THE COEFFICIENT METHOD OF MANAGING THE ADDED VALUE INDICATORS FOR PROVIDING CONSISTENT ENTERPRISE GROWTH
(case study of the russian federation ferrous metallurgy plants)

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The article deals with the method of finding the area of optimum financial coefficient values, which will provide favorable conditions for achieving high amounts of added value indicators. It proposes two means of managing the added value indicators using the integral estimation of the financial and economic activity of an enterprise.

The present investigation is dedicated to developing a method of managing the added value (*ДС*), produced by enterprises, the most important economic indicator that defines the enterprise's input to the state GDP.

The added value can be defined as a sum of three variables:

$$ДС_{ВВП} = П + S_{ЗП} + Ам,$$

where *П* - gross profit margin; $S_{ЗП}$ - salary, including the unified social tax; *Ам* - depreciation.

The present article studies the relative indicators of the added value: ratio of added value (*ДС*) to assets, *ДС/А*; to cost, *ДС /С*; as well as to product of proceeds from sales times the number of persons working, $ДС/(B_p \cdot N_{mp})$ - because this selection of indicators helps to reduce the inflation impact.

For added value (*ДС*) management it was decided to utilize the traditional means of managing the financial indicators, the so-called coefficient method, the essence of which boils down to confronting the paramount financial coefficients that characterize the financial and economic condition of the enterprise with their normative values, and taking appropriate actions to get these coefficients grow. The values taken for normative ones are:

- the coefficient values at the best of the latest periods of enterprise operation;
- the bigger coefficient values of the competitor enterprises;
- the average coefficient values considering the revenue for enterprises of a certain technological group etc.

Books tell us about more than thirty financial coefficients and various integral indicators, which unlike the financial coefficients characterize the financial and economic condition of an enterprise as a whole. The majority of financial coefficients as well as the integral indicators are intended for indirect control over the financial and economic condition of an enterprise, that is, if they do not exceed the normative, there is almost no probability for the enterprise under study to go bankrupt within the shortest period in future. At that the selection of control action or management model for improving the enterprise condition is based upon the living experience of the financial manager's office.

Therefore, in the present investigation an objective is set to develop a method to get the financial coefficients, which will help to manage the financial and economic condition of an enterprise, particularly those added value (*ДС*) indicators, shown above, directly, i.e., by direct impact over those indicators. There were chosen as financial coefficients the p_1 and p_2[1] coefficients, used for managing the turnover assets of en enterprise within a short period.

The first one represents a ratio of the turnover assets value to the currency of *B* balance:

$$p_1 = S_{oc}/B.$$

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The second - p_2 is connected with the supply of enterprises with fixed and long-term borrowed funds and is calculated using the formula:

$$p_2 = \frac{B - (И_c + K_T)}{S_{oc}} = \frac{K_t + R_p}{S_{oc}} = \frac{1}{K_1},$$

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 indicators can characterize the type of turnover assets management model (strategy) utilized 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 the enterprise is supplied with 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.

As an example let us take the correspondence between added value (*ДС*) indicators applied to one of the large-scale metallurgical plants, and the financial coefficients p_1 and p_2. The initial kind of relationship was set to be a complete polynominal of the second rank. After eliminating irrelevant variables based on data of 40-quarter time regarding the enterprise under study we get the following relationships:

$$\frac{ДС}{A} = 1{,}046\pi_1 - 0{,}305\pi_2 - 1{,}423\pi_1^2 + 0{,}629\pi_1\pi_2, \quad (1)$$

$$t_1 = 3{,}18;\ t_2 = -2{,}89;\ t_3 = -2{,}19;\ t_4 = 2{,}32;\ R_{множ} = 0{,}923;$$

$$\frac{ДС}{C} = 2{,}517\pi_1 - 1{,}190\pi_2 - 3{,}353\pi_1^2 + 2{,}8\pi_1\pi_2, \quad (2)$$

$$t_1 = 2{,}88;\ t_2 = -4{,}14;\ t_3 = -1{,}89;\ t_4 = 3{,}78;\ R_{множ} = 0{,}935;$$

$$\frac{ДС}{N_{тр} \cdot B_p} = 0{,}0176\pi_1 - 0{,}0181\pi_2 - 0{,}00298\pi_2^2 + 0{,}0625\pi_1\pi_2, \quad (3)$$

$$t_1 = 4{,}28;\ t_2 = -2{,}14;\ t_3 = -2{,}00;\ t_4 = 3{,}23;\ R_{множ} = 0{,}935.$$

Here t_i - the t value - the Student criterion for i - coefficient of regression; $R_{множ}$ - the value of the multiple correlation coefficient.

