





Strengthening Financial Stability based on the Factor Forecast of Profitability of the Enterprise

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Abstract: The article presents the materials of theoretical and empirical studies of the influence of factors on such a significant indicator of the activities of enterprises and organizations as profitability. In the theoretical part of the work, the types of factor analysis are considered; the importance and necessity of using correlation and regression analysis in the study of the influence of factors on the profitability of the organization's activities are justified; the conditions and tasks of using this type of analysis are described. In the practical part of the work, the described methodology for analyzing the influence of factors on the profitability indicator was tested on the example of BioVitrum M LLC, which sells medical laboratory and diagnostic equipment. The assessment of the degree of influence of factors on the change in the profitability of the analyzed enterprise was carried out on the basis of data for 2014-2019. For the purposes of evaluation, the method of stochastic modeling, such as correlation and regression analysis, was used. On the basis of the constructed regression model, the forecast level of profitability of the activities of LLC "BioVitrum M" was determined, which was formed under the influence of the growth of equity capital, and contributes to the strengthening of the financial stability of the enterprise.

1 INTRODUCTION


In modern economic conditions, the efficiency of any enterprise is evaluated using various indicators. In turn, the value of the company's performance indicators is formed under the influence of various factors, the totality of which can be divided into objective and subjective, external and internal factors. The final result of the activity, which acts as a generalizing indicator of the effectiveness of the functioning of any organization, is the indicator of profitability.


The study of various groups of factors and the assessment of their impact on the change in the performance indicators and sustainability of the organization, the identification of existing reserves is possible through competent management. In this


regard, the importance and necessity of using correlation and regression analysis in the study of the influence of factors on the profitability of an organization is justified; the conditions and tasks of using this analysis, and the stages of its practical implementation are described (Tarasova, 2019; Shokumova, 2019; Shchepkina, 2019). In the practical part of the work, on the basis of this methodology, the key factor of influence on the profitability indicator of LLC "BioVitrum M" and its financial stability is determined.


2 MATERIALS AND METHODS

Factor analysis is used to analyze profitability and the factors that influence it (Savitskaya, 2014). This

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methodological toolkit allows us to identify the degree of influence of each factor on the overall change in the final result (Kogdenko, 2016).

The type of factor analysis – deterministic or stochastic (Galchina, 2009) - is determined by the nature of the relationship under study. Using this methodological approach involves performing the following actions: determining the factors that affect the performance indicator, grouping these factors and systematizing them, modeling the relationship between the factors and the performance indicator, assessing the degree of influence of each factor on the result, as well as identifying the reserves for growth of the performance result and formulating a management decision on this basis (Ponomarenko, 2014; Voronina, 2018; Zhulina, 2020).

A specific mathematical equation obtained during the analysis and evaluation allows us to measure the role of a single factor in the formation of the final estimated indicator (Voronina, 2015). At the same time, stochastic (regression) modeling serves as a supplement to deterministic factor analysis and is used in cases where the factors cannot be combined in one model, or the complexity of the factors cannot be estimated by a single quantitative indicator. Using correlation and regression analysis, the degree of tightness of the relationship between the sets of

indicators is established and an analytical expression of the stochastic dependence between the studied features is formed (Voronina, 2015; Voronina, 2020).

The practical use of correlation and regression analysis involves the construction of models of this type using ready-made software packages, such as Statistica, MathCad, MatLab, applications in Excel, etc. (Kundakchyan, 2014).

3 RESULTS AND DISCUSSION

Testing of the described method was carried out on the materials of LLC "BioVitrum M", which sells medical laboratory and diagnostic equipment. To assess the degree of influence of factors on the change in the profitability of the activities of LLC "BioVitrum M" for 2014-2019, such a method of stochastic modeling as correlation and regression analysis was used.

For the purpose of the assessment, a list of factors that affect the effective indicator – of the profitability of the organization (Y) was determined, and the coefficients of the pair correlation between the factors were calculated (Fig. 1).

