INNOVATIVE APPROACH TO ENTERPRISE FINANCIAL CONDITION MANAGEMENT BY A DYNAMIC MODEL DEVELOPMENT

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Abstract. The key parameters of an economic entity financial condition innovative management are the indicators of the following units: profitability, capital structure, market value, liquidity and business activity. In modern conditions it is necessary to develop an optimal system of financial characteristics, which allows to identify the most problematic aspects of an enterprise activity. This is possible by setting a benchmark for an enterprise dynamics development, which makes it possible to identify those aspects of management that are the most problematic ones. In accordance with the presented algorithm for a dynamic model design to manage the financial condition of an enterprise, an actual tempo dynamics of indicator system is developed, on the basis of which the ordering graph of the financial performance of an enterprise is developed, which makes it possible to diagnose the emerging problem situation. Modeling allows to direct the priority efforts at the most problematic aspects of financial activity correction in order to increase efficiency and effectiveness

Keywords: innovative approach, financial characteristics, reference dynamics, dynamic model.

1 Introduction

A generally accepted approach of an enterprise financial management involves the focusing on some decisive parameter. However, this approach is not justified enough in the innovative conditions of business development, therefore it is necessary to form a system of financial characteristics. The theory and practice has a wide range of indicators to assess financial and economic activity, but they do not allow to identify problem areas and develop the measures to improve the financial position of enterprise, therefore, in order to manage finances effectively in modern conditions of innovative development of an enterprise, it is necessary to use the most informative methods of analysis.

The following domestic scientists made a significant contribution to the study of methodological approaches for the assessment and the management of an enterprise financial condition: Savitskaya G.V. [1] and Plaskova N.S. [2]. The assessment of business financial state was reflected in the scientific works by V.I. Makarieva [3]. The methods and the indicators of liquidity and solvency are analyzed in the works by N.S. Plaskova. [2]. A special attention should be paid to the development of the methods and the models in the field of anti-crisis management, which are currently reflected in the works by N.P. Lubushin [4]. A significant contribution to the studies in the field of financial and economic analysis was made by foreign scientists: Bragg S. M. [5], Brauer M. F. [6], Carlin., T. P., Mc Meen, A.R. [7], Lippman S. [8], Protus, W. S. [9], Wilcox, J.W. [10] and others. The identification of the most problematic indicators of an enterprise development is possible by setting the standard (reference) dynamics of an enterprise development. The reference dynamics of development makes it possible to identify those aspects of management that require the most careful attention, since they are problematic ones.

2 Study methods

The methods of induction and deduction were used as the methods of scientific study. When they study the actual material, they used the methods of economic-statistical processing and generalization, as well as the coefficient method. The main provisions of the study are presented in the form of analytical tables, algorithms and drawings.

3 Main part

In the financial management of a firm, various criteria are considered as the main guidelines, which in the theory and the practice of financial management are divided into several groups: liquidity indicators, business activity indicators, capital structure indicators, profitability indicators and market value indicators [1, 4]. As a rule, the main emphasis is on the maximization of some decisive parameter, from the point of view of the highest financial management, for example, profits, revenues, assets, etc. [2, 3]. However, the use of this approach in practice has a number of constraints. Putting the task of profit maximization for a company, the way of its achievement remains unclear often. The traditional set of indicators for an enterprise financial condition evaluation is presented in Table 1.

Table 1 - The system of indicators for an enterprise financial condition estimation

Coefficients	Designations	Calculation algorithm	Recommended dynamics
Liquidity indicators			
Coefficient of coverage	Cr	Current assets (CA) / Current liabilities (CL)	Growth

Coefficient of liquidity	Lr	(CA - Inventories (I) and Work in Progress (GIP)) / CL	Growth
Absolute liquidity ratio	ALR	Cash (MA) + Short-term investments (STI) / CL	Growth
Indicators of business activity			
Asset turnover ratio	Itr	Cost of sales (C) / I	Growth
Accounts receivable turnover ratio	Artr	Proceeds from sales of products (R) / Receivables (AR)	Growth
Accounts payable turnover ratio	Aptr	R / Accounts Payable (AP)	Growth
Total asset turnover ratio	T_{ATR}	R / Total assets (TA)	
Own capital turnover ratio	T_{REC}	R / Equity (E)	Growth
Financial sustainability indicators			
Coefficient of long-term liability security	R_{LTL}	Long-term liabilities (LTL) / (CL+LTL)	Decline
Financial risk ratio	F_{RR}	(CL+LTL) / E	Decline
Debt ratio	D_R	(CL+LTL) / TA	Decline
Interest coverage ratio	I_{CR}	Income before interest and taxes / Total interest payments	Growth
Performance Indicators			
Profitability of sales, %	Ps	Gross profit (GP) / R	Growth
Profitability of capital, %	Pc	GP / Sum of capital	Growth
Return on equity, %	ROE	GP / E	Growth

Let's consider the algorithm to identify the most problematic indicators based on the development of an enterprise reference development dynamics (Table 2).