Thus, managing the values of p_1 and p_2, it is possible to control the added value (*ДС*) indicators. To implement this control it is necessary to know the range for changing the p_1 and p_2 coefficients in order to have high value of added value indicators (create favorable conditions for achieving high values of the said indicators). In the article it was demonstrated that the used model of managing the turnover assets, defined by the values of coefficients p_1 and p_2, exerts influence over profitability and liquidity characteristics of enterprise assets, and by correct selection of the coefficient values one can work at such areas of their values, at which conditions are formed for providing both high profitability and liquidity of assets at the same time[2].

Obviously, the similar relationships should exist for added value (*ДС*) indicators as well, as its composing values, depreciation and salary, along with the profit, do not change significantly within short periods in the existing environment of the Russian Federation.

As the benchmark data for statistical processing there were used production indicators of 9 metallurgical enterprises of Russia within a period of 1999-2007 (77 points). Like in article [1] the range of change for indicators p_1 and p_2 was divided into three nearly equal intervals. For p_1 the interval 0,2-0,45 relates to the aggressive model of managing the working asset volumes (A_2), the interval 0,45-0,7 - relates to the moderate one ($У_2$), and the interval 0,7 and higher - to the conservative one (K_2). Similar to the p_2 indicator it is assumed that the interval 0,1-0,4 relates to the conservative model (K_1); 0,4-0,7 - to the moderate one ($У_1$); 0,7-1,0 to the aggressive one (A_1). When $p_2 > 1$ it means that the enterprise is not provided sufficiently with fixed and long-term borrowed funds ($Н_1$).

The values of added value (*ДС*) indicators at different financial coefficients, shown at Figure 1, were calculated using statistical treatment of data taken from the annual financial

accounting (77 points). Based on this the models of turnover assets management were chosen (table 1) that will ensure the best added value (*ДС*) values:

for $\frac{ДС}{A}$ - moderate $У_1$ and $У_2$;

for $\frac{ДС}{C}$ - conservative and moderate $К_1$ and $У_2$;

for $\frac{ДС}{N_{тр} \cdot B_р}$ - conservative and aggressive $К_1$ and $А_2$.

Based on table 2 it is possible to identify the following best ranges, within which it is desirable to select the values of p_1 and p_2 indicators, in order to create favorable conditions for high added value (*ДС*) indicators:

$$0,45 \le p_1 \le 0,7;$$
$$0,1 \le p_2 \le 0,4.$$

Thus, for The Russian Federation metallurgical plants it is better to select the p_1 and p_2 values within the identified ranges. If those values are situated in other ranges, then by increasing the turnover asset volumes and long-term funding sources, it is possible to pass to the ranges within which the conditions are good for added value (*ДС*) indicators to go up.

For the resulting area it is generally possible to solve the optimization problem. As a target function an integral indicator can be used, which depends on p_1 and p_2, applied to one of the large-scale metallurgical plants, for instance:

$$R_j = f(\pi_1, \pi_2)$$

The initial relationship was set as a complete polynominal of the second rank. The correlation (4) was derived after eliminating the irrelevant variables. The indicator $R_{j.A}$ represents an improved and adapted for ferrous metallurgy applications indicator discovered by R.S. Saifulin and G.G. Kadykov[3]. At that,

$$R_j^{комб} = \frac{1}{4}\left[\frac{R_{k_2}}{0,280} + \frac{A_{k_3}}{14,043} + \frac{F_{k_9}}{0,399} + \frac{L_{k_7}}{2,483}\right] =$$
$$= 0,893R_{k_2} + 0,0178A_{k_3} + 0,627F_{k_9} + 0,101\,L_{k_7}.$$

The coefficients which are part of the integral indicator are calculated using the following formulae.

$$R_{k_2} = \frac{П_{чист}}{(B_1 + B_2) \cdot 0,5} \cdot \frac{365}{T},$$

where $П_{чист}$ - net profit; B_1, B_2 - balance currency at the start and at the end of the period; T - period duration, days.

$$A_{k_3} = \frac{B_p^{нетто}}{(z_1 + z_2) \cdot 0,5} \cdot \frac{365}{T},$$

where z_1 and z_2 - financial expenditures at the start and at the end of the period; $B_p^{нетто}$ - net proceeds.

$$F_{k_9} = \frac{K_T}{K_T + K_t + R_p};$$

$L_{k_7} = K_1 = \frac{S_{OC}}{K_t + R_p}$ - the current liquidity of the enterprise balance.

