Analysis of profitability of production in the construction industry of the Irkutsk region

E A Filatov

Irkutsk Scientific Center of the Siberian Branch of the Russian Academy of Sciences, 134, Lermontov str., 664033, Irkutsk, Russian Federation

E-mail: johnru3000@rambler.ru

Abstract. In economic practice, many specific indicators of profitability are used. They may differ in the complexity of the calculation, the availability of necessary information, and the usefulness of the analytical conclusions process. To measure the size of profit and the amount of funds used to achieve it in the industry economy, the indicator profitability of production is used. Profitability of production is an important parameter for determining the efficiency of the economy. Profitability of production is the most general, qualitative indicator of economic efficiency of production, efficiency of functioning of companies in the industry. This indicator is very important for making current and strategic decisions. The article presents the author's model for analyzing the profitability of production. The article reveals the influence of factors affecting the change in profitability and are more methodical approaches to its calculation (methods of factor analysis developed by Filatov E. A.). The article presents the author's analytic, systematic statistical material for the analysis of key indicators revealing the impact on the change of profitability of the construction industry in Irkutsk region of the Russian Federation.

1. Introduction

In economic analysis, the performance of various economic entities can be assessed by indicators such as revenue or profit (loss). However, the values of these indicators are not enough to form an opinion about the effectiveness of economic entities. This is due to the fact that these indicators are absolute characteristics of the activities of economic entities, and their correct interpretation for evaluating performance can only be carried out in conjunction with other indicators that reflect the funds invested in the company. Therefore, in economic analysis, profitability indicators are calculated to characterize the overall performance and profitability of various activities (economic, financial, and entrepreneurial).

The term profitability originates from «rent», which literally means income. Thus, profitability in the broad sense of the word means profitability, profitability [1].

Profitability indicators are widely used for evaluating financial and economic activities of enterprises in all industries. For example, profitability indicators are used for comparative evaluation of the performance of individual enterprises and industries that produce different volumes and types of products. These indicators characterize the profit received in relation to the production resources spent. The most commonly used indicators are profitability of sales and profitability of production [2-7].
Profitability of production is the most generalized, qualitative indicator of economic efficiency of production, efficiency of functioning of economic entities. The profitability of production just measures the amount of profit received with the size of the means by which it is obtained.

2. Research questions

The essence of the problem of increasing the profitability of production is to increase the economic results for each unit of costs in the process of using available resources.

Therefore, the task of economic science is to increase attention to the analysis of profitability as an economic phenomenon, to the forms of its manifestation, and methods of accounting in practice. The relevance of the topic is explained by the fact that the market economy makes it necessary to increase production efficiency.

The problems of increasing the efficiency of production and increasing the efficiency of individual economic entities in particular have been studied in the works of foreign and domestic scientists. Among them in the Russian economic literature, first of all, we can distinguish the works of: A.I. Anchishkin, A.M. Burman, P.G. Bunich, K.M. Velikanov, L.A. Gatosky, B.C. Kabakov, A.E. Karlik, B.C. Nemchinov, A.V. Panskov, V.A. Lantsov, A.I. Muraviev, V.V. Novozhilov, B.P. Plyshevsky, S.G. Strumilin, K.G. Tatevosov, N.N. Ukhov, G.S. Khachaturov, N.A. Tsagolov and others, as well as research by foreign scientists I. Ansoff, B. Karloff, M. Porter, V. Hoyer, and others.

In Russia, the problems of integrated assessment of the performance of companies are presented in publications at the level of familiarity with a special direction in economic science. There are few monographs on the problems of integrated performance analysis, and none where these problems are generalized at all. The most noteworthy conceptual approaches to integrated analysis of the performance of A.D. Sheremet, A.N. Romanov, Yu.A. Lvov, A.N. Bogatko, J.V. Bogatin, E.Yu. Duhonina, D.V. Isayev, G.G. Fetisov.

Thus, the lack of development of issues related to the comparative evaluation of various methods for evaluating the performance of companies, and the urgent need to resolve them, indicate the relevance and practical significance of the chosen topic of the article.

3. Materials and methods

Five indicators were used for factor analysis of production profitability: revenue, cost, net profit, asset value, and cost of equity.

Further, based on the methods of deterministic (functional) factor analysis developed by the author [8], we will assess the degree of influence of four factors on the change in the profitability of the construction industry in the Irkutsk region of the Russian Federation.

Source data for alternative factor analysis of profitability in the construction industry (all legal entities) Irkutsk region of the Russian Federation are presented in table 1 based on data from 4 statistical bulletins of Irkutskstat (1. Financial results of organizations. Volume 2-large and medium-sized organizations. 2017; 2. Financial results of organizations. Volume 3-small businesses. 2017; 3. Financial results of organizations. Volume 2-large and medium-sized organizations. 2018; 4. Financial results of organizations. Volume 3-small businesses. 2018).

Table 1. Baseline data for the factor analysis.

| No. | Indicators | № factor's | 2017 (0) * | 2018 (I) ** | Deviation (Δ) *** |
|-----|------------|------------|-----------|-------------|------------------|
| 1   | V – Net revenue, thousand rubles | 119165673 | 110973284 | -8192389 |
|     | including: |           |           |             |                  |
|     | - large and medium-sized organizations, thousand rubles | 49976459 | 45595417 | -4381042 |
|     | - small businesses, thousand | 69189214 | 65377867 | -3811347 |
The original formula derived by the author for factor analysis of production profitability will have the following form (formula 1):

\[
P_{OP} = \frac{P}{SK} * \frac{SK}{A} * \frac{A}{V} * \frac{V}{SS} = F_1 * F_2 * F_3 * F_4 = \prod_{n=1}^{4} F_n \tag{1}
\]

The author's model of production profitability consists of 4 factors: 
- \( F_1 \) – \( ROE \) – return on equity, calculated as the ratio of net profit \( (P) \) to equity \( (SK) \). This is one of the key indicators of financial profitability. This indicator is important for the owners of the company, since it characterizes the profit that the owner will receive from the unit of money invested in the organization.
**F**₂ – **FIR** – financial independence coefficient or autonomy coefficient, which describes the ratio of equity ($SK$) to the total amount of capital (assets) ($A$) of the organization. The autonomy coefficient shows how independent an organization is from creditors.

**F**₃ – **RI** – resource intensity the reverse indicator of resource return or capital return. If the resource return (capital return) indicates the efficiency with which the company uses its resources to produce products and has an economic interpretation, showing how much revenue from sales ($V$) accounts for one monetary unit of investment in the assets ($A$) of the organization. The resource intensity characterizes the ratio of assets ($A$) to one monetary unit of sales revenue ($V$). Resource intensity – the amount of resources used to produce a unit of final product, i.e. the ratio between resources consumed and products produced (in physical form or in the form of services). It includes both components that are part of the final product and those consumed during its production. Resource intensity is expressed in the number of units of resources spent per unit of production. This indicator is used for analytical comparisons for various purposes.

**F**₄ – **YOP** – yield of production, close to the indicator of profitability of production (**POP**). Profitability of production is calculated as the ratio of net profit to cost. Profitability of production shows how much a company has net profit ($P$) per monetary unit of cost ($SS$). The author introduced the indicator of yield of production (**YOP**), which is calculated as the ratio of sales revenue (revenue) ($V$) per unit cost ($SS$). This indicator shows the ratio of revenue received from sales ($V$) to the amount of funds spent on its receipt (cost – $SS$).

The author's indicator of yield of production (**YOP**) and the well-known indicator of profitability of production (**POP**) characterize the effectiveness of the company's production and commercial activities.

Based on the data in table 1, it can be seen that:

- the return on equity of the construction industry of the Irkutsk region in 2017 was 12.60%, while in 2018 it was 20.83%, an increase of 8.23%;
- the coefficient of financial independence of the construction industry of the Irkutsk region in 2017 was 11.40%, while in 2018 it was 13.26%, an increase of 1.86%;
- the resource intensity of the construction industry in the Irkutsk region in 2017 was 97.40%, while in 2018 it was 98.17%, an increase of 0.77%;
- the yield of production of the construction industry in the Irkutsk region in 2017 was 104.37%, while in 2018 it was 105.57%, an increase of 1.21%.

The resulting indicator of the author's model of profitability of production in the construction industry of the Irkutsk region in 2017 was 1.46%, while in 2018 it was 2.86%, an increase of 1.40%.

The total deviation for the resulting indicator ($\Delta POP$) is determined by the formula 2:

$$\Delta POP = \sum_{n=1}^{4} \Delta POP (F_n) = \Delta POP (F_1) + \Delta POP (F_2) + \Delta POP (F_3) + \Delta POP (F_4)$$  \hspace{1cm} (2)

Auxiliary data on comparative coefficients for factor analysis are presented in table 2.

| Comparison of factors | Designation of comparative coefficients | Value | The product of coefficients (value) |
|-----------------------|----------------------------------------|-------|-----------------------------------|
| $F_{11} / F_{10}$     | $A_1$                                  | 1.652967 | 1.0                              |
| $F_{10} / F_{11}$     | $A_2$                                  | 0.604973 | 1.0                              |
| $F_{21} / F_{20}$     | $A_3$                                  | 1.162890 | 1.0                              |
| $F_{20} / F_{21}$     | $A_4$                                  | 0.859926 | 1.0                              |
| $F_{31} / F_{30}$     | $A_5$                                  | 1.007904 | 1.0                              |
| $F_{30} / F_{31}$     | $A_6$                                  | 0.992158 | 1.0                              |
| $F_{41} / F_{40}$     | $A_7$                                  | 1.011560 | 1.0                              |
| $F_{40} / F_{41}$     | $A_8$                                  | 0.988572 | 1.0                              |
The author’s (alternative) methods of factor analysis are presented in the table 3.

Method No. 1.1 (formulas 1.1–1.4 in the table 3) is based on the difference between the effective planned indicators, which are adjusted on the comparative coefficients (A₁, A₃, A₅).

Method No. 1.2 (formulas 2.1–2.4 in the table 3) is based on the difference between the effective actual indicators, which is adjusted on the comparative coefficients (A₁, A₃, A₅).

Method No. 2.1 (formulas 3.1–3.4 in the table 3) is based on the ratio of the departure of the original factor to the original plan factor multiplied by the planned performance indicator, which is adjusted on the comparative coefficient (A₁, A₃, A₅).

Method No. 2.2 (formulas 4.1–4.4, in the table 3) is based on the ratio of the departure of the original factor to the original actual factor multiplied by the actual performance indicator, which is adjusted on the comparative coefficient (A₁, A₃, A₅).

Method No. 3.1 (formulas 5.1–5.4 in the table 3) is based on the difference between the effective actual and planned factors, which is adjusted on the comparative coefficients (A₁, A₃, A₅).

Method No. 3.2 (formulas 6.1–6.4 in the table 3) is based on the difference between the effective actual and planned indicators, which is adjusted on the comparative coefficients (A₄, A₆, A₈).

Method No. 4.1 (formulas 7.1–7.4 in the table 3) is based on the ratio of deviation of the effective factor to the difference between the effective actual and planned factors, which is adjusted on the comparative coefficient (A₁, A₃, A₅).

Method No. 4.2 (formulas 8.1–8.4 in the table 3) is based on the ratio of deviation of the effective factor to the difference between the effective actual and planned factors, which is adjusted on the comparative coefficients (A₁, A₃, A₅).

Method No. 5.1 (formulas 9.1–9.4 in the table 3) is based on the ratio of deviation of the effective factor to the difference between the actual performance factors, which is adjusted on the comparative coefficients (A₁, A₃, A₅).

Method No. 5.2 (formulas 10.1–10.4 in the table 3) is based on the ratio of deviation of the effective factor to the difference between the planned performance factors, which is adjusted on the comparative coefficients (A₁, A₆, A₈).

Table 3. Methods of alternative factor analysis using comparative coefficients.

| № formulae | formulas / calculations | the main part of the formula | adjustment factors |
|------------|--------------------------|----------------------------|-------------------|
| 1.1        | ΔPOP (F₁) = POP₁₀*(A₁)  | POP₀ − POP₀               | −                 |
| 1.2        | ΔPOP (F₂) = (POP₁₀*(A₁)  | POP₀)* A₁                |                   |
| 1.3        | ΔPOP (F₃) = (POP₁₀*(A₃)  | POP₀)* A₁*A₃              |                   |
| 1.4        | ΔPOP (F₄) = (POP₁₀*(A₃)  | POP₀)* A₁*A₃*A₅            |                   |
| 2.1        | ΔPOP (F₁) = (POP₁−POP₁*/ (A₂))  | A₆*A₆*A₄                |                   |
| 2.2        | ΔPOP (F₂) = (POP₁−POP₁*/ (A₂))  | A₆*A₆                |                   |
| 2.3        | ΔPOP (F₃) = (POP₁−POP₁*/ (A₆))  | A₆*A₆                |                   |
| 2.4        | ΔPOP (F₄) = POP₁−POP₁*/ (A₆)  | −                   |                   |
| 3.1        | ΔPOP (F₁) = (ΔF₁/F₁₀)多余 | POP₀ − POP₀             | −                 |
| 3.2        | ΔPOP (F₂) = (ΔF₂/F₂₁0)* POP₀  | POP₀* A₁                |                   |
| 3.3        | ΔPOP (F₃) = (ΔF₃/F₃₁0)* POP₀  | A₁*A₃*A₅                |                   |
| 3.4        | ΔPOP (F₄) = (ΔF₄/F₄₁0)* POP₀  | A₁*A₃*A₅*A₅              |                   |
| 4.1        | ΔPOP (F₁) = (ΔF₁/F₁₁0)多余 | POP₀* A₁*A₅*A₅           |                   |
| 4.2        | ΔPOP (F₂) = (ΔF₂/F₂₁1)* POP₀  | POP₀* A₁*A₅*A₅          |                   |
| 4.3        | ΔPOP (F₃) = (ΔF₃/F₃₁₁)* POP₀  | A₁*A₅*A₅*A₅             |                   |
| 4.4        | ΔPOP (F₄) = (ΔF₄/F₄₁₁)* POP₀  | A₁*A₅*A₅*A₅             |                   |
| 5.1        | ΔPOP (F₁) = POP₁*(B₆) − POP₀  | −                   |                   |
| 5.2        | ΔPOP (F₂) = (POP₁*(B₆) − POP₀)* A₆  | −                   |                   |
4. Results and discussions

The result of methods 1.1, 2.1, 3.1, 4.1, 5.1 is presented in table 4, the result of methods 1.2, 2.2, 3.2, 4.2, 5.2 is presented in table 5.

Table 4. The result on methods 1.1, 2.1, 3.1, 4.1, 5.1.

| No. | the main part of the formula | adjustment factors | result  |
|-----|-----------------------------|-------------------|---------|
| 1   | \( \Delta \text{POP} (F_1) = 0.009537 \) | -- | 0.009537 |
| 2   | \( \Delta \text{POP} (F_2) = 0.002379 \) | 1.652967 \( A_1 \) | 0.003932 |
| 3   | \( \Delta \text{POP} (F_3) = 0.000115 \) | 1.922219 \( A_1A_3 \) | 0.000222 |
| 4   | \( \Delta \text{POP} (F_4) = 0.000169 \) | 1.937412 \( A_1A_3A_5 \) | 0.000327 |
|     |                             |                   | 0.012200 |
|     |                             |                   | 0.014018 |

Table 5. The result on methods1.2, 2.2, 3.2, 4.2, 5.2.

| No. | the main part of the formula | adjustment factors | result  |
|-----|-----------------------------|-------------------|---------|
| 1   | \( \Delta \text{POP} (F_1) = 0.011307 \) | 0.843433 \( A_4A_5A_6 \) | 0.009537 |
| 2   | \( \Delta \text{POP} (F_2) = 0.004009 \) | 0.980820 \( A_5A_6 \) | 0.003932 |
| 3   | \( \Delta \text{POP} (F_3) = 0.000224 \) | 0.988572 \( A_6 \) | 0.000222 |
| 4   | \( \Delta \text{POP} (F_4) = 0.000327 \) | -- | 0.000327 |
|     |                             |                   | 0.015868 |
|     |                             |                   | 0.014018 |

Factor analysis allows you to obtain a quantitative assessment of the impact of factor deviations on the deviation of the value of the indicator under study. As can be seen from the final result of tables 1, 4, 5, the purpose of the analysis is achieved-the determination of the influence of factors is disclosed without deviations.
According to the results of the analysis, the following factors influenced the change in the profitability of production ($\Delta POP$) in the construction industry of the Irkutsk region in the amount of 1.40%:

- the increase in the return on equity of the construction industry of the Irkutsk region ($F_1$) by 8.23% increased the studied indicator by 0.95%;
- an increase in the financial independence coefficient of the construction industry of the Irkutsk region ($F_2$) by 1.86% increased the studied indicator by 0.40%;
- an increase in the resource intensity of the construction industry in the Irkutsk region ($F_3$) by 0.77% increased the studied indicator by 0.02%;
- the increase in yield of production of the construction industry in the Irkutsk region ($F_4$) by 1.21% increased the studied indicator by 0.03%.

Table 1 shows that revenue for the construction industry in the Irkutsk region has decreased by about 8.2 billion rubles over the last period under study. At the same time, the revenue of small enterprises decreased by 3.8 billion rubles, and large and medium-sized organizations by 4.4 billion rubles, or about 15% more than that of small enterprises.

The cost of the construction industry in the Irkutsk region for the last study period decreased by about 9 billion rubles or more than revenue by 0.8 billion rubles or 10%. That is, despite the decline in the construction industry in the Irkutsk region, enterprises have become more efficient at managing costs. At the same time, the revenue of small enterprises decreased by 4.4 billion rubles, and large and medium-sized organizations by 4.6 billion rubles, or about 5% more than that of small enterprises.

Net profit in the construction industry of the Irkutsk region increased by 1.34 billion rubles over the last period under study. At the same time, the net profit of small businesses increased by 1.2 billion rubles, while large and medium-sized organizations increased by 0.14 billion rubles. Small businesses added 8.6 times more to the net profit of the construction industry in the Irkutsk region than large and medium-sized organizations.

The cost of the total capital of construction industry enterprises in the Irkutsk region has decreased by about 7.1 billion rubles over the last study period. At the same time, the cost of total capital for small enterprises increased by 0.6 billion rubles, while for large and medium-sized organizations it decreased by 7.7 billion rubles.

The cost of equity capital of construction companies in the Irkutsk region increased by 1.21 billion rubles over the last study period. At the same time, the cost of equity for small enterprises increased by 1.8 billion rubles, while for large and medium-sized organizations it decreased by 0.59 billion rubles. In other words, large and medium-sized organizations have become more dependent on creditors.

Table 6. Structure of absolute indicators for the production profitability model, %.

| No. | Indicators                           | 2017  | 2018  | $\Delta$ |
|-----|--------------------------------------|-------|-------|----------|
| 1   | $V$ – Net revenue                    | 100.00| 100.00| 0.00     |
|     | including:                          |       |       |          |
|     | - large and medium-sized organizations| 41.94 | 41.09 | -0.85    |
|     | - small businesses                   | 58.06 | 58.91 | 0.85     |
| 2   | $SS$ – Cost of work                  | 100.00| 100.00| 0.00     |
|     | including:                          |       |       |          |
|     | - large and medium-sized organizations| 42.46 | 41.73 | -0.74    |
|     | - small businesses                   | 57.54 | 58.27 | 0.74     |
| 3   | $P$ – Net profit                     | 100.00| 100.00| 0.00     |
|     | including:                          |       |       |          |
|     | - large and medium-sized organizations| 9.61  | 10.04 | 0.43     |
|     | - small businesses                   | 90.39 | 89.96 | -0.43    |
Table 6 shows that in the structure of income and costs of the construction industry in the Irkutsk region, small enterprises occupy about 60%, and large and medium-sized organizations about 40%. The deviation during the last study period was less than 1%.

In the structure of the final financial result (net profit) for the construction industry of the Irkutsk region, small enterprises account for about 90%, and large and medium-sized organizations for about 10%. The deviation during the last study period was less than 0.5%.

In the structure of the total assets of the construction industry of the Irkutsk region, small enterprises on average make up 2/3, and large and medium-sized organizations about 1/3. At the same time, the value of total assets for small enterprises increased by an average of 5% during the last study period, while for large and medium-sized organizations, respectively, it decreased by 5%.

In the structure of the equity capital of the construction industry of the Irkutsk region, small enterprises on average make up 60%, and large and medium-sized organizations about 40%. At the same time, the cost of equity for small enterprises increased by an average of 8% during the last study period, while for large and medium-sized organizations, respectively, it decreased by 8%.

In contrast to absolute indicators such as revenue, cost or profit, profitability is a relative indicator, which makes it possible to compare businesses of different business lines and different sizes. The cost-effectiveness of production (or cost-effectiveness) can be compared to the economic efficiency coefficient.

Based on the data in table 1, we calculate the profitability of the construction industry in the Irkutsk region by organizations (table 7).

**Table 7. Profitability of production in the construction industry of the Irkutsk region, %**

| No. | Indicators                              | 2017 | 2018 | Δ    |
|-----|----------------------------------------|------|------|------|
| 1   | all organization                       | 1.46 | 2.86 | **1.40** |
| 2   | - large and medium-sized organizations | 0.33 | 0.69 | **0.36** |
| 3   | - small businesses                     | 2.29 | 4.42 | **2.12** |

Table 7 clearly shows that small businesses are more effective in the construction industry of the Irkutsk region than large and medium-sized organizations.

Integrated assessment of the company's economic condition is important primarily for comparative analysis of the efficiency of enterprises.

**5. Summary**

Business performance has always been the focus of attention for managers, economists, and researchers. This is an actual problem, it is the basic subject of study of economic science and practice.

The global financial and economic crisis of 2020, which the author previously wrote about [9], the bursting of the financial bubble on stock markets, and the bankruptcy of many companies have put the problem of evaluating the company's performance once again in the center of attention of the world community of economists.

The indicator of profitability of production is particularly important in modern economic
conditions, when it is necessary to constantly make a number of extraordinary decisions to ensure profitability, and, consequently, financial stability [10-16].

Factors that affect the profitability of production are numerous and diverse. Some of them depend on the activities of specific teams, others are related to the technology and organization of production, the efficiency of the use of production resources, the introduction of scientific and technological progress.

6. References

[1] Abryutina M S 2010 Economics of the enterprise. Moscow, Publishing house «Business and Service», 585
[2] Avdeenko I A, Kaev Yu A 2016 Factors of increasing profit and profitability New Science: From Idea to Result 5-1 (84) 112-114
[3] Lbova N O 2017 Management of business profitability Actual Issues of Economic Sciences 16-1 105-109
[4] Lupil'ceva M A 2016 Bases and methods of the factorial analysis of profitability Right. Economy. Security 3 (9) 89-92
[5] Nikonenko S Yu 2016 System of forming indicators of profitability of a commercial organization and factors of its growth Actual Directions of Scientific Research of the XXI Century: Theory and Practice 4 (24) 139-143
[6] Berdnikova T B 2018 Analysis and diagnostics of financial and economic activity of the enterprise. Moscow, UNITY, 391
[7] Korotkova E M 2018 Anti-crisis management. Moscow, INFRA-M, 432
[8] Filatov E A 2020 Factor analysis of the knowledge intensity of the invested capital of Russia by Filatov’s methods Advances in Social Science, Education and Humanities Research 128 964-972 DOI: https://doi.org/10.2991/aebmr.k.200312.132
[9] Filatov E A 2019 Forecast of the beginning of the fundamental global financial and economic crisis of the third Millennium Management of Economic Systems 10
[10] Certo S C 2003 Modern management. Prentice Hall, 595
[11] Farnham P G 2005 Economics for managers. Prentice Hall, 558
[12] Hill C W L, Jones G R 2004 Strategic management. An Integrated approach. Houghton Mifflin Company, 1182
[13] Naylor J 2004 Management. Prentice Hall, 668
[14] Sydsæter K, Hammond P 2002 Essential mathematics for economic analysis. Prentice Hall, 684
[15] Thompson A A, Fulmer W E, Strickland III A J 1990 Readings in strategic management. Richard D. IRWIN, Inc., 511
[16] Zikmund W G 2003 Business research methods. THOMSON, 748

Acknowledgments

The paper is produced in the framework of the scientific project of the Siberian branch of the Russian Academy of Sciences No. XI.174.1.4 «Activation of the internal development potential of regions of the resource specialization (on the example of the Baikal region)». 