The solution of this task by setting the benchmark dynamics of an enterprise development is the condition that the characteristics with a similar economic meaning are used. Hence the indicators can be arranged relative to each other through their tempo characteristics.

Table 2 - The algorithm for benchmark dynamics of an enterprise development

Stages	**Stage description**
Stage 1. Setting of indicator dynamics benchmark	The financial indicators selected for analysis are divided into the groups with a similar economic meaning, to order their tempo characteristics relative to each other and to set the reference dynamics
Stage 2. The development of a standard (reference) ordering graph	Based on the established relationships between the indicators of individual groups, the preferred dynamics of change rates is determined for the analyzed indicators relative to each other
Stage 3. The development of indicator standard ordering matrix	A matrix is developed on the basis of financial indicator graph ordering, based on their condition: the correspondence to established relationships (+1); non-correspondence (-1); the absence of relations (0)
Stage 4. Determination of indicator change actual rates	According to the relevant groups of analyzed indicators, the actual dynamics is calculated on the basis of the financial statements
Stage 5. The development of indicator actual ordering matrix	Based on the actual tempo dynamics of the indicators, the matrix of indicator actual ordering is developed, based on the rule presented in the third stage
Stage 6. The determination of financial indicator problematic level	Using the normative ranks of indicators and their actual values, the deviation modules are calculated, on the basis of which the degree of financial indicator problem level is determined

Stage 7. The identification of bottlenecks in the financial condition of an enterprise	Using the value of indicator deviation degree for all branches of the graph, an average value of deviation degree is determined for all analyzed indicators, on the basis of which the urgency graph is developed

Let's introduce the designations of the indicator tempo:

$$h(a) = \frac{a_2}{a_1}, \qquad (1)$$

where a is the indicator of an enterprise economic activity;
h(a) is the rate of the indicator a;
a_2 - the value of the indicator a in the analyzed period;
a_1 - the value of the indicator a in the previous period.

These arguments can be represented in the form of a cobweb-like graph with the center in 1.

This technique was described by the associate professor Tonkih A.S. [12] on a separate group of indicators. Further consideration of the methodology application scope and its approbation were carried out by Grankin V.F., I.N. Marchenkova and Udovikova A.A. [12], where the dynamic model of anti-crisis management by an enterprise financial condition was built on the example of the machine-building industry.

This model can be widely used in the financial management of enterprises regardless of their industry characteristics. An alternative approach makes it possible to implement a number of preventive measures for the crisis development of an enterprise, which essentially distinguishes it from the traditional methods of analysis. [13,14].

Figure 1 shows the graph of mining enterprise financial performance ordering.

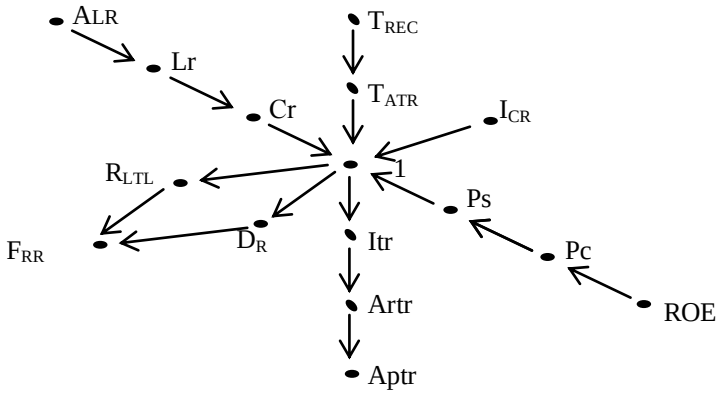

Figure 1 - The ordering graph of an enterprise financial performance

The management of an enterprise should make efforts to correct an existing situation and improve the efficiency of an enterprise management [3]. To do this, it is necessary to determine which areas of an analyzed object activity are the most problematic and require priority efforts. It is necessary to diagnose an appeared problem situation in detail. To do this, let's return to the ordering graph of an enterprise financial performance, which contains 12 branches.