As a minimum and maximum value of p_1 and p_2 we can take their values at the end of the previous time period (for example, a quarter), increased or decreased by a certain quantity (for example, by 3%).

To find the control actions there is a simpler way. The enterprise should always keep track of its need for turnover assets; this will help to identify the $_1$ value easily. The need for turnover assets is usually forecast considering

$$R_{j.A} = 6,37\pi_1 - 0,604\pi_2 - 6,73\pi_1^2 \qquad (4)$$
$$t_1 = 6,44;\ t_2 = -10,35;\ t_3 = 3,57;\ R_{множ} = 0,983.$$
$$\pi_1^{min} \le \pi_1 \le \pi_1^{max};\quad \pi_2^{min} \le \pi_2 \le \pi_2^{max}.$$

the enterprise proceeds and the coefficient of turnover asset utilization. It is also necessary to scheme the level lines of the integral indicator of financial and economic enterprise condition as a function of p_1 and p_2, i.e. the line $R_j = f(\pi_1, \pi_2)$, fig. 2. Then, setting values of and drawing a line parallel to axis, we find a point of intersection between this line and the curve . After that, drawing a line from this point parallel to p_1 axis, we identify the p_2 coordinate in question.

			A_2	$У_2$	$К_2$
			Added value (ДС)- Number of points		
π_2	$Н_1$	π_2>1,0	14	6	
	$А_1$	0,7<π_2<1,0	4	2	
	$У_1$	0,4<π_2<0,7	8	8	1
	$К_1$	0,1<π_2<0,4	11	21	1
			0,2<π_1<0,45	0,45<π_1<0,7	π_1>0,7
			π_1		

			A_2	$У_2$	$К_2$
			The average of *ДС / С*		
π_2		π_2>1,0	0,18	0,22	
		0,7<π_2<1,0	0,34	0,27	
		0,4<π_2<0,7	**0,41**	**0,40**	0,11
		0,1<π_2<0,4	**0,56**	**0,63**	0,30
			0,2<π_1<0,45	0,45<π_1<0,7	π_1>0,7
			π_1		

			A_2	$У_2$	$К_2$
			The average of ДС / А		
π_2	$Н_1$	π_2>1,0	0,19	0,21	
	$А_1$	0,7<π_2<1,0	0,39	0,26	
	$У_1$	0,4<π_2<0,7	**0,41**	**0,59**	0,03
	$К_1$	0,1<π_2<0,4	0,33	**0,46**	0,09
			0,2<π_1<0,45	0,45<π_1<0,7	π_1>0,7
			π_1		

			A_2	$У_2$	$К_2$
			The average of *ДС* / (*Nmp* · *Bp*) · 10^6		
π_1		π_2>1,0	5,8	6,9	
		0,7<π_2<1,0	11,0	8,6	
		0,4<π_2<0,7	**10,9**	**12,6**	4,3
		0,1<π_2<0,4	**18,6**	**11,0**	12,3
			0,2<π_1<0,45	0,45<π_1<0,7	π_1>0,7
			π_1		

Fig. 1. **Values of added value (*ДС*) indicators at different financial coefficients $ð_1$ and $ð_2$**

Table 1

Result comparison of added value indicator forecast

Table 2

Range of change selection for financial coefficients δ_1 and δ_2, which ensure achieving the most favorable conditions for getting the highest values of *ДС* indicators

№ items	Added value (*ДС*) indicators	The optimum model of turnover assets management	The optimum ranges	
			π_1	π_2
1	$\frac{ДС}{A}$	$У_1$, $У_2$	0,45-0,7	0,4-0,7
2	$\frac{ДС}{C}$	$К_1$, $У_2$	0,45-0,7	0,1-0,4
3	$\frac{ДС}{N_{тр} \cdot B_р}$	$К_1$, $А_2$	0,2-0,45	0,1-0,4
4		The best values for π_1 and π_2	0,45-0,7	0,1-0,4

After the values of control actions p_1 are p_2 found, it is advisable to specify the forecast of added value (*ДС*) indicators with regard to the market environment. For this sake the model types (1)-(3) were completed with profitability indicators. The following correlations were found:

the balance currency and p_2 - the coefficient, inverse to total liquidity indicator, which defines the sufficient provision of an enterprise with long-term funding sources.

