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MARGIN ANALYSIS IN MANAGEMENT AND OPERATIONAL PROFITABILITY AND PRICING POLICY OF A PRODUCTION ORGANIZATION

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Abstract. *The article aims to discuss methodological approaches to developing a profitability management policy for a manufacturing company's operations and pricing based on a margin model. The article defines the effectiveness of operating activities, formed complementarily based on the etymological approach in the comparative analysis of similar formulations in the literature. The purpose of the research is to justify the system of performance indicators of profitability, reflecting the effectiveness of operating activities. Practical solutions for factor analysis and forecasting the impact of a set of external and internal factors on the level of cost and profitability of operating activities based on modeling key business valuation indicators are proposed. A methodology for the phased calculation of options for price scenarios using the accounting method NIFO and the level of marginal costs is proposed. The calculation algorithms and the practical implementation of the pro-*

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posed methodology for predicting the optimal price level for a manufacturing enterprise's sold products are presented.

Keywords: *marginal analysis, variable and fixed costs, pricing, marginal profitability, sales profitability, modeling, factor analysis.*

JEL: *G32, M11, L32.*

1. Introduction

One of the main stages of analysis and forecasting the profitability of a manufacturing company's operating activities, the prospects for increasing its business activity, strengthening its financial position, solvency, and investment attractiveness is the identification and measurement of the influence of environmental and internal factors (Alam et al. 2019).

For a comprehensive study of the profitability of operating activities, it is necessary to use unique factor analysis methods to construct appropriate models and form a sufficient amount of information about the dynamics of the values of factors and useful indicators. Any company's performance, which is measured by profit margin and profitability, is achieved by increasing the volume of commercial production and sales of products. The level of profit margin ability depends on various factors, including production costs, price parameters in the material and labor markets, pricing, and assortment policy of the production company itself (Berkowitz et al. 2020). Besides, profit margin ability is influenced by such factors as the level of security with working capital, the sufficiency and speed of the flow of financial resources, solvency, and the cost of servicing borrowed funds (Urbano and Aparicio 2016). It is necessary to consider the already existing influence of factors and determine the trends of their further dynamics using multifactor models of profit margin and operating profitability to justify the forecast of profit margin ability in the budgeting process (Cieślik and Michałek 2018).

2. Literature Review

Methodological foundations for evaluating business performance and managerial analysis of profitability, basic methods for managing operating profit based on connection "cost – volume – profit" (CVP) are presented in the works of foreign and domestic experts, such as Apcherch (2002), Drury (2012), Ilina and Ilysheva (2016), Kerimov (2017), Nikolayeva and Shishkova (2017), Horngren, Foster and Datar (2008), Sheremet (2000), Shim and Siegel (1996), and others.

In a market economy, the primary measure of business performance is performance, a generalized concept that captures all aspects of the organization's life (Wittman et al. 2017). Efficiency is a broader concept than efficiency. Despite this, some experts identify these terms, which, in our opinion, is erroneous. Here are some generally accepted definitions of the concepts of "effectiveness" and "efficiency," from which it follows that

sometimes there are significant differences between them (Du and O'Connor 2018). So, in the dictionary of Dal's (2016), "effectiveness" comes from the same root word "result" (French – *resultat*), as "the consequence of something, the consequence, the conclusion, the result, the outcome, the end of the case." Ushakov (2000) cites the formation of the word "result" from the Latin *resultatus* (literally – "reflected"), representing the "final result, consequence, completing any actions, phenomena, development of something." Interpretation of the concept of "result" is also contained in other sources: the result is the final result for which some action is taken. The result is the performance of someone's skill, achievement in any activity. The result is the digital result of some mathematical action, the process (Dmitriyev 2003). Firstly, the above formulations characterize the result and effectiveness as terms reflecting the absolute and relative outcome of something, respectively, without emphasizing its positive nature. Therefore, the effectiveness in economic analysis can be represented by positive as well as negative parameters.