Let's write them out:

1) ROE → Pc → Ps → 1 → Itr → Artr → Aptr;
2) ROE → Pc → Ps → 1 → R_{LTL} → F_{RR};
3) ROE → Pc → Ps → 1 → D_R → F_{RR};
4) I_{CR} → 1 → Itr → Artr → Aptr;
5) I_{CR} → 1 → R_{LTL} → F_{RR};
6) I_{CR} → 1 → D_R → F_{RR};
7) T_{REC} → T_{ATR} → 1 → Itr → Artr → Aptr;
8) T_{REC} → T_{ATR} → 1 → R_{LTL} → F_{RR};
9) T_{REC} → T_{ATR} → 1 → D_R → F_{RR};
10) ALR → Lr → Cr → 1 → Itr → Artr → Aptr;
11) ALR → Lr → Cr → 1 → R_{LTL} → F_{RR};
12) ALR → Lr → Cr → 1 → D_R → F_{RR};

The following ratios of normative growth rates correspond to these orders:

1) h(ROE) > h(Pc) > h(Ps) >1> h(Aptr) > h(Artr) > h(Itr);
2) h(ROE) > h(Pc) > h(Ps) >1> h(R_{LTL}) > h(F_{RR});
3) h(ROE) > h(Pc) > h(Ps) >1> h(D_R) > h(F_{RR});
4) h(I_{CR}) >1> h(Aptr) > h(Artr) > h(Itr);

5) $h(I_{CR}) >1> h(R_{LTL}) > h(F_{RR})$;
6) $h(I_{CR}) >1> h(D_R) > h(F_{RR})$;
7) $h(T_{REC}) > h(T_{ATR}) >1> h(Aptr) > h(Artr) > h(Itr)$;
8) $h(T_{REC}) > h(T_{ATR}) >1> h(R_{LTL}) > h(F_{RR})$;
9) $h(T_{REC}) > h(T_{ATR}) >1> h(D_R) > h(F_{RR})$;
10) $h(ALR) > h(Lr) > h(Cr) >1> h(Aptr) > h(Artr) > h(Itr)$;
11) $h(ALR) > h(Lr) > h(Cr) >1> h(R_{LTL}) > h(F_{RR})$;
12) $h(ALR) > h(Lr) > h(Cr) >1> h(D_R) > h(F_{RR})$;

Further, the problematicity degree of the indicators is determined according to individual branches of the graph.

Then the deviations of the ranks are calculated by the following rule:

$$b^k_i = R_{ie} - R_{if}, \quad (2)$$

where R_{ie} is the rank of the i-th indicator in the normative order;

R_{if} is the rank of the i-th indicator in the actual order.

Then the absolute value of deviations is obtained, which indicates the degree of problematicity, and the attention that should be paid to this indicator by management. The indicators with the greatest absolute deviation are the most "narrow" place in the financial management of an enterprise.

To identify the problem indicators among their entire population, let's calculate the average value of the deviation modules of each indicator for all branches of the ordering graph according to the following rule:

$$b_i^{av} = \sum_{K=1}^{N} \frac{\left| b_i^K \right|}{m} \quad (3)$$

where т is the number of the reference order graph branches into which the indicator i is included;

N = 1 - 12 – graph branch number.

The average value is calculated from those considerations that different indicators can be the elements of an unequal number of ordering branches, and if you do not consider the average, the picture may be distorted.

Thus, we obtain deviations and corresponding degrees of problematicity for all analyzed indicators.

At the beginning of the graph those aspects of an enterprise management are reflected, which require the closest attention. As you move toward the end of the graph, the tension in the indicators falls, and they do not require any major changes in the activity that is appropriate for them.

As the part of the dynamic model of an enterprise financial management implementation, first of all, it is necessary to evaluate the actual dynamics of basic performance indicator system for mining enterprises (table 3).

In accordance with the algorithm, the algorithm identifying the most problematic indicators based on the benchmark dynamics development of an enterprise let's form an actual tempo dynamics of the indicators and will present it in Table 4.

Table 3 - The system of indicators to assess the financial condition of a group of mining enterprises

Coefficients	Designation	Periods		Recommended dynamics	By enterprise
		2015	2016		
Liquidity indicators					
Coefficient of coverage	Cr	0.97097	5.0590		
Coefficient of liquidity	Lr	0.86893	4.53023		
Absolute liquidity ratio	ALR	0.39588	3.32975		
Indicators of business activity					
Asset turnover ratio	Itr	26.0675	8.5642	Growth	Decline
Accounts receivable turnover ratio	Artr	8.6478	3.0886	Growth	Growth
Accounts payable turnover ratio	Aptr	5.0769	5.4687	Growth	Growth
Total asset turnover ratio	T_{ATR}	1.6641	1.5337	Growth	Decline
Own capital turnover ratio	T_{REC}	3.4388	1.7516	Growth	Decline
Financial sustainability indicators					