A method of finding the optimum area of coefficient values p_1 and p_2 was proposed,

$$\frac{ДС}{A} = 0{,}0809\pi_1 + 0{,}00948\pi_2 + 0{,}698Rk_2 - 0{,}7289\pi_1 Rk_2 - 0{,}0723\pi_2 Rk_2, \quad (5)$$

$$t_1 = 3{,}62;\ t_2 = 1{,}99;\ t_3 = 5{,}06;\ t_4 = -2{,}86;\ t_4 = -2{,}49;\ R_{множ} = 0{,}991;$$

$$\frac{ДС}{C} = 1{,}340\pi_1 + 0{,}0306\pi_2 - 2{,}501\pi_2^2 + 4{,}530\pi_1 Efk_2 - 0{,}141\pi_2 Efk_2, \quad (6)$$

$$t_1 = 5{,}08;\ t_2 = 1{,}81;\ t_3 = -4{,}27;\ t_4 = 14{,}79;\ \ t_5 = -2{,}61;\ R_{множ} = 0{,}994;$$

$$\frac{ДС}{N_{тр} \cdot Bp} = 0{,}001836\pi_2 + 0{,}00917\pi_1^2 + 0{,}0447Efk_2 + 0{,}0352\,Efk_2^{\,2} \quad (7)$$

$$t_1 = 4{,}28;\ t_2 = 2{,}04;\ t_3 = 12{,}60;\ t_4 = 4{,}78;\ R_{множ} = 0{,}981.$$

Here only one indicator of the previously used coefficients is employed $Efk_2 = \frac{П_{чист}}{B_р^{нетто}}$ - sales profitability.

The result comparison of *ДС* indicator forecast and models 1 and 5; 2 and 6; 3 and 7 is shown in table 1. The represented data show that after introducing the profitability indicators to the model for considering the market environment, the average square errors of the *ДС* indicators in view reduce 2,3-4 times within the said models.

Thus, the coefficient method was specified for managing the added value indicators by introducing the direct control over those indicators for providing consistent enterprise growth.

For direct control of the added value (*ДС*) indicators it is proposed to use the p_1 coefficient - the share of turnover assets regarding

which ensures favorable conditions for high added value (*ДС*) indicators. For this sake the rectangle, corresponding to actual values of π_1^{min}, π_1^{max}, π_2^{min}, π_2^{max} is split into segments that characterize various management models of turnover assets and long-term funding sources: aggressive, moderate and conservative, as well as shortage of assets. Using the statistical treatment of indicators, which refer to a certain group or a specific enterprise, areas are distinguished with rather high values of added value (*ДС*) indicators. An example of finding such an area for a large-scale enterprise was presented.

For the area found two ways of control over added value (*ДС*) indicators were proposed via integral estimation of financial and economic enterprise condition, which is oriented toward these indicators and is calculated as a complete polynominal of the second rank. In the

Fig. 2. **Level lines of integral indicators of financial and economic enterprise condition depending upon the values of financial coefficients $ð_1$ and $ð_2$**

first case a nonlinear programming problem is suggested for solving; in this problem the target function is a stated estimation, and the restrictions are - the inequalities for p_1 and p_2, in which the left and the right limits comply with values of these parameters at the end of each quarter, reduced and increased by a small quantity.

In the second case it is proposed to identify the p_1 quantity according to the demanded volume of turnover assets. Then, using the contour curve of integral estimation $R_j = f(\pi_1, \pi_2)$, the calculated p_1 value and the set level of R_j the p_2 coefficient is calculated.

It is proposed to close the procedure with a forecast of added value (*ДС*) indicators based on the calculated values of p_1 and p_2, and on one of the profitability indicators (sales or assets profitability), which depend significantly upon the market environment.

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