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Abstract

The diversification and integration of economic relations between different market participants requires improving the quality of prospective analysis. Scenario analysis is a most effective tool to formulate options for the future economic development of an enterprise and financial insolvency prevention. The study of the future state of the enterprise based on economic diagnostics makes it possible to organize a system of managerial actions aimed at reducing the consequences of unfavorable situations and preventing its possible bankruptcy. In this context, the paper discusses the methodological aspects of using scenario forecasting based on economic diagnostics to optimize financial performance and prevent the insolvency of an enterprise.

The developed approach to scenario analysis that considers the technological features of the enterprise enables to elaborate predictive scenarios for making managerial decisions that reduce the risk of bankruptcy. The results obtained during the research can be applied in practical management to analyze and develop the future growth directions of the enterprise.

Keywords: scenario analysis, economic diagnosis, forecasting, bankruptcy, enterprise.

1 Introduction

Current economic environment affects the financial stability of the enterprise, which creates a threat and risk of possible bankruptcy, regardless of the type and scale of operations. Many key problems of bankruptcy are solved through a set of indicators to determine the deliberate bankruptcy and by improving methods for predicting bankruptcy considering all risk factors [1, 2].

Scenario forecasting methods play an essential role in determining a successful long-term strategy for the enterprise development and allow management to anticipate and eliminate the risks of bankruptcy [3, 4]. Scenario analysis should be seen as a management method that includes generally accepted methodological techniques and basic approaches to the economic diagnostics of enterprise insolvency [5, 6].

In this regard, it is necessary to pay attention to the implementation of scenario analysis to detect and eliminate bankruptcy risks based on the actual financial state of the enterprise [7, 8]. Scenario analysis should be based on diagnostics, control and supervision to prevent bankruptcy [9, 10]. Insufficient methodological support for scenario analysis to prevent bankruptcy, misunderstanding of the importance of predictive and analytical decisions to identify bankruptcy predetermine the relevance and significance of scientific and practical study of this issue.

2 Methods

Scenario analysis includes different stages: economic diagnostics of the organization's solvency, analysis of the enterprise performance and its financial standing. All these areas determine the key factors required to build scenario-forecasting models. When constructing a scenario forecast, it is necessary to build at least three scenarios that reflect the change in the economic result of the enterprise: optimistic, pessimistic and realistic.

Economic phenomena are inertial and current trends largely continue in future periods. However, it is impossible to build an infinite forecast based on current data. Therefore, the best forecast should be selected as a hypothesis about the form of dependence between the main indicator underlying the construction of a forecast and its change over time.

When constructing a scenario forecast depending on the time factor, one should take into account the characteristic feature of the enterprise's activities. For the oil company under study, this is a seasonality factor, as vigorous activities of the enterprise are associated with geological exploration [11, 12, 13]. The annual production cycle of the oil company is conducted according to the following principle: preparatory work and careful planning of activities are done in late spring, summer and early autumn, and the operational management of the production cycle falls on the period from October to April. Such a scheme of activity causes difficulties in management, since most projects with this approach are investment ones and require investments before the start of the active phase of work (6-8 months), while the enterprise receives payment for the work already performed at the final stages of project. Thus, the oil company incurs high costs during certain periods of the season and generates the most income only at certain periods of time as well.

Consequently, the economic performance of the company for different periods should be forecast taking into account the factor of seasonality in order to achieve comparability. The main forecast values of the oil company are based on regression models using a software solution. Data from 2016 to 2020 were used to create a predictive model of the best and worst performance of the company, to present the general financial state in order to prevent the risk of bankruptcy.

3 Research Methodology

We will consider scenarios for the development of an oil company based on solvency indicators, since they enable to assess the financial standing. The calculation consists of a grouping of assets by the degree of liquidity and a separate grouping of liabilities by maturity. Let us represent the specified grouping according to the data of the oil company in Table 1.