Coefficient of long-term liability security	R_{LTL}	0.7083	0.0052	Decline	Decline
Financial risk ratio	F_{RR}	10.6657	0.1422	Decline	Decline
Debt ratio	D_R	0.51607	0.12446	Decline	Decline
Interest coverage ratio	I_{CR}	301.843	3.25241	Growth	Decline
Performance Indicators					
Profitability of sales, %	Ps	4.6414	5.5866	Growth	Growth
Profitability of capital, %	Pc	7.7237	8.5.2512	Growth	Growth
Return on equity, %	ROE	15.9608	97.3702	Growth	Growth

Then, it is necessary to diagnose a problem. To do this, let's return to the ordering graph of an enterprise financial performance (Figure 1).

At the next stage, they determine the degree of indicator problematicity for individual branches of the graph. The highest (leftmost) member of the order 1 has the rank of 1. The remaining elements are numbered in ascending order. Then we put the ranks of the actual order for the ordering elements 1 (the column "Actual Ranks" of Table 4).

Table 4 - The rate of financial position indicator change for a group of mining enterprises during the period of 2015-2016.

Coefficients	Designation	Actual rates	Preferred rates
Liquidity indicators			
Coefficient of coverage	Cr	5.222523	>1
Coefficient of liquidity	Lr	5.213549	>1
Absolute liquidity ratio	A_{LR}	8.411107	>1
Indicators of business activity			
Asset turnover ratio	Itr	0.3285	>1
Accounts receivable turnover ratio	Artr	1.5135	>1
Accounts payable turnover ratio	Aptr	1.0772	>1
Total asset turnover ratio	T_{ATR}	0.9216	>1
Own capital turnover ratio	T_{REC}	0.5094	>1
Financial sustainability indicators			
Coefficient of long-term liability security	R_{LTL}	0.0073	<1
Financial risk ratio	F_{RR}	0.0133	<1
Debt ratio	D_R	0.241174	<1
Interest coverage ratio	I_{CR}	0.010775	>1
Performance Indicators			
Profitability of sales	Ps	11.9763	>1
Profitability of capital	Pc	11.0376	>1

Return on equity	ROE	6.1006	>1

The rate of the indicator "Profitability of sales" has the largest value in actual rank ordering: h(Ps) = 11.9763. He is credited with the greatest rank - the first rank. And so on (table 5).

Table 5 - The ranking of mining enterprise indicator problematicity by the example of the branch 1 of the graph during 2015-2016.

Coefficients	Designation	Normative ranks	Actual rates	Actual ranks	Rank deviation	Deviation module	Problematicity degree
Profitability of equity capital	ROE	1	6.1006	3	-2	2	1
Profitability of capital	Pc	2	11.0376	2	0	0	0
Profitability of sales	Ps	3	11.9763	1	2	2	1
Caliber	Калибр	4	1.0	6			
Inventory turnover ratio	Itr	5	0.3285	7	2	2	1
Accounts receivable turnover ratio	Artr	6	1.5135	4	2	2	1
Accounts payable turnover ratio	Aptr	7	1.0772	5	2	2	1

Then the deviations of the ranks are calculated. Further, we obtain the following deviations and corresponding degrees of problematicity for all analyzed indicators (Table 6).

Table 6 - Identification of the most problematic indicators for a group of mining enterprises activity over all branches of the ordering graph during the period of 2015-2016

Coefficients	Designation	The sum of deviation modules	Average deviation	Problematicity degree
Coefficient of coverage	Cr	4	1.5	4
Coefficient of liquidity	Lr	4	1.5	4
Absolute liquidity ratio	A_{LR}	0	0.0	0
Asset turnover ratio	Itr	7	1.75	2
Accounts receivable turnover ratio	Artr	6	1.5	4
Accounts payable turnover ratio	Aptr	6	1.5	4
Total asset turnover ratio	T_{ATR}	3	1.0	5
Own capital turnover ratio	T_{REC}	5	1.667	3
Coefficient of long-term liability security	R_{LTL}	3	0.75	6
Financial risk ratio	F_{RR}	5	0.625	7
Debt ratio	D_R	1	0.250	8
Interest coverage ratio	I_{CR}	6	2.000	1
Profitability of sales	Ps	6	2.000	1
Profitability of capital	Pc	0	0	0
Return on equity	ROE	5	1.667	3

In the column "The sum of deviation modules", the sum of deviation modules for each indicator is calculated in all branches of the reference ordering. The "Average Deviation" column is calculated by rule. "Degree of problem" indicates the degree of urgency in the state of affairs correction.