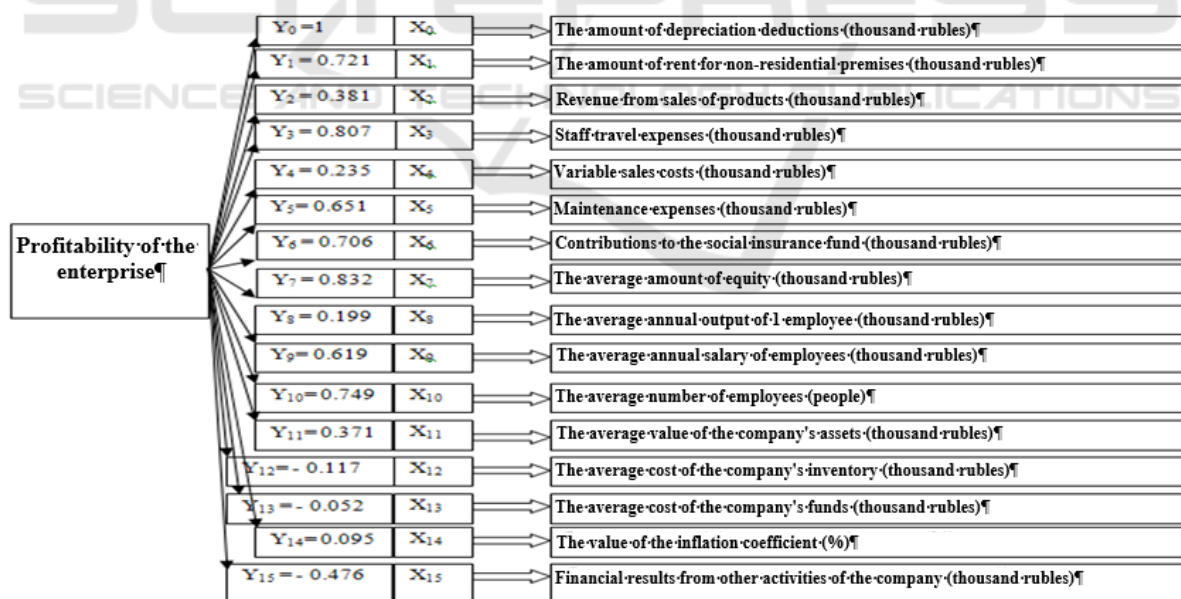


Figure 1: Values of paired correlation coefficients between factors affecting the level of profitability of the enterprise

Based on the determination of the "weight" of the indicators and their ranking by the degree of decreasing relationship (Table 1), only factors X₇ and

X₁₀ were taken into account to exclude multicollinearity (the other factors were excluded from the model construction).

Table 1: Calculation of the specific weight of influence factors.

Indicator	Correlation coefficient		Sum of coefficients	"Weight" of the indicator
	K_i	$ K_i $		
X ₇	0.832	0.832	7.781	10.69
X ₃	0.807	0.807		10.38
X ₁	0.765	0.765		9.83
X ₁₀	0.749	0.749		9.63
X ₀	0.721	0.721		9.27
X ₆	0.706	0.706		9.07
X ₅	0.651	0.651		8.37
X ₉	0.619	0.619		7.96
X ₁₅	-0.476	0.476		6.12
X ₂	0.381	0.381		4.90
X ₁₁	0.371	0.371		4.78
X ₄	0.235	0.235		3.02
X ₈	0.199	0.199		2.56
X ₁₂	-0.117	0.117		1.51
X ₁₄	0.095	0.095		1.23
X ₁₃	-0.052	0.052		0.67

The empirical formula (mathematical model) for the dependent variable "Profitability of the enterprise" due to the factors X₇ and X₁₀ was formed using the Excel software package. For these purposes,

the functions LINEAR (linear approximation) and LGRFPRIBL (exponential approximation) were used. The results of the calculations are presented in Tables 2, 3.

Table 2: Results of calculation of linear regression indicators.

Constant 1			Constant 0		
$m_n = 0.0222$	$m_{n-1} = 8E - 05$	$b = 0,517$	$m_n = 0.04$	$m_{n-1} = 6E - 05$	$b = 0$
$S_{en} = 0.0477$	$S_{en-1} = 6E - 05$	$S_{eb} = 1.32$	$S_{en} = 0.01$	$S_{en-1} = 4E - 05$	# No data available
$R_2 = 0.713$	$S_{ey} = 0.438$	# No data available	$R_2 = 0.971$	$S_{ey} = 0.3887$	# No data available
$F = 3.7274$	$Df = 3$	# No data available	$F = 67.19$	$Df = 4$	# No data available
$Ssreg = 1.4288$	$Ssresid = 0.575$	# No data available	$Ssreg = 20.3$	$Ssresid = 0.6044$	# No data available

Table 3: Results of calculation of exponential regression indicators (constant 1).

