relation of turnover assets S_{OC} to the currency of balance B:

$$\pi_1 = \frac{S_{oc}}{B}.$$

The second - p_2 is connected with the provision of enterprises with fixed and long-term borrowed funds and is calculated due to the formula:

$$\pi_2 = \frac{B - (И_C + K_T)}{S_{OC}} = \frac{K_t + R_P}{S_{OC}} = \frac{1}{k_1}$$

where $И_C$ - fixed assets and reserves of the enterprise; K_T - long-term borrowed assets; K_t - short-term borrowed assets; R_p - bill payable; k_1 - coefficient of total coverage.

These indices can characterize the type of turnover assets management model applied by the enterprise and the sources of their coverage. It is true that the smaller amount of turnover assets the enterprise has (the smaller p_1 is), the more aggressive is the model of managing the volume of current assets. The more enterprise is provided by fixed and long-term borrowed assets (the smaller p_1 is), the closer is the used model of managing the sources of coverage of current assets to the conservative model.

Let's consider regression models that connect p_1 and p_2 indices with company's profit and coefficient of absolute liquidity. Using the data of 68 balances and reports about profits and losses the following relations are set:

above mentioned correlations are got by the method of step screening of not significant variables.

Therefore, by managing the values of p_1 and p_2 indices connected with the volumes of turnover assets and the sources of their financing it is possible to create the conditions for changing the profitability of the enterprise and liquidity of its assets.

We conclude that the general problem of managing turnover assets can be represented as two interrelated problems.

The first problem is solved when the enterprise is provided with some volumes of turnover assets and the sources of their financing that make it possible to have positive profitability and enough assets liquidity. In this case it is enough to manage the structure of turnover assets. But in this situation it is enough to manage the structure of turnover assets and impossible to exceed the barrier of profit and assets liquidity determined by the volume of assets and sources of their financing.

If for the enterprise it is necessary to increase the general level (the existing barrier) of profitability and liquidity of its assets and then should be engaged in managing the structure of turnover assets.

The above mentioned problems of managing the system of turnover assets are solved at every metallurgical enterprise but in a different way. Instead of the first problem another similar problem is solved - the problem of meeting the standards of spending the main components of turnover assets. M.I. Litvin thinks that with the help of expenditure norms it is necessary to calculate the standard structure of turnover assets and control the factual structure on the stage of diagnostics, determine its deviation from the standard one and give the corresponding recommendations on accomplishing the managing aspect on structure correction.

Finding the solution to the second problem is connected with reconstruction and development. It is produced in the interaction with implementing big investment projects.

$$\Pi = 10^6 \cdot (78,43\pi_1 - 81,18\pi_1 \cdot \pi_2 + 6,71\pi_2^2), \quad R = 0,863;$$

$$K_{абс.л} = 1,94\pi_2 - 7,06\pi_1 \cdot \pi_2 + 7,08\pi_1^2, \quad R = 0,793.$$

In the process of creating regression models initially full polynomials of the second order from the variables p_1 and p_2 were considered, and the

There are no methods referring to the second stage of diagnostics - to developing certain quantitative recommendations on forming the

managerial impacts targeted at improving the economic condition of the enterprise on the basis of optimizing the whole system of turnover assets, though the existing models of optimizing its separate components, in particular, the reserves of the used materials and monetary assets on the settlement account. The optimization of the whole system of turnover assets can be implemented finding the optimal solutions of the above mentioned two interrelated problems of managing the turnover assets.

A number of diagnostics methods, in particular the methods of analyzing the dynamics of financial coefficients and diagnosing the condition of the enterprise of European federation of financial analytics, use the monitoring of financial indices. However this monitoring has the following main disadvantages:

♦ In the analysis of the dynamics of economic indices, the method of statistical control map is not popular;

♦ The monitoring does not go together with the optimization procedure.

It is evident that the usual monitoring of financial indices is the indirect method of managing the structure of turnover assets, their volumes and the sources of financing. According to the data of monitoring financial coefficients correlate in order to bring their values to the standard ones. We can have the change in the structure of turnover assets, their size and the sources of financing, all this contribute to either to the increase the profit of the enterprise, or to the liquidity of its assets. But this method of management cannot be the most effective as it does not solve the problems of optimization. The direct method of managing the whole system of turnover assets based on the combination of monitoring and solving the two above mentioned optimization problems is more effective. This combination makes it possible to follow the tendencies of the deviation of the examined parameters from the optimal trajectory.

However, as we have already mentioned this method is not widely used at metallurgical enterprises of Russian Federation. In this relation the implementation of direct method needs the creation of new methods of managing the turnover assets. Firstly, let's distinguish the

method connected with the direct method of managing the structure of turnover assets. This method is implemented in managing the turnover assets in short-term time period, for example in the period of one season it is possible to solve the optimization problem of the structure of turnover assets in dynamics in order to maximize the financial result of the enterprise.

It is possible to solve another optimization problem of the second stage of diagnostics connected with providing the enterprise with the necessary volume of turnover assets and the sources of their financing.

It is possible to summarize the generalized problem connected with the stage of diagnosing the turnover assets devoted to forming the managerial impacts according to the change of the volume of turnover assets and the sources of their financing considered in dynamics. It includes the following private goals:

♦ Implementation of the method of diagnosing the provision of metallurgical enterprises of RF with turnover assets, evaluating the economic efficiency of their use and managing them with the help of the indirect method with the application statistic of control maps;

♦ The implementation of the methods of diagnosing the provision of the enterprise with necessary volumes of turnover assets and the sources of their financing with the application of monitoring procedure;

♦ Evaluating the change of the structure of turnover assets of metallurgical enterprise in short and log-term periods;

♦ The implementation of the direct method of diagnosing and managing the volumes of turnover assets and the sources of their financing.

1. *Sedykh A.M., Yuzov O.V., Afonin S.Z.* Black metallurgy in Russia in world market. M., 2003. 256 p.

2. Economics of the enterprise with the extended use of financial models: Study book for universities / I.M.Rozhkov, I.A.Larionova, A.B. Pyatetskaya. M.: "MISIS", 2004. 320p.

3. *Litvin M.I.* Managing the turnover assets of the enterprise in market economy. Lipetsk, 1996. 184 p.

4. *Kolass B.* Managing financial activity of the enterprise. Problems, concepts and methods: Study book. Edited by Prof. Y. V. Sokolova. M.: Finance, 1997. 576 p.