So, the PS and I_{CR} index have the greatest average deviation of 2, and therefore the highest degree of problematicity. Further, the problem indicator is Itr, the degree of problematicity is 1.75, the next degree of T_{REC} and ROE indicator value problematicity is 1.667, etc.

Thus, we have the graph of urgency to eliminate the "bottlenecks" of a group of mining enterprises - Figure 2.

At the beginning of the graph those aspects of an enterprise management are reflected, which require the closest attention. As you move toward the end of the graph, the tension in the indicators falls, and they do not require any major changes in the activity which is appropriate for them.

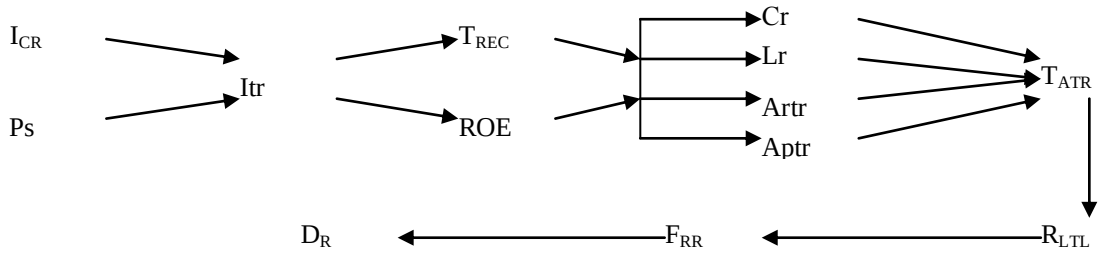

Figure 2 - The graph of the urgency in bottlenecks elimination within the management by financial condition in the group of mining enterprises

According to the obtained results, the most problematic indicators are I_{CR} and Ps, (the degree of problematicity 1), as there is a significant reduction in the ability of the company to cover current interest payments based on received revenues.

Thus, a significant slowdown in the turnover of work in progress and other material current assets is, in its turn, the reason for an insufficient growth of sale profitability. On the other hand, the decrease of material current asset use intensity leads to an insufficient acceleration of receivables turnover (Artr) and, thus, does not allow to accelerate the calculations of the group of enterprises of the mining complex on current liabilities (Aptr). These indicators have the 4th problematicity degree.

The indicators T_{ATR}, R_{LTL}, F_{RR}, D_R, which have, respectively, the degree of problematicity 5,6,7,8 are less problematic. This is due to the fact that the company at this point in time has a fairly optimal structure of the balance sheet and the intensity of aggregate asset use is quite high.

It should also be noted that the urgency graph does not contain the A_{LR} indicator, since the degree of its problematicity is equal to 0, therefore, the assets of the group of mining enterprises are sufficiently provided with absolutely liquid funds to cover current liabilities. The problem indicators do not have Pc, since the degree of its problematicity is also equal to 0, therefore, there is a fairly high degree of efficiency for the total amount of capital use.

4 Summary

The results of the research showed that there are quite positive characteristics of financial and economic performance of the group of enterprises of the mining complex in the analyzed period. However, in order to improve the financial condition of the group of enterprises of the mining complex, it is necessary to reduce the amount of reserves and funds in the calculations, which will accelerate the turnover of both mobile assets and all assets in general; due to the expansion of product sales markets, it is necessary to achieve the growth of sale profitability, which will allow to obtain higher efficiency indicators, since the return on capital is directly proportional to the ratio of capital turnover and profitability of sales. Thus, the described dynamic model of financial management is a workable element in the enterprise management system.

5 **Conclusions**

For the stability of a modern enterprise development, it is not enough to conduct complex analytical procedures of various aspects of financial and economic activity that allow us to discover the bottlenecks and positive moments, and also to reveal the reserves of growth of the main economic indicators. The most important task of financial state management is the ability to predict and prevent crisis situations. The adaptation and the implementation of the dynamic model of an enterprise financial management in the conditions of economic crisis overcoming on the example of three branches of the economy made it possible to identify specific problem areas of financial and economic activity. Based on the obtained modeling results, enterprise management will be able to make efforts to correct the current situation and improve the efficiency of an enterprise management. The presented model is a set of providing elements and system forming processes of anti-crisis financial management aimed at a stated general goal achievement. The elements that ensure the continuity and the effectiveness of anti-crisis financial management are the strategies of flexibility, target orientation, innovation and competence. Thus, theoretical provisions and practical developments allow to achieve a more efficient use of financial resources, and ensure the achievement of the objectives of an enterprise financial condition management in the conditions of financial crisis overcoming.

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