The meaning of the term "effectiveness" reflects the positive result of the analyzed actions or events. Ushakov's (2000) explanatory dictionary gives the following definition: "Effective – giving effect, leading to the desired results, effective." The explanatory dictionary of economic terms defines efficiency as "achieving any specific results with the lowest possible costs or obtaining the maximum possible volume of products from a given amount of resources" (Black 2000).

The indicators of effect and efficiency differ since the first reflects the absolute result (as a rule, the excess of revenues over expenses) (Ključnikov et al. 2017). The second is relative (as a rule, the ratio of the effect to costs or payments).

A comparative analysis of various definitions of the term "efficiency" presented in the outstanding economic literature allowed us to generalize them and formulate this concept concerning an enterprise's operating activities (Yuan and Xu 2019). Efficiency is a comprehensive systematic characteristic of the level of business quality, which is evaluated by various entities based on the interpretation of the values of the system of aggregated and detailed indicators calculated using the available amount of financial and non-financial information (Du and O'Connor 2018).

When analyzing the results or generating forecast parameters of operational activities, one should consider effectiveness as a system of qualitative characteristics subjectively assessed by various business turnover participants (managers, company owners, investors, lending organizations, fiscal and regulatory institutions) based on the interpretation of a certain amount of financial and non-financial information (Wu et al. 2018).

According to specific criteria, various entities evaluate it depending on their affiliation and the degree of participation when considering the enterprise's performance parameters. So, the companies' owners are guided by performance indicators' values, formed based on financial and management reporting data (return on shareholders' equity, dividend yield per share, etc.). Lending organizations evaluate the effectiveness of companies' funds according to the profitability of credit operations (Cerqua and Pellegrini 2018). Investors analyze the profitability of investments by the level of return on capital. Tax authorities are interested in increasing companies' performance and, as a result, increasing tax revenues to the budget (Rahman et al. 2019).

Despite the specificity of a company's performance indicators evaluated by various financial and economic relations, the most aggregated of them are profitability indicators, a percentage of a particular profit indicator to resources, costs, income, capital, etc. (Urbano and Aparicio 2016). Professionals distinguish several groups of profitability indicators. Russian specialists traditionally combine profitability indicators into three groups such as economic profitability (return on assets and their elements), financial profitability (return on shareholders' equity and borrowed funds in various forms), and profitability of production and sales (return on sales and costs) (Gerasimenko 2007; Lebedev 2012; Malyshenko and Goncharova 2015; Akolzina 2016).

The set of profitability indicators should not be excessive to avoid their partial duplication and disperse stakeholders' attention. The estimated and forecasted profitability parameters and the initial cost components that form them (income, expenses, profits, assets, capital, and liabilities) should be reliably measured and reflected in financial and management reporting. Incorrectly defined parameters distort the manager's behavior and reduce their productivity. A limited number of key parameters are needed that drive the organization (Phelps 2004, p. 10).

A special place in assessing and forecasting the profitability of organizations' operating activities is occupied by identifying and measuring the impact of various external and internal environments. It allows timely adjusting of the management of business processes, creating reliable protection against external risks, minimizing their possible negative consequences, and preventing internal threats coming from the imperfection of the management organization of the company itself (Wang et al. 2018).

The increase in profitability is directly related to the growth of the financial result of operating activities, whose share in the total revenue of the company is a determining factor reflecting the "quality" of profit: "The concept of quality of profit arose because of the need to compare the profits of different enterprises, and also because of the need to realize assessments in 'quality'" (Bernstein 1996, p. 546).

As Drury (2012, p. 36) notes, to achieve a common goal – to maintain a competitive position in the market – companies operating in various industries focus on multiple factors (Gavurova et al. 2017a). It assigns a unique role to factor analysis in terms of identifying reserves for growth in the productivity of production activities: factor analysis can be aimed at elucidating the action of factors shaping the results of economic activity from various sources of spatial or temporary origin (Sheremet 2000, p. 302).

