Econometric model of the effective activity of the enterprise

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Abstract. In modern conditions of globalization and growing economic instability, many enterprises cannot withstand competition and find themselves in a state of crisis. In order to carry out successful trading activities, there is a growing demand for reliable information about the future development of the organization, and therefore the most urgent problem of any enterprise is its financial stability. Using the example of an enterprise with a registered form of a limited liability company, the authors considered the assessment and analysis of the stability of the enterprise's development in order to confirm the future prospects of its functioning in the Russian markets. With the help of basic methodological approaches and principles of using the apparatus of econometric modeling and analysis of economic phenomena and processes, an assessment of the state of efficiency of a limited liability company is considered and a forecast of the development of economic phenomena and processes is made, which is an urgent task. The problem at this point in time. As a result of our research, we have determined a linear model of the dependence of indicators such as profit and cost of sales, which is statistically significant with a probability of 95\% and allows us to predict the profit of a limited liability company. A comprehensive assessment of the financial condition of the company allowed us to formulate conclusions and proposals to improve the efficiency of the company.

1 Introduction

The modern level of organization and management of entrepreneurial activity objectively determines the need to use the tools of financial and economic analysis of the assessment of the state and the choice of forecast options for the development of entrepreneurship [1]. The methodology of econometric research allows us to identify the main factors of changes in performance indicators, determine the degree of their influence on volume and non-financial indicators, and ultimately concentrate the actions of management personnel on the implementation of strategies of an active socio-economic orientation. The development of econometric methods and models using them in the field of quantitative and non-quantitative information determines new opportunities for substantiating current and prospective management decisions.

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The volume of sales of a particular product depends on a number of factors, the impact of which must be taken into account. Only with the help of econometric analysis it is possible to identify the influence of certain factors on the result. A properly conducted econometric study can show us the close relationship of several explanatory factors in the regression equation. The change of one variable cannot practically occur with the absolute immutability of other variables. Some factors of the model have a positive effect on the growth of the effective feature, i.e., accelerate the growth of output, while others, on the contrary, slow down its growth [2].

Thus, with the help of basic methodological approaches and principles of using the apparatus of econometric modeling and analysis of economic phenomena and processes, we can assess the state and make a forecast of the development of economic phenomena and processes, including evaluating the efficiency of the enterprise, which is an urgent problem at this point in time.

The store of the limited liability company (LLC) «Usadba» in the city of Tyumen, is a popular store at home with a traditional form of service, its main function is to promote food products to the consumer. Among the goods sold are milk and dairy products, bread and bakery products, groceries, meat and fish products, draft beer, tobacco products.

2 Materials and methods

Using the example of this store, we decided to conduct a study in order to identify the links between quantitative characteristics in the activities of a limited liability company and build a model of the dependence of related quantitative characteristics for the purpose of analysis and forecasting.

To achieve this goal, the following tasks were solved:
- collection of information on the available quantitative characteristics in the activities of the limited liability company «Usadba»;
- identification of the relationship between quantitative characteristics;
- determination of the general type of the dependence model between the features, determination of the parameters of this model and their interpretation;
- determination of the quality of the constructed model;
- forecast based on the constructed model.

The scientific novelty of the results of our research is as follows: an econometric model has been developed based on the analysis of the qualitative characteristics of the enterprise the limited liability company "Usadba", which allows predicting the results of activities.

The practical novelty of the research is that on the basis of the developed model, the conclusions and proposals formulated, the efficiency of the enterprise increases. The formulated conclusions and suggestions can be used in similar enterprises.

A model of the dependence of related quantitative characteristics in the activities of the limited liability company «Usadba» is constructed. According to this model, the analysis and forecast of the company's activities are carried out. A comprehensive assessment of the financial condition of the limited liability company «Usadba» allowed us to formulate conclusions and proposals to improve the efficiency of the enterprise.

3 Results and Discussion

The financial position of the limited liability company «Usadba» of the city of Tyumen is characterized by its business activity. The criteria of business activity include indicators that reflect the qualitative and quantitative aspects of the development of the company's activities, the volume of sales of goods and services, profit, indicators of the turnover of
assets and liabilities. Thus, according to these criteria, it is possible to determine how effectively the company uses its funds.

Without an analysis of the financial condition today, it becomes impossible for any economic entity to function, including those that, for certain reasons, do not pursue the goal of maximizing profits. If the efficiency of farming is a voluntary matter of the agent of economic activity, then financial reporting is mandatory [7].

The stable activity of the limited liability company «Usadba» depends both on the validity of the development strategy, marketing policy, on the effective use of all resources at its disposal, and on external conditions, which include the tax, credit, pricing policy of the state and market conditions. Because of this, the information base for the analysis of the financial condition should be the reporting data of the store, some specified economic parameters and options under which the external conditions of its activity change, which must be taken into account when making analytical assessments and managerial decisions.

Table 1. The main indicators of the activity of the limited liability company "Usadba" store for 2019 - 2020.

<table>
<thead>
<tr>
<th>Indicators</th>
<th>2019</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue from the sale of goods (thousand rubles)</td>
<td>104</td>
<td>3866.95</td>
</tr>
<tr>
<td>Expenses for ordinary activities (thousand rubles)</td>
<td>(2478)</td>
<td>(3324.32)</td>
</tr>
<tr>
<td>Gross Profit (thousand rubles)</td>
<td>(2559)</td>
<td>422.57</td>
</tr>
</tbody>
</table>

The analysis of business activity carried out in Table 1 shows that revenue from the sale of goods in 2019 compared to 2018 increased by 3762.95 thousand rubles, therefore, gross profit also increased, covering the loss of 2018 and reaching a positive result, which amounted to 422.57 thousand rubles. The gross profit of the limited liability company «Usadba» for the period under study has a pronounced upward trend, which positively characterizes the commercial activity of the store.

Expenses for ordinary activities in the limited liability company «Usadba» in 2018 amounted to 2,478 thousand rubles, and in 2019 - 3,324.32 thousand rubles, which is 34% more. The ongoing changes have affected the growth of the profitability of sales. The return on sales is calculated by dividing the profit from the sale of products, works and services or net profit by the amount of revenue received. The calculation shows that in 2018 the profitability is negative, and in 2019 it is positive.

Let's consider the model of dependence of the profit of the limited liability company «Usadba» on various factors listed in Table 2. To build a model of the dependence of the profit of the limited liability company «Usadba» on various factors, we studied the following indicators in rubles: Y - profit (loss) from core activities, X1 - receipt of goods to the warehouse, X2 - accounts payable to suppliers, X3 - cash flow, X4 - cash outflow, X5 - customer debt, X6 - tax arrears to the budget, X7 - cost of sales, X8 - revenue from sales [8].

Table 2. Indicators of the turnover balance sheet for 12 months.
<table>
<thead>
<tr>
<th>№</th>
<th>Profit (loss) from core business</th>
<th>Receipt of goods to the warehouse</th>
<th>Accounts payable to suppliers</th>
<th>Receipt of funds</th>
<th>Cash outflow</th>
<th>Customer debt</th>
<th>Tax arrears to the budget</th>
<th>Self-efficacy of sales</th>
<th>Sales revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>y</td>
<td>x_1</td>
<td>x_2</td>
<td>x_3</td>
<td>x_4</td>
<td>x_5</td>
<td>x_6</td>
<td>x_7</td>
<td>x_8</td>
</tr>
<tr>
<td>2</td>
<td>-1907.4</td>
<td>811911.3</td>
<td>274949.8</td>
<td>234630.14</td>
<td>324130.85</td>
<td>555405.8</td>
<td>547872.4</td>
<td>980074.8</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>-51583.1</td>
<td>331781.8</td>
<td>236375.9</td>
<td>243460.1</td>
<td>667676.9</td>
<td>674299.2</td>
<td>170687.2</td>
<td>143333.6</td>
<td>168163.5</td>
</tr>
<tr>
<td>4</td>
<td>259557.4</td>
<td>190736.7</td>
<td>665639.2</td>
<td>320686.2</td>
<td>668244.6</td>
<td>475481.3</td>
<td>983783.2</td>
<td>162412.1</td>
<td>90074.8</td>
</tr>
<tr>
<td>5</td>
<td>96780.64</td>
<td>927906.7</td>
<td>881919.38</td>
<td>773006.12</td>
<td>932613.7</td>
<td>654381.3</td>
<td>170787.2</td>
<td>143333.6</td>
<td>143333.6</td>
</tr>
<tr>
<td>6</td>
<td>256305.7</td>
<td>672904.6</td>
<td>6216417.2</td>
<td>578163.7</td>
<td>834598.53</td>
<td>714853.2</td>
<td>798578.3</td>
<td>168163.5</td>
<td>168163.5</td>
</tr>
<tr>
<td>7</td>
<td>-907218</td>
<td>491470.1</td>
<td>656348.2</td>
<td>507481.2</td>
<td>704433</td>
<td>912610.1</td>
<td>912733.5</td>
<td>183539.9</td>
<td>183539.9</td>
</tr>
<tr>
<td>8</td>
<td>491470.1</td>
<td>627904.6</td>
<td>853157.74</td>
<td>717842.5</td>
<td>572564.6</td>
<td>718353.2</td>
<td>160776.8</td>
<td>183539.9</td>
<td>183539.9</td>
</tr>
<tr>
<td>9</td>
<td>927906.7</td>
<td>927906.7</td>
<td>881919.38</td>
<td>773006.12</td>
<td>658244.6</td>
<td>718353.2</td>
<td>798578.3</td>
<td>160776.8</td>
<td>160776.8</td>
</tr>
<tr>
<td>10</td>
<td>-8720.09</td>
<td>722493.1</td>
<td>850574.74</td>
<td>717842.5</td>
<td>720257.5</td>
<td>714149.1</td>
<td>912733.5</td>
<td>183539.9</td>
<td>183539.9</td>
</tr>
</tbody>
</table>
Consider a matrix of paired correlation coefficients for all variables involved in the analysis. The matrix was obtained using the Correlation tool from the Data Analysis package in Excel.

Table 3. Matrix of pair correlation coefficients.

<table>
<thead>
<tr>
<th></th>
<th>y</th>
<th>x1</th>
<th>x2</th>
<th>x3</th>
<th>x4</th>
<th>x5</th>
<th>x6</th>
<th>x7</th>
<th>x8</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>x1</td>
<td>0.051146</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>x2</td>
<td>0.081737</td>
<td>0.956522</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>x3</td>
<td>0.015502</td>
<td>0.42957</td>
<td>0.371463</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>x4</td>
<td>0.023055</td>
<td>0.280159</td>
<td>0.156792</td>
<td>0.371463</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>x5</td>
<td>0.37318</td>
<td>0.236961</td>
<td>0.156792</td>
<td>0.390454</td>
<td>0.824580</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>x6</td>
<td>-0.48116</td>
<td>0.236961</td>
<td>0.355266</td>
<td>0.32067</td>
<td>0.156792</td>
<td>0.048541</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>x7</td>
<td>0.37318</td>
<td>0.236961</td>
<td>0.156792</td>
<td>0.390454</td>
<td>0.824580</td>
<td>0.048541</td>
<td>0.199315</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Visual analysis of the matrix allows you to set:

1. Profit has a fairly high pair correlation with factor x7 - the cost of sales, and a moderate pair correlation with factors x5 - customer debt, x6 - tax arrears to the budget, x9 - sales revenue;

2. Some analysis variables demonstrate rather high pair correlations, which necessitates checking factors for the presence of multicollinearity between them. Moreover, one of the conditions of the classical regression model is the assumption of the independence of explanatory variables [8].

Conducting a step-by-step selection of factors by excluding statistically insignificant variables from the model, we obtain two statistically significant factors, namely x7 - cost of sales and x8 - revenue. A two-factor regression equation, all coefficients of which are significant at a 5% significance level, has the form:

$$y = 0.0000000001 - x_7 + x_8.$$ (1)

To select the most significant explanatory variables, after conducting a test for "long" and "short" regressions, we obtained two "short" regressions: the equation of the dependence of profit on the cost of sales (2) and the equation of the dependence of profit on sales revenue (3).

$$y_{x_7} = 484742.5 - 0.73774 \cdot x_7$$ (2)

This equation shows that with an increase in the cost of sales by 1 ruble, the profit of the company «Usadba» will decrease by an average of 0.73774 rubles per month. Accordingly, with a decrease in the cost of sales by 1 ruble, the profit of the company «Usadba» will increase by an average of 0.73774 rubles per month.

$$y_{x_8} = -45502.2 + 0.54 \cdot x_8$$ (3)

The resulting equation of the dependence of profit on sales revenue (3) shows that with an increase in sales revenue by 1 ruble, the profit of LLC «Usadba» increases by an average of 0.54 rubles per month.

By checking the statistical significance of the obtained dependence equations (1), (2) and (3), we obtain that the regression equation (1) and (2) is statistically significant at 95% significance level, therefore, they are suitable for further use, and the regression equation (3) is statistically insignificant at 95% significance level, therefore, it is not suitable for further use.

As a result of the analysis of the "long" and "short" regression, I will give preference to the "short" regression (2).

Using the elasticity coefficient, we will evaluate the degree of influence of factor x7 on the result. The elasticity coefficient shows by how many percent the dependent variable changes when the factor changes by one percent.

$$E_{(x_7)} = a_7 \cdot \frac{x_7}{y} = -0.73774 \cdot \frac{304729.2}{259930.4} = -0.86$$
The obtained coefficient shows that with an increase in the cost of sales by 1% from the average level of 304729.2 rubles, the profit of LLC «Usadba» will decrease by 0.86% from the average level of rubles.

Based on the data obtained, we will consider three types of forecasting:
- point forecast of factor \( x_7 \);
- point forecast of the Y indicator.

As a point forecast of the factor, let's consider what value the cost of sales will be, if it decreases by 10% from the average level. We get:

\[
x_{7pr} = \overline{x_7} - 0.1 \cdot \overline{x_7} = 0.9 \cdot 304729.2 = 274256.3
\]

Accordingly, with a reduction in the cost of sales by 10% from the average level, the forecast profit value will be:

\[
y_{pr} = 484742.5 - 0.73774 \cdot x_{7pr} = 484742.5 - 0.73774 \cdot 274256.3 = 282412.66
\]

Conclusion: with the value of the cost of sales of 274256.3 rubles per month, the profit of LLC «Usadba» will average 282412.66 rubles per month, this is higher than the average profit of 22482.3 rubles. A graphical representation of the results of modeling and forecasting is shown in fig. 1.

As a result of studying the dependence of the profit of LLC "Usadba" on eight different factors, it was found that the greatest attention should be paid to reducing the cost of sales, since reducing the cost of sales by 1 ruble entails an increase in profit by 0.73774 rubles.

![Graph](image)

**Fig. 1.** The result of modeling and forecasting by pair regression.

### 4 Conclusion

A comprehensive econometric analysis of the activities of the limited liability company «Usadba» in Tyumen showed that the highest correlation is manifested [9] between profit and cost of sales [9,10]. The relationship between these indicators is linear and inverse. A linear model of the dependence of these indicators has been determined, which is statistically significant with a probability of 95% and allows us to forecast the profit of the limited liability company "Usadba". A comprehensive assessment of the financial
condition of the limited liability company «Usadba» allowed us to formulate conclusions and proposals to improve the efficiency of the enterprise.

References

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