Constant 1			Constant 0		
$m_n = 1.0125$	$m_{n-1} = 1$	$b = 0.8175$	$m_n = 1.005$	$m_{n-1} = 1$	$b = 1$
$S_{en} = 0.023$	$S_{en-1} = 3E - 05$	$S_{eb} = 0.6345$	$S_{en} = 0.005$	$S_{en-1} = 0$	# No data available
$R_2 = 0.7874$	$S_{ey} = 0.2105$	# No data available	$R_2 = 0.939$	$S_{ey} = 0.19$	# No data available
$F = 5.5539$	$Df = 3$	# No data available	$F = 30.83$	$Df = 4$	# No data available
$Ssreg = 0.4922$	$Ssresid = 0.1329$	# No data available	$Ssreg = 2.118$	$Ssresid = 0.14$	# No data available

The choice of the model that allows the most accurate description of how close the equation approximates the actual data was carried out on the basis of the determinism coefficient (R₂).

For the linear type of dependence (equation of the form $y(x) = b_0 + b_1 \cdot x$), the value of R₂ was 0.713.

For the linear form of dependence (equation of the form $y(x) = b \cdot x$) the value of R₂ was 0.971.

For the exponential type of dependence (equation of the form $y(x) = b_0 \cdot b^x$), the value of R2 was 0.787.

For the exponential type of dependence (equation of the form $y(x) = b^x$), the value of R2 was 0.939.

The highest value of the determination coefficient was obtained for a model of the form $y(x) = b_1 \cdot x_1 + b_2 \cdot x_2$. In this regard, the quality of the model was evaluated according to the Student and Fisher criteria. The evaluation was carried out by comparing the calculated values with the data in the tables.

The calculated value of the Fischer F-test for our model was obtained at the level of 50,389.

The critical value of this statistic corresponds to F_{Table} (0.05; 2; 3) = 9.552 (table 4).

Since $F_{is\ calculated} > F_{table}$, the regression equation can be considered adequate, that is, the constructed model of the dependence of the profitability of the enterprise on such factors as the average size of equity and the average number of employees explains 97.1% of the total variance of the Y attribute:

$$Y = 0.00006 \cdot X_7 + 0.04 \cdot X_{10}$$

$$Y = 0,00006 * X_7 + 0,04 * X_{10} \tag{1}$$

Table 4: estimated performance of the model according to the Fisher F-criterion and the Student's coefficient (t-criterion).

F _{Estimated}	F _{table}	Regression equation	Factor	t	t	Significance
50.389	9.552	is adequately	X ₇	3.001	2.776	significant
			X ₁₀	2.262	2.776	insignificant

The evaluation of the model quality according to the Student's criterion (Kuznetsova, 2019), taking into account the level of significance ($\alpha = 0.05$) and the number of degrees of freedom (n - 2), showed the significance of the factor X10 as not significant ($t_{is\ observed} < t_{of\ the\ criterion}$) (Table 4). Therefore, the "average headcount" factor was also excluded from the model.

Thus, the model of the influence of factors on the level of profitability of activities has received the form of the equation of paired (one-factor) regression.

The initial data for modeling the relationship between the level of profitability of the activities of LLC "BioVitrum M" and the value of the average size of the company's equity are presented in Table 5 and in the form of a scatter plot, which shows the presence of such a relationship (Fig. 1).

Table 5: Initial data for constructing the regression model.

Period	Profitability of activity of LLC "BioVitrum M", %	The average equity capital, RUB ths
2014	1.16	578
2015	1.23	1,881
2016	1.35	3,811
2017	2.64	9,092
2018	1.87	12,155
2019	2.40	13,050
The average value of the indicator	1.78	6,761

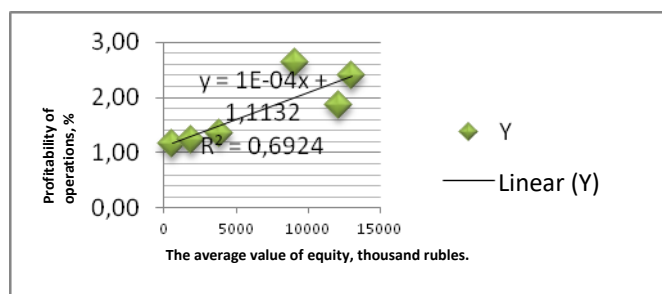


Figure 1: The dependence of the profitability (y) of the activities of LLC "BioVitrum M" on the average size of equity.

Using the MS Excel software package "Data Analysis", the regression equation was constructed on the basis of the obtained source data:

$$Y = 1.113234423 + 0.000097877 \cdot X_7$$

$$Y = 0,00006 \cdot X_7 + 0,04 \cdot X_{10} \quad (2)$$

The results of the correlation analysis conducted by MS Excel allowed us to obtain the following results (Table 6).

The multiple correlation coefficient ($r = 0.83211833$) characterizes a strong relationship

between the dependent and independent variables of the constructed model.

The coefficient of determination ($R_2 = 0.69242092$) shows that the variation in the values of the profitability indicator of the enterprise by 69.2% depends on the size of the equity capital. The influence of unaccounted factors on the profitability of the enterprise in the resulting model is 30.8%.

The value of the standard error (in our calculation "0.392527571") means that the deviation of the actual value of the profitability indicator from the projected values is no more than 0.39 percentage points.

Table 6: Results of the correlation analysis conducted by MS Excel.

Indicator		Regression statistics
Multiple R		0.83211833
R-square		0.69242092
Normalized R-square		0.61552615
Standard error		0.39252757
Coefficients:	Y-intersection	1.11323442
	X ₇	9.7877E - 0,5
t-statistics:	Y-intersection	4.083701
	X ₇	3.000798

The free term of the equation ($b_0 = 1.11323442$) shows that the value of the profitability indicator in the absence of the X7 factor will be at the level of 1.113234423%.

The regression coefficient ($b_1 = 0.000097877$) shows that with an increase in the amount of equity by 1 thousand rubles, the expected increase in the profitability of activities will be 0.000097877 percentage points.

Checking the obtained model by the F-criterion showed that the regression equation is considered adequate.

Checking the significance of the model at the five percent significance level ($t_{b_0} = 4.0837, t_{b_1} = 3.0008$) showed a linear relationship between the indicators.

Further, on the basis of the constructed regression model, the forecast of the values of the profitability indicator of the analyzed enterprise was determined, subject to an increase in the amount of equity by 7.36% (similar to the growth rate of the indicator in 2019). The results of the calculations are shown in Fig. 2.

The analysis of forecast calculations shows that with an increase in the amount of equity by 7.36%, the forecast value of the level of profitability of the enterprise will be 2.49% (with 2.40% in 2019).

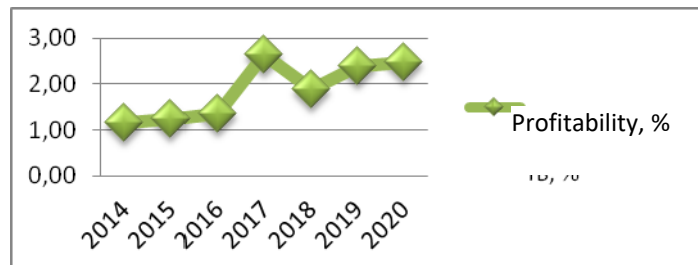


Figure 2: Forecast of the values of the profitability indicator of LLC "BioVitrum M"

4 CONCLUSIONS

To assess the degree of influence on the performance indicator – the profitability of the activities of LLC "BioVitrum M" of individual factors, a sample was conducted and 15 characteristics of the activities that, according to experts, have a significant impact were identified. The results of the correlation and regression analysis showed that of all the factors listed, only one (the amount of equity) is in a significant linear relationship with the resulting indicator and actually affects the change in the level of profitability of the enterprise. Thus, it was proved that the growth of the amount of equity capital leads to an increase in the efficiency of activities, acceleration of the mobilization of own sources and strengthening of the financial stability of the enterprise.

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