Combined approach to forecasting the financial condition of a transport company based on cost optimization

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Abstract. The financial strategy of the company is one of the most important functional strategies that ensures the formation, efficient distribution and use of financial resources. Analysis and optimization of expenses, as a tool for implementing a financial strategy, allows you to reduce the cost of sales (services) and increase profit margins and, accordingly, increase the amount of financial resources for the development of the company. The article discusses the impact of cost optimization on the financial strategy of the organization and forecasting the main indicators of its activity using the example of the North-West Suburban Passenger Company (hereinafter referred to as JSC “SZPPK”), which carries out passenger rail transportation on the territory of St. Petersburg, in Leningrad, Novgorod, Pskov, Murmansk regions, as well as in the Republic of Karelia. To forecast the main indicators of the company’s activities, such as revenue, cost of sales (services), net profit, and the passenger turnover indicator was used in the article as a factor determining these indicators.

1. Introduction

The sphere of rail passenger transportation in suburban traffic has a huge impact on the development of the region, being an infrastructure industry that provides for the movement of economically active people. The activities of the company JSC NWPC is subject to state regulation of prices (tariffs), therefore, it largely depends on the correct choice of strategic guidelines and cost optimization [1]. The company interacts with the railway on the organization of commuter trains, the use of traction services, railway infrastructure, railway stations, stopping points, cash pavilions, and with the authorities of the constituent entities of the Russian Federation on tariff policy issues. NWPC JSC carries out transportation of various categories of passengers, namely [2]:

- passengers transported at 100% cost;
- passengers transported for 50% - students and schoolchildren;
- federal beneficiaries - this category includes passengers who are paid for from the federal budget;
- railway workers (employees of the company Russian Railways OJSC), payment for which is fully carried out by Russian Railways;
- regional beneficiaries (partial payment) - passengers whose transportation is regulated by regional legislation, with full compensation for lost revenue from the budget of the Subject of the Russian Federation.

The company's revenue structure in 2018 is presented in Figure 1.
The largest share in the structure of the company's revenue, namely 55%, is occupied by the transportation of people on subscription and one-time tickets, the smallest (1%) is other insignificant incomes, which include transportation of hand luggage, services for placing vending machines and advertising, excursions, SMS-services notifications of the schedule of suburban trains, etc.

The company’s tariffs are regulated by the state on the basis of the provision on state regulation of tariffs, fees and charges in relation to the work (services) of natural monopolies in the field of railway transportation dated August 5, 2009 N 643 and approved by the Tariff Committee of St. Petersburg, acting on the basis of a government decree St. Petersburg dated September 13, 2005 N 1346 [3,4]. The main passenger traffic of the company falls on St. Petersburg and the Leningrad region. Figure 2 shows the dynamics of passenger traffic in the constituent entities of the Russian Federation for 2016-2018.

Figure 1. The company's revenue structure in 2018.

Figure 2. Dynamics of the passenger flow of JSC NWPC by regions of the Russian Federation for 2016-2018, million pass. [24].
In 2018, total passenger traffic increased by 5% compared to 2017 and amounted to 80.399 million passengers. The highest growth rate in 2018 is observed in St. Petersburg - by 5.6% more than in 2017.

2. Materials and methods

An important tool for implementing the financial strategy of an enterprise is cost analysis, since by analyzing and optimizing costs, an enterprise reduces sales costs and increases gross profit, and as a result, net profit. Net profit is a source of self-financing of the enterprise, contributing to capital growth, investment, increase the financial stability of the enterprise, carrying out the main function of the financial strategy for the formation, distribution and use of financial resources [5]. The financial condition has a direct impact on production and commercial activities, the security of the organization with material and financial resources. Unsatisfactory financial condition leads to untimely settlements with employees of the organization, the budget, extra-budgetary funds, suppliers, banks and other lenders, which, ultimately, can lead to bankruptcy of the organization [6].

The investment activity of the organization depends on the financial condition. The lack of financial resources does not allow updating the main production assets, incurring costs for research, development and technological work, and applying new technologies, which may adversely affect the competitiveness of products.

In turn, the financial condition depends on the results of production and commercial activities. Therefore, in case of failures in production and sales, cash flow is reduced and, as a result, the financial stability of the organization is reduced [7].

The system of strategic goals should ensure the selection of the most effective areas of financial activity; formation of a sufficient amount of financial resources and optimization of their composition; the acceptability of the level of financial risks in the process of carrying out forthcoming business activities, etc [8]. The system of strategic goals of financial development should be clearly and concisely, reflecting each of the goals in specific indicators, target strategic standards. As an example of targeted strategic standards, for certain aspects of the financial activity of an enterprise, the following can be established [9]:

• average annual growth rate of own financial resources generated from internal sources;
• minimum share of equity in the total used capital of the enterprise;
• return on equity ratio;
• the ratio of current and non-current assets of the enterprise;
• minimum level of monetary assets ensuring the current solvency of the enterprise;
• the minimum level of self-financing of investments and the maximum level of financial risks in the context of main areas of economic activity of the enterprise.

• development of target strategic standards for financial activities and making strategic decisions. Formed at the previous stage, the system of strategic financial goals should receive a concretization of certain target strategic standards. The development of such targeted strategic financial standards serves as the basis for making key management decisions and ensuring control over the implementation of the financial strategy [10].

3. Results

Analysis and cost reduction allows you to increase the amount of financial resources necessary for the development of the company, thereby solving one of the objectives of the financial strategy [11]. In 2018, the expenses of NWPC JSC amounted to 6,445,042 thousand rubles. Figure 3 shows the structure of the company's expenses for 2018. The largest share in the structure of expenses accounted for other expenses (70%, 4,506,185 thousand rubles).
Labor costs
Social Security Contributions
Material costs
Depreciation
Other expenses

Figure 3. The structure of expenses of JSC NWPC in 2018.

Table 1. Details of other costs of JSC “NWPC” in 2016-2018.

| Elements of other expenses, thousand rubles             | 2016     | 2017     | 2018      |
|--------------------------------------------------------|----------|----------|-----------|
| Infrastructure Services                                | 31000    | 33110    | 33452     |
| THAT, TR, KR rolling stock                             | 1873486  | 2031982  | 2040189   |
| Locomotive Team Services                               | 1170176  | 1229487  | 1283324   |
| Rental of rolling stock                                | 608664   | 807309   | 668943    |
| Rental of movable property                             | 891      | 3519     | 3674      |
| Wagon Equipment                                        | 437      | 707      | 1711      |
| Information Services                                   | 4910     | 12700    | 12423     |
| Communication services                                 | 873      | 1303     | 1244      |
| Sublease of land                                       | 108      | 1303     |           |
| Publications                                           | 204      | 127      | 206       |
| Rental of non-residential premises                     | 308      | 436      | 439       |
| Temporary residence                                    | 1630     | 2164     | 2881      |
| Electricity, utilities                                 | 83       | 99       | 136       |
| Treasury control                                       |          |          | 508       |
| Technical supervision during construction work          |          |          | 712       |
| Freight Forwarding Services                            |          |          | 81        |
| Rest                                                   | 433487   | 274376   | 456262    |
| TOTAL                                                  | 4126257  | 4399131  | 4506185   |

During the study period, the largest items among other expenses are those related to maintenance and repair of the train - 32% of the cost of services, services of locomotive crews (20%) and rental of rolling stock (10%). It should be noted that the amounts paid for the repair of rolling stock exceed the cost of renting it. As an action to reduce costs, the search for alternative options for the implementation of rolling stock repairs among private companies involved in the production and repair of rolling stock was considered. Because of the selection of service providers for maintenance and overhauls with the lowest prices, we managed to reduce these costs by 229,838 thousand rubles or 11.3%.

In order to determine the impact of reducing the company's expenses on maintenance and overhauls on the key performance indicators of the enterprise in the long run, we will forecast the revenue and cost of sales (services) based on passenger turnover for 3 years [12]. To build a forecast,
it is necessary to build a linear regression model. First, in order to predict the passenger turnover, it is necessary to consider the factors that have an impact on it.

Consider the following macroeconomic factors:

- population of the region;
- average per capita cash income;
- gross regional product;
- number of enterprises operating in the region;
- number of own cars per 1 thousand people;
- length of roads

Table 2 presents the values of the above indicators in dynamics for 2010-2018 within the Northwestern Federal District.

Table 2. Macroeconomic indicators affecting passenger flow in dynamics for 2010-2018.

| Year | Population. thousand people (X₁) | Regional product. million rubles (X₂) | Per capita cash income. rub. (X₃) | Number of enterprises (X₄) | The number of own cars per 1000 population (X₅) | The length of roads. km. (X₆) |
|------|---------------------------------|--------------------------------------|---------------------------------|--------------------------|---------------------------------|--------------------------|
| 2010 | 13625.8                         | 3943054                             | 19837                           | 631766                   | 253.7                           | 91 791.1                  |
| 2011 | 13660.1                         | 4785459                             | 21184                           | 622277                   | 265.8                           | 95 728.5                  |
| 2012 | 13717.8                         | 5247508                             | 23422                           | 601863                   | 277                             | 121 282.2                 |
| 2013 | 13800.7                         | 5553389                             | 26167                           | 612415                   | 302.5                           | 139 160.2                 |
| 2014 | 13843.6                         | 5945311                             | 28580                           | 616159                   | 302.3                           | 141 891.7                 |
| 2015 | 13843.6                         | 7204795                             | 32329                           | 640810                   | 307.4                           | 142 080.9                 |
| 2016 | 13853.7                         | 7726085                             | 33217                           | 616017                   | 315                             | 143 091.8                 |
| 2017 | 13899.3                         | 8114708                             | 33890                           | 590793                   | 319.2                           | 143 111.2                 |
| 2018 | 13952                           | 9015190                             | 34595                           | 542742                   | 320                             | 144 243.1                 |

According to the indicators of table 2, despite the increase in population, the growth of regional product and income, the number of enterprises operating in the region is falling. The company's passenger turnover indicators for the corresponding period are presented in table 3.

Table 3. Passenger turnover of the company JSC "SZPPK" for 2010-2018.

| Year | Passenger turnover. million pass-km. (Y) |
|------|------------------------------------------|
| 2010 | 2 986.94                                 |
| 2011 | 2 853.92                                 |
| 2012 | 3 037.06                                 |
| 2013 | 2888.79                                  |
| 2014 | 2 785.31                                 |
| 2015 | 2 805.24                                 |
| 2016 | 2 879.176                                |
| 2017 | 2 887.665                                |
| 2018 | 3 044.903                                |

To identify the relationship between the resulting indicator of passenger turnover (y) and the above factors (x), table 4 presents the correlation matrix.
According to the correlation matrix, where \( y \) is the passenger turnover indicator, \( x_i \) is the factor that influences; we can conclude that the passenger turnover indicator of the company has a high feedback with such indicators as the number of enterprises in the district, the length of roads, per capita cash income. The connection of other factors with the resulting indicator is weak, but many factors have a strong relationship between themselves. Thus, to build the forecast, we use the factors that have the greatest relationship with the resulting indicator and the lack of interconnection [13]. Since factors \( x_3 \) and \( x_6 \) have a high relationship with factor \( x_4 \), we exclude them. Accordingly, the number of enterprises in the region will be used as a factor of influence.

The equation of the resulting indicator will have the following form [14,15]:

\[
Y = b_0 + b_1 x_1,
\]

where \( Y \) is the resulting indicator (passenger turnover, million pass-km.); \( b_0 \) – free member; \( b_1 \) – regression coefficients; \( x_1 \) – factors determining the resulting indicator.

The coefficients \( b_0 \) and \( b_1 \) calculated using the LINEST function in Microsoft Excel are 4104.52 and -0.0019, respectively. The number of enterprises in the forecast period, determined using the existing trend of 2010-2018 will be 575495 in 2019, 568 391 in 2020 and 562 367 in 2021, respectively. Based on the available data, we calculate the values of the resulting indicator and make a forecast of the resulting indicator in table 5.

Table 5. Predicted values of passenger traffic.

| Year | Passenger turnover, million pass-km. | Number of enterprises |
|------|-------------------------------------|----------------------|
| 2010 | 2 987                               | 631766               |
| 2011 | 2 854                               | 622277               |
| 2012 | 3 037                               | 601863               |
| 2013 | 2 889                               | 612415               |
| 2014 | 2 785                               | 616159               |
| 2015 | 2 805                               | 640810               |
| 2016 | 2 879                               | 616017               |
| 2017 | 2 888                               | 590793               |
| 2018 | 3 045                               | 542742               |
| 2019(n) | 2 972                           | 575495               |
| 2020(n) | 2 985                          | 568391               |
| 2021(n) | 2 998                          | 562367               |

Thus, the passenger turnover in the forecast period will be 2972, 2985 and 2998 million pass-km. Define the coefficients of the linear regression equation for calculating the revenue and cost of sales (services) for passenger turnover in table 6. The considered period 2014-2018.

| Table 4. Passenger turnover of the company JSC "SZPK" for 2010-2018 [7]. |
|-----------------------------|-----------------------------|-----------------------------|
| \( Y \) | \( X_1 \) | \( X_2 \) | \( X_3 \) | \( X_4 \) | \( X_5 \) | \( X_6 \) |
| Y | 1 | | | | | |
| \( X_1 \) | -0.11 | 1 | | | | |
| \( X_2 \) | 0.015 | 0.940 | 1 | | | |
| \( X_3 \) | -0.365 | 0.962 | 0.970 | 1 | | |
| \( X_4 \) | -0.596 | -0.597 | -0.628 | -0.468 | 1 | |
| \( X_5 \) | -0.215 | 0.977 | 0.916 | 0.963 | -0.479 | 1 |
| \( X_6 \) | -0.339 | 0.931 | 0.805 | 0.892 | -0.380 | 0.960 | 1 |
Table 6. Coefficients of the linear regression equation.

|                     | To calculate revenue for passenger traffic | To calculate the cost of sales (services) for passenger turnover |
|---------------------|-------------------------------------------|---------------------------------------------------------------|
| $b_0$               | -11477933.31                              | -5455993.6                                                  |
| $b_1$               | 6282.43                                   | 3932.39                                                     |

Based on the coefficients presented in Table 5 and the predicted value of the passenger turnover, we calculate the revenue and cost of sales (services). Table 7 presents the calculation results.

Table 7. Forecasted values of revenue and cost of sales (services) of JSC “NWPC” for passenger turnover.

| Year | Revenues, thousand rubles ($Y_1$) | Cost of sales (services), thousand rubles ($Y_2$) | Passenger turnover, million pass-km. ($X$) |
|------|-----------------------------------|--------------------------------------------------|------------------------------------------|
| 2014 | 5546418                           | 5562668                                          | 2 785                                    |
| 2015 | 6321957                           | 5366665                                          | 2 805                                    |
| 2016 | 6758551                           | 5752530                                          | 2 879                                    |
| 2017 | 7021690                           | 6228694                                          | 2 888                                    |
| 2018 | 7443148                           | 6445042                                          | 3 045                                    |
| 2019(f) | 7193454                         | 6231096                                          | 2 972                                    |
| 2020(f) | 7275126                         | 6282218                                          | 2 985                                    |
| 2021(f) | 7356797                         | 6333339                                          | 2 998                                    |

By the end of the forecast period, the company’s revenue will amount to 7356797 thousand rubles, and the cost price of 6333339 thousand rubles, which is 86351 thousand rubles and 111703 thousand rubles less than in 2018 respectively. To determine the cost of sales (services) after reducing the cost of repairs, we will reduce the cost of sales (services) to save by changing the cost of current and major repairs, namely by 229838 thousand rubles.

Table 8 presents the calculation of net profit based on forecast values of revenue and cost of sales (services). At the same time, the amount of other income and expenses, interest receivable and the income tax rate, as well as other indicators, will remain at the level of 2018.

Table 8. Projected performance indicators of NWPC JSC for 2019-2021.

| Indicator, thousand rubles | 2019 (f) | 2020 (f) | 2021 (f) |
|----------------------------|----------|----------|----------|
| Revenue                    | 7193454  | 7275126  | 7356797  |
| Cost of sales              | 5977884  | 6029006  | 6080127  |
| Gross profit (loss)        | 1215570  | 1246120  | 1276670  |
| Selling expenses           | 0        | 0        | 0        |
| Management expenses        | 0        | 0        | 0        |
| Sales profit               | 1215570  | 1246120  | 1276670  |
| Interest receivable        | 23097    | 23097    | 23097    |
| Percentage to be paid      | 21756    | 21756    | 21756    |
| Other income               | 557386   | 557386   | 557386   |
| Other expenses             | 1168767  | 1168767  | 1168767  |
| Profit before tax          | 627286   | 657836   | 688386   |
| Income tax                 | 156805   | 164442   | 172079   |
| Change in deferred tax liabilities | 5448      | 5448     | 5448     |
| Change in deferred tax assets | -121     | -121     | -121     |
| Other                      | -303     | -303     | -303     |
| Net profit                 | 459187   | 482100   | 505014   |
Thus, at the end of the forecast period, net profit will amount to 505,014 thousand rubles, which is 61.6% higher than in 2018.

Based on the obtained net profit values, we calculate the changes in profitability indicators in table 9.

| Indicator            | 2018  | 2021(f) | Change. % |
|----------------------|-------|---------|-----------|
| Return on sales. %   | 4.2   | 7       | +2.8      |
| Gross margin. %      | 15.49 | 21      | +5.51     |

According to table 8, profitability indicators show a significant increase: return on sales increased by 2.8%, gross profit margin by 5.51%. Thus, based on the developed measures and the constructed forecast, we can draw the following conclusions:

• reduction in the cost of ongoing and overhauls of rolling stock allowed to reduce costs by 229838 thousand rubles, which is 3.7% of the cost of sales (services) by the end of the forecast period;

• the absolute value of net profit by the end of the forecast period increased by 61.6%, return on sales by 2.13%, return on core activities by 7.73%.

Thus, using cost analysis, items were identified to optimize costs. The reduction in expenses allowed us to increase the company's net profit, as well as the amount of financial resources necessary for the company to achieve its strategic goals, maintain financial stability and form the financial strategy of the company under study.

4. Conclusion

Using the cost analysis, using the example of the organization of JSC NWPC, the largest significant cost items in the cost structure were identified. As part of optimizing the costs of current and overhaul repairs, it was proposed to change the service provider performing these repairs, having examined private companies that manufacture and repair rolling stock.

Based on the correlation and regression analysis, this article predicts the passenger turnover, revenue and cost of sales (services). Taking into account the developed measures to optimize expenses, by the end of the forecast period, net profit will amount to 505014 thousand rubles, which is 61.6% higher than the indicator for 2018, sales profitability is higher than the indicator for 2018 by 2.13%, and profitability of the core business is 7.73%. These measures will allow the company under study to effectively use the available resources and correctly formulate its financial strategy.

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