3. Materials and Methods

The methodology and practice of this study are based on scientific and practical publications of Russian and foreign experts on the formation of a theoretical base for analysis and forecasting of a system of indicators of operational performance using the margin approach and methods of managing the cost structure, production volumes, market factors that determine them, and the rationale criteria parameters (Kozubikova et al. 2019). In the process of the study, the following general scientific economic and specific methods were used:

- Analysis and synthesis;
- Systematization;
- Modeling,
- Statistical generalization to substantiate theoretical principles.

The practical recommendations aim to improve the methodological apparatus for analyzing and evaluating the effectiveness of the operating system management of production companies. For the practical implementation of the proposed methodological approaches, the mathematical apparatus of deterministic factor economic analysis and modeling of exposure to external and internal constraints were used, such as production volumes and product range, cost elements and their structure, pricing policy, and market demand (Lawrenz and Oberndorfer 2018).

4. Results and Discussion

In recent years, in the analytical management practice of commercial organizations, there has been a need to develop an operational policy that would allow timely response to adverse market trends (Satori et al. 2018). Achieving the optimality of such a policy is based on:

- In-depth study of the achieved level of business performance (Belás and Sopková 2016);
- Realistic measurement and assessment of the impact of various factors of the external and internal environment, primarily on the profitability of operating activities;
- Justification of the optimal set of forecast indicators of business activity and their values for the formation of operating budgets and control of their implementation (Urbano et al. 2019);
- Development of information components for making management decisions aimed at business competitiveness;
- Substantiation of optimal pricing policy and timely response to market factors of demand and competition (Lawrenz and Oberndorfer 2018);
- Formulating operational risk management policies (Long et al. 2018).

Despite the widespread presentation of methodological developments in the field of managing the operating activities of companies in Russian and foreign literature, each of them requires adaptation to the specific conditions of the production activity of a particular company and the stage of its life cycle, the prevailing system of business process management, information, and analytical management needs.

The criteria for profitability used to evaluate and forecast a manufacturing company's operating activities are largely determined by the stage of its life cycle and products sold (Behun et al. 2018). As a rule, at the initial phase of developing new products, until the breakeven point is reached, operating activities' financial result (profit from sales) remains negative for a long time. In this situation, it is important that the interim financial result – profit margin, reaches a positive value, which is a prerequisite, since sales revenue should exceed the total variable costs of its production, which usually include elements such as material, costs on wages of production workers and social contributions, energy costs for production processes, etc. (Walsh and Winsor 2019).

An important step in the analysis of operating performance is the study of the influence of various factors on the value of profit margin (P_{MARG}) and the level of marginal profitability (ROS_{MARG}). Based on the methodology developed by the specialists of the DuPont company ("DuPont", "E.I. du Pont de Nemours and Company"), so-called "The DuPont System of Analysis," which consists of transforming the rate of return on shareholders' equity (*ROE)* for conducting its multivariate analysis, we propose the conversion of indicators – marginal profit and marginal profitability by converting them into multivariate deterministic models.

$$P_{MARG} = N - VC = \sum_{i=1}^{n} q_i \cdot p_i - \sum_{i=1}^{n} q_i \cdot vc_i^l = \sum_{i=1}^{n} q_i \left(p_i - vc_i^l\right), \quad (1)$$

where P_{MARG} – profit margin;
N – sales revenue;
VC – total variable cost;
q_i – the physical quantity of the i-type product sold;
p_i – the unit price of the i-type product sold;
n – number of types of products sold;
vc_i^l – unit variable costs per unit of the i-type product sold.

It is worth noting that conducting factor analysis involves using at least two measurements of each indicator included in the analytical multivariate model. If the task is to calculate the influence of factors on profit margin in a retrospective plan for the elapsed time, then, as a rule, the actual data of the indicators of the reporting period and the base (previous), or the actual data of the indicators of the reporting period and planned budget indicators are used. The factor analysis mechanism will be similar if the task is to determine the influence of various factors on profit margin in the forecast period; only the data on the indicators included in the analytical model should reflect their achieved parameters and the data budgeted for the planned period.