Table 1
Grouping of assets and liabilities of the oil company by liquidity (2020)

Assets			Amount	Liabilities			Amount
Asset	Elements	Function	thousand rubles	Liability	Elements	Function	thousand rubles
A1	Cash and cash equivalents	Highly liquid assets	198 169 189	L1	Accounts payable	The most urgent liabilities	241 411 775
A2	Short-term accounts receivable	Quick selling assets	341 991 572	L2	Current liabilities and credits	Medium-term liabilities	654 728 312
A3	long-term accounts receivable, inventory	Slowly sold assets	3 371 686	L3	Long-term liabilities	Long-term liabilities	278 510 667
A4	Fixed assets	Hard-to-sell assets	1 626 681 708	L4	Owner capital	Constant liabilities	995 563 401

According to the data in 2020, the following inequalities are established: $A1 \leq L1$, $A2 \leq L2$, $A3 \leq L3$, $A4 \geq L4$. This indicates that the company does not have sufficient funds to cover the most urgent obligations, loans and borrowings. Failure to meet the minimum criterion of financial stability is associated with the lack of working capital [14]. Despite this, for a more meaningful assessment of the company's solvency, it is necessary to calculate the solvency ratios (Table 2).

Table 2
Calculation of the main solvency ratios of the oil company (2020)

Ratio	Ratio calculation formula	Standard value	Actual value
Cash ratio	$CR = \frac{C+SFI}{CL}$;	$X \geq 0.2$	0.22

	where: C – cash and cash equivalents; SFI – short-term financial investments; CL – current liabilities [15]		
Quick ratio	$QR = \frac{C+SFI+SR}{CL}$; where: C – cash and cash equivalents; SFI – short-term financial investments; SR – short-term receivables; CL – current liabilities [15]	$X \geq 0.8$	0.61
Current ratio	$CR = \frac{CA}{CL}$; where: CA – current assets; CL – current liabilities [15]	$1 \leq X \leq 2$	0.61

The results obtained show that the oil company's solvency indicators do not fully comply with the normative values. Although the company has sufficient funds to pay off accounts payable, their share is only 61%. Let us determine the general liquidity indicator according to the following formula [16]:

$$LR = \frac{A1+C1 \times A2+C2 \times A3}{L1+C1 \times L2+C2 \times L3} \quad (1)$$

where: C1, C2 - weighting coefficients;

A1 – highly liquid assets,

A2 - quick selling assets,

A3 – slowly sold assets;

L1 - the most urgent liabilities;

L2 - short-term liabilities;

L3 - long-term liabilities.

$$LR = \frac{198169189+0,5 \times 341991572+0,3 \times 3371686}{241411775+0,5 \times 654728312+0,3 \times 278510667} = 0.57$$

The total liquidity ratio reflects the value of the oil company's liquid assets, which correlate only by 57% with the value of payment liabilities.

Summarizing the results, we can state that the company does not have the necessary amount of its own funds to pay off the debt. To increase the solvency and reduce the risk of bankruptcy, it is necessary to carry out a long-term forecast assessment of the enterprise.

As a rule, when making a forecast, the main attention is paid to the expenditures, and the revenues are not sufficiently detailed and justified. Therefore, the correct choice of the method to build a company's forecast and consideration of factors reflecting the specifics of the business, enable to make it more accurate.

4 Summary

Let us determine the forecast values of the key indicators of the oil company for five years based on regression models using applied software (Table 3).

Table 3
The set of key performance indicators of the oil company for 2016-2020

Indicator, thousand rubles	2016	2017	2018	2019	2020
Sales proceeds	242 880 237	259 197 748	316 540 706	223 419 850	264 355 247
Cost of sales	(17 799 989)	(21 896 003)	(18 041 817)	(19 364 531)	(20 625 229)
Selling and marketing expense	1 494 273	1 607 869	3 478 855	1 899 327	1 435 908
Administrative expenses	20 684 140	24 161 685	22 723 125	44 409 672	30 914 170
Interest receivable	43 401 283	66 565 274	67 435 282	65 725 955	56 232 201
Interest payable	19 173 951	42 937 268	51 353 028	36 834 167	35 526 528
Other revenues	174 449 269	99 026 992	4 370 750	9 811 436	68 649 023

Other expenses	3 075 784	10 527 867	108 511 599	41 593 653	13 815 751
Current income tax	(29 570 900)	(16 099 523)	24 620 694	(12 302 891)	(6 674 029)
Deferred tax liabilities	30 058	(47 452)	(76 116)	(43 956)	(45 445)
Deferred tax assets	56 438	(46 569)	39 256	2 713 694	(2 152 036)
Other	(317 884)	34 976	168 522	(97 832)	22 635
Reallocation of income tax within the consolidated group of taxpayers	3 180 741	1 876 603	(16 399 198)	401 213	251 683
Net income (loss)	371 881 105	302 294 681	182 566 224	204 363 706	219 484 106

Let us consider forecasting the income of an oil company through sales proceeds indicator, since the inflow of funds has a direct impact on business activity.

The predicted value of sales proceeds can be determined based on the linear regression equation [17]:

$$Y = a + b * x, \quad (2)$$

where: Y is the forecast value of sales proceeds;

a, b – regression coefficients;

x - the independent variable (predictor) or the ordinal number of the period.

Using the functions of the application software, the value is set for coefficients $b = 717\,212$, $a = 259\,124\,121$ of the linear trend $Y = a + b * x$. Substituting these values of the coefficients into the equation, the value of the sales proceeds for 2021 is calculated: $Y = 263\,430\,394$ thousand rubles.

However, this indicator does not consider the seasonality factor. This factor is necessary to achieve comparability when making a forecast that is close to the real predicted values of the enterprise. To do this, according to the company's data, we will determine the values of price fluctuations, which characterize changes in both income and expenses. This influence should be determined for each period of the season, which we define as the variation coefficient according to the formula:

$$\text{Variation coefficient} = \frac{\text{Seasonal value of the predicted indicator}}{\text{Average seasonal value of the predicted indicator for the analyzed period}} \quad (3)$$

Calculation of variation coefficient for sales proceeds of the oil company for 2020 is summarized in Table 4.

Table 4

Values of the variation coefficient for sales proceeds of the oil company for 2020

Season	Variation coefficient
December-February	0.5937
March-May	1.2274
June - August	1.4305
September November	0.7956
2020	1.0118

The values of the variation coefficient of the oil company for the previous periods from 2016 to 2019 in terms of sales proceeds were calculated in a similar way (Table 5).

Table 5

Values of the variation coefficient in sales proceeds of the oil company for 2016-2020

Period	Variation coefficient
2016	0.9296
2017	0.9920
2018	1.2115
2019	0.8551
2020	1.0118

The values of the variation coefficient make it possible to take into account the technological features of the oil company's activities in order to make a forecast for one of the financial indicators - "sales proceeds".

Other financial indicators are calculated in the same way.

For further forecasting based on the calculated variation coefficients, we select the variation index:

$$Ii = \frac{Yi}{\bar{Y}} * 100\% \quad (4)$$

where: Yi is the annual value of the predicted indicator;

$\bar{Y}$ is the average value of the predicted indicator for a set of periods

Taking into account the variation index, the following equation was compiled to build a realistic forecast:

$$\hat{Y} = (a + b * x) * Ii : 100\% \quad (5)$$

To simplify the calculations, the results are determined using applied software, according to which the forecast value of sales proceeds for 2021 is 226 175 061 thousand rubles.

Similarly, realistic forecast values of other financial indicators reflecting the financial position of the oil company are formed (Table 6).

We have to note that in addition to the main forecast, it is necessary to form acceptable upper and lower thresholds, often called "optimistic forecast" and "pessimistic forecast" [18]. This forecast makes it possible to most flexibly plan the tactics of the enterprise for future periods.

In order to make such forecasts, it is necessary to calculate the permissible deviation from the predicted values. The standard deviation is calculated using the following formula [15]:

$$S = \sqrt{\frac{\sum(x - \bar{x})^2}{(n-1)}} \quad (6)$$

where: x is the sample value of the forecast indicator;

$\bar{x}$ - the average value of the forecast indicator;

n - the sample size.

Based on this formula and on a confidence interval of 95%, using the application software, the standard deviation of the predicted indicator from the value obtained is calculated that is received when making a realistic forecast. In our case, for sales proceeds it is $S = 75\,518\,635$ thousand rubles. Further, formulas are drawn up to calculate the pessimistic and optimistic forecast:

$$Y_{\text{pessim.}} = \hat{Y} - S \quad (7)$$

$$Y_{\text{optim.}} = \hat{Y} + S \quad (8)$$

where: $Y_{\text{pessim.}}$ – pessimistic value of the forecast indicator;

$\hat{Y}$ – realistic value of the forecast indicator;

$Y_{\text{optim.}}$ – optimistic value of the forecast indicator;

S – the deviation of the forecast indicator from the realistic forecast.

According to one of the financial indicators of the oil company - sales proceeds, we calculate a pessimistic forecast for 2021: $Y_{\text{pessim. sales proceeds}} = 226\,175\,061 - 75\,518\,635 = 150\,656\,426$ thous.rub.

It follows that the value of the optimistic forecast for sales proceeds for 2021 is 301 693 695 thousand rubles. ($Y_{\text{optim.}} = \hat{Y} + S = 226\,175\,061 + 75\,518\,635 = 301\,693\,696$ thous.rub.)

A similar algorithm is used to calculate the rest of the forecast indicators. Table 6 shows the forecast values of the main financial indicators of the oil company for 2021 for three types of forecast: realistic, optimistic and pessimistic.

Table 6
Predicted values of financial indicators of the oil company for 2021

Indicators, thousand rubles	2020	Realistic forecast for 2021	Pessimistic forecast for 2021	Optimistic forecast for 2021
Sales proceeds	264 355 247	226 175 061	150 656 426	301 693 696
Cost of sales	(2 0625 229)	(20 364 455)	(23 753 731)	(16 975 179)
Selling and marketing expense	(1 435 908)	(1 678 449)	(3 519 319)	162 422
Administrative expenses	(30914170)	(50 216 863)	(64 969 553)	(35 464 173)
Interest receivable	56 232 201	63 588 000	41 021 336	86 154 665
Interest payable	(35 526 528)	(41 016 456)	(67 195 215)	(14 837 698)
Other revenues	68 649 023	4 539 388	(111 183 002)	120 261 778

Other expenses	(13 815 751)	(33 401 837)	(124 717 110)	57 913 437
Current income tax	(6 674 029)	(813 432)	(41 517 260)	39 890 396
Change in deferred tax liabilities	(45 445)	(68 883)	(144 542)	6 775
Change in deferred tax assets	(2 152 036)	2 045 927	(1 278 713)	5 370 567
Other	22 635	54 997	(338 243)	448 236
Reallocation of income tax within the consolidated group of taxpayers	251 683	121 112	(16 788 192)	17 030 415
Net income (loss)	219 484 106	148 964 110	(263 727 118)	561 655 336

5 Conclusions

According to the results of the realistic forecast, the oil company's net profit will decline by more than 30% compared to the current period. However, with a change in management tactics, namely, if the enterprise focuses on reducing the costs and increasing cash inflows, this can lead to the results of an optimistic forecast.

If the company reaches an optimistic forecast, the net profit in the next reporting period can increase by more than 2.5 times. However, it should be taken into account that future changes in the operations of the oil company can be located between the optimistic and pessimistic scenarios, and sometimes freely go beyond their values, since the forecast values are based on the assumption that past development trends will continue. Considering this, however, the enterprise should concentrate on the optimal scenario model, which assumes the maximization of the economic benefits of the enterprise and provides minimum risk.

Thus, the implementation of scenario analysis opens up new opportunities to regulate economic processes. Due to scenario forecasting models, enterprise management can see the problems of financial activities, optimize the system and prevent possible bankruptcy. If the company is having trouble, it is important to prevent conditions under which this financial standing deteriorates so much as leads to bankruptcy. Preventing possible bankruptcy is one of the main functions of scenario analysis.

The proposed approach to the preparation of forecast scenarios drives the company to achieve better results. It enables to develop a certain flexibility in making management decisions. The scenario forecast models with possible future values of indicators of economic activity is of great significance for controlling. Therefore, forecasting is an important component of the management function. Scenario generation helps to identify likely problems and constraints of the enterprise; the impact of management decisions on the future of the company; factors and trends of business development in different conditions.

6 Acknowledgements

This paper has been supported by the Kazan Federal University Strategic Academic Leadership Program

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