To justify management decisions to identify the degree of influence of various factors on operating activities' profitability, it is necessary to use the information on the production and marketing of products, investment activities, organizational changes within the enterprise, etc., which are classified as internal management information and are available only to internal users (Chen and Chang 2019).

To calculate the influence of factors on profit margin in retrospect, we used the initially planned budget indicators and existing (reporting) period (Table 1). Since the analyzed company produces two types of products, the original multi-factor model of profit margin ability is transformed into a six-factor model as follows:

$$P_{MARG} = q_A \left(p_A - vc_A^l\right) + q_B \left(p_B - vc_B^l\right) = x_1 \left(x_3 - x_5\right) + x_2 \left(x_4 - x_6\right) \quad (2)$$

Table 1. *Calculation of the Influence of Factors on Profit Margin.*

Index	Shorthand	Plan	Report	±Δ	±D, %
1. Profit margin, thousand rubles	$P_{MARG_{x3}}$	1017	1298	281	27,63
2. Sales revenue, thousand rubles	N	28095	33212	5117	18,21
3. Total variable cost, thousand rubles	VC	27078	31914	4836	17,86
4. The physical quantity of A products sold, units	$q_A(x_1)$	3900	4400	500	12,82
5. The physical quantity of B products sold, units	$q_B(x_2)$	990	1080	90	9,09
6. Unit price of A products, thousand rubles.	$p_A(x_3)$	5,30	5,56	0,26	4,91
7. Unit price of B products, thousand rubles	$p_B(x_4)$	7,50	8,10	0,60	8,00
8. Unit variable costs per unit of production A, thousand rubles	$vc^1_A(x_5)$	5,09	5,40	0,31	2,55
9. Unit variable costs per unit of production B, thousand rubles	$vc^1_A(x_6)$	7,30	7,55	0,25	3,42
10. The influence of factors on profit margin, thousand rubles – total:	ΔP_{MARG}	-	-	281	-
Including due to changes: 10.1. The physical quantity of A products sold	$\Delta P_{MARG_{x1}}$	-	-	105	-
10.2. The physical quantity of B products sold	$\Delta P_{MARG_{x2}}$	-	-	18	-
10.3. Unit prices of sold products A	$\Delta P_{MARG_{x3}}$	-	-	1144	-
10.4. Unit prices of sold products B	$\Delta P_{MARG_{x4}}$	-	-	648	-
10.5. Unit variable costs per unit of output A	$\Delta P_{MARG_{x5}}$			-1364	-
10.6. Unit variable costs per unit of output B	$\Delta P_{MARG_{x6}}$			-270	-

Source: *Developed by the authors.*

Calculations of the influence of each of the six factors on profit margin are made by the method of chain substitutions:

1. $\Delta P_{MARG_{x1}} = [(4400(5,30 - 5,09) + 990(7,50 - 7,30)] - [3900(5,30 - 5,09) + 990(7,50 - 7,30)] = 105$ thous.rub.
2. $\Delta P_{MARG_{x2}} = [4400(5,30 - 5,09) + 1080(7,50 - 7,30)] - [4400(5,30 - 5,09) + 990(7,50 - 7,30)] = 18$ thous.rub.
3. $\Delta P_{MARG_{x3}} = [4400(5,56 - 5,09) + 1080(7,50 - 7,30)] - [4400(5,30 - 5,09) + 1080(7,50 - 7,30)] = 1144$ thous.rub.
4. $\Delta P_{MARG_{x4}} = [4400(5,56 - 5,09) + 1080(8,10 - 7,30)] - [4400(5,56 - 5,09) + 1080(7,50 - 7,30)] = 648$ thous.rub.
5. $\Delta P_{MARG_{x5}} = [4400(5,56 - 5,40) + 1080(8,10 - 7,30)] - [4400(5,56 - 5,09) + 1080(8,10 - 7,30)] = -1364$ thous.rub.
6. $\Delta P_{MARG_{x6}} = [4400(5,56 - 5,40) + 1080(8,10 - 7,55)] - [4400(5,56 - 5,40) + 1080(8,10 - 7,30)] = -270$ thous.rub.

Check: $\Delta P_{MARG_{x1}} + \Delta P_{MARG_{x2}} + \Delta P_{MARG_{x3}} + \Delta P_{MARG_{x4}} + \Delta P_{MARG_{x5}} + \Delta P_{MARG_{x6}}$ = 105 + 18 + 1144 + 648+(-1364)+(-270)=*281 thous.rub.*= ΔP_{MARG}

Such calculations of the influence of factors on profit margin allow us to obtain information not only about the nature of influence, but also measure the degree of their impact on effective indicators, which provides useful information to relevant business process management entities to make adequate decisions aimed at minimizing negative processes in the future; justification measures to reduce entrepreneurial risks (Mota et al. 2019) and their financial consequences (Fairlie and Fossen 2018).

As calculations showed, the marginal profit in the reporting period exceeded the planned level by 281 thousand rubles, resulting from the influence of both positive and negative factors. The most significant positive impact on the dynamics of marginal profit was exerted by the price of product A, an increase of 4.91%, yielding an additional amount of profit of 1,144 thousand rubles. The influence of the cost of product B, despite its more intensive growth rate (by 8.00%), allowed to increase the financial result only by 648 thousand rubles, which is due to the smaller share of sales of products B compared to products A in the total physical sales.

The advantage of multivariate modeling also lies in the fact that this approach helps identify the negative impact of individual factors, which may not be so evident in the usual comparison of effective indicators (Gavurova et al. 2017b). The proposed multifactor model for the formation of profit margin made it possible not only to detect, but also to calculate the negative impact of two factors on it: the growth of unit variable costs for both products A and products B, as a result of which the profit margin was less than what was planned by the budget, respectively, at 1364 thousand rubles and 270 thousand rubles. Thus, none of the factors that had a positive effect on profit compensated for the entirely negative impact of the growth of variable costs for products A. It follows from this situation that the company needs to focus in the coming budget period on finding ways to prevent the growth of variable costs, especially for products A.

To conduct a factor analysis of the following order (with details of individual elements of variable costs that are part of variable values) to the level of variable expenses by type of product, we suggest using the corresponding factor model. The factor model for product A is given as an example:

$$VC_A = \sum_{j=1}^{m} VC^{1}_{A_j} \cdot q_A, \tag{3}$$

where:

VC_A – value of variable costs for products A;

$vc^1_{A_j}$ – unit variable costs per unit of production A for the *j*-th element (type, article);

q_A – physical quantity of products A;

$vc^1_{A_j}$ – unit variable costs per unit of production A for the *j*-th cost element;

m – number of elements of variable costs that form the total value of variable costs for products A.

Factor analysis allows you to simulate the studied effective indicator and determine which drivers can be effectively managed in the planned budget period to minimize pos-

sible financial losses if there is a sufficient probability of malicious processes. The calculations can be successfully used to assess the significance of certain factors' impact on the predicted effective indicator, making a possible assessment of them in the future in several ways, based at least on the optimistic, pessimistic, and average level of the available initial information (Kusmiati et al. 2019). Suppose the physical quantity of products sold is differently measurable in physical terms (for example, the physical amount of products is measured in units, tons, liters, etc.). In that case, a similar factor analysis should be performed for individual types of products that are individually measurable in terms of a physical quantity.

One of the areas of performance analysis is the assessment of the business activity of the analyzed object, which is manifested in the dynamism of the organization's development, the achievement of its goals, which reflect various absolute cost and relative analytical indicators, and above all, the rate of turnover of organization's assets and resource productivity (Caliendo and Kritikos 2019). The assessment of business activity is based on the results of a study of the absolute values of the levels and dynamics of profitability and resource productivity ratios, defined as the ratio of profit or income indicators to the resources used in economic activity (current and non-current assets and their elements, financial, labor resources, etc.), as well as with the values of total costs and their articles, types, elements.

One of the most critical indicators of an organization's operating performance is sales profitability, the value of which can be determined based on the ratios of various profit indicators (marginal, gross, sales profit, profit before tax, net profit, etc.) and income indicators (Androniceanu et al. 2019).

Assessing the effectiveness of operating activities, a comparative analysis of profit margin ability is not enough. Therefore, we propose to transform one of the most important indicators based on the DuPont model – sales profitability, calculated for this case based on profit margin (ROS_{MARG}).

$$ROS_{MARG} = \frac{P_{MARG}}{N} = \frac{N - VC}{N} = 1 - \frac{VC}{N} = 1 - \frac{VC \cdot \overline{CA} \cdot \overline{TL} \cdot \overline{TA}}{N \cdot \overline{CA} \cdot \overline{TL} \cdot \overline{TA}} =$$

$$= 1 - \left(\frac{\overline{TA}}{\overline{TL}} \cdot \frac{\overline{TL}}{\overline{CA}} \cdot \frac{VC}{\overline{TA}} \cdot \frac{\overline{CA}}{N} \right) = 1 - \left(\frac{\overline{E} + \overline{TL}}{\overline{TL}} \cdot \frac{\overline{TL}}{\overline{CA}} \cdot \frac{VC}{\overline{TA}} \cdot \frac{\overline{CA}}{N} \right) =$$

$$= 1 - \left[\left(1 + \frac{\overline{E}}{\overline{TL}} \right) \cdot \frac{\overline{TL}}{\overline{CA}} \cdot \frac{VC}{\overline{TA}} \cdot \frac{\overline{CA}}{N} \right] = 1 - \left[(1 + x_1) \cdot x_2 \cdot x_3 \cdot x_4 \right] \quad (4)$$

where:

ROS_{MARG} – profit margin;

N – sales revenue;

$\underline{VC}$– total variable cost;

$\overline{CA}$ – period average balance value of current assets;

$\overline{TL}$ – period average balance value of total liabilities;

$\overline{TA}$ – period average balance value of total assets;

$\overline{E}$ – period average balance value of shareholders' equity;

$\frac{\overline{E}}{\overline{TL}}(x_1)$ – equity current ratio;

$\frac{\overline{TL}}{\overline{CA}}$ (x_2) – debt ratio (the reciprocal of the liquidity ratio – covering current assets of total liabilities);

$\frac{VC}{\overline{TA}}$ (x_3) – total assets maintenance ratio by variable costs (cost of assets);

$\frac{\overline{CA}}{N}$ (x_4) – current assets load ratio (the reciprocal of the coefficient of their turnover).

The presented model reflects the dependence of profit margin ability on four factors, each of which has an inverse effect on its dynamics. It should be noted that when determining the sequence of inclusion of factors in the analytical model, if there is a multiplicative or multiple dependence, some conditions should be observed. So, first of all, the model includes the so-called resource (extensive) factors, which, in comparison with others, are primary, and then every next factor that is logically related to the previous one. In the above formula (4), the first place is given to the coefficient for covering total liabilities with own capital (ratio of shareholders' equity to liabilities), reflecting the structure of financing sources and is primary. The second place is taken by the factor - the debt burden ratio (the ratio of total liabilities to current assets), which is associated with the first circumstance that the value of total liabilities is used to calculate it. In third place in the factor, the model is the coefficient of servicing total assets with variable costs (asset cost), the denominator of the value of total assets, that is also a resource indicator associated with the previous factor. Finally, the fourth factor is the load factor of current assets (the reciprocal of the ratio of their turnover), which is a kind of "quality" indicator, reflecting the inverse of the turnover rate of current assets.

The reason that the last place in the analytical model is assigned to the quality indicator is that when calculating the influence of each factor using common factor analysis methods (chain substitutions, absolute and relative differences), a multiplicated effect of the combined effect on the effective indicator of all factors included in the model (the so-called "indecomposable" residue), the value of which subjectively refers to the effect of the last factor.

The mixed-type four-factor model presented above reflects the nature of the relationship between the marginal profitability of sales and the factors included in it, considering the objective nature of their influence on the effective indicator, namely, inversely proportional dependence. With the first factor (the coefficient of covering total liabilities with equity), profitability is inversely related: the higher its value, the less the effect of financial leverage is used, the less borrowed financial resources are used; therefore, the lower the profitability. The second factor (leverage ratio) also has an opposite effect on profitability, as it is a characteristic opposite in value to the coefficient of coverage of liabilities with current assets (otherwise – potential solvency). The third factor's impact, asset cost on profitability, is also inversely proportional since its growth is undesirable. With a faster increase in prices than asset growth, profit is reduced at a quicker pace, which will negatively affect sales' marginal profitability. The fourth factor, the load fac-

tor of current assets, is the inverse ratio of their turnover. Therefore, growth will mean a slowdown in turnover, which reduces profit and profitability (Table 2).

Table 2. *Calculation of the Influence of Factors on Marginal Profitability.*

Index	Shorthand	Plan	Report	±D	±D, %
1. Profit margin, thousand rubles	P_{MARG}	1017	1298	281	27,63
2. Sales revenue, thousand rubles	N	28095	33212	5117	18,21
3. Marginal profitability	$ROS_{MARG_{x3}}$	3,620	3,908	0,288	7,96
4. Total variable cost, thousand rubles	VC	27078	31914	4836	17,86
5. Period average balance value of current assets, thousand rubles	$\overline{CA}$	8289	9984	1695	20,45
6. Period average balance value of total liabilities, thousand rubles	$\overline{TL}$	9650	10862	1212	12,56
7. Period average balance value of total assets	$\overline{TA}$	15632	17336	1704	10,90
8. Period average balance value of shareholders' equity	$\overline{E}$	5982	6474	492	8,22
9. Equity current ratio	$\frac{\overline{E}}{\overline{TL}}(x_1)$	0,6199	0,5960	-0,0239	-3,86
10. Debt ratio	$\frac{\overline{TL}}{\overline{CA}}(x_2)$	1,1642	1,0879	-0,0763	-6,55
11. Total assets maintenance ratio by variable costs	$\frac{VC}{\overline{TA}}(x_3)$	1,7322	1,8409	0,1089	6,28
12. The current assets load ratio	$\frac{\overline{CA}}{N}(x_4)$	0,2950	0,3006	0,0056	1,90
13. The impact of factors on marginal profitability, % – total:	ΔROS_{MARG}	-	-	0,288	-
Including due to changes: 13.1. Equity coverage ratio	$\Delta ROS_{MARG_{x1}}$	-	-	1,433	-
13.2. Debt ratio	$\Delta ROS_{MARG_{x2}}$	-	-	6,223	-
13.3. Total assets maintenance ratio by variable costs	$\Delta ROS_{MARG_{x3}}$	-	-	-5,568	-
13.4. Current assets load ratio	$\Delta ROS_{MARG_{x4}}$	-	-	-1,800	-

Source: *Developed by the Authors.*

The calculations of the influence of each of the four factors on marginal profitability were made by the method of chain substitutions:

1. $\Delta ROS_{MARG_{x1}} = \{1 - [(1 + 0{,}5960) \cdot 1{,}1642 \cdot 1{,}7322 \cdot 0{,}2950]\} - \{1 - [(1 + 0{,}6199) \cdot 1{,}1642 \cdot 1{,}7322 \cdot 0{,}2950]\} = 1{,}433\%$.
2. $\Delta ROS_{MARG_{x2}} = \{1 - [(1 + 0{,}5960) \cdot 1{,}0879 \cdot 1{,}7322 \cdot 0{,}2950]\} - \{1 - [(1 + 0{,}5960) \cdot 1{,}1642 \cdot 1{,}7322 \cdot 0{,}2950]\} = 6{,}223\%$.
3. $\Delta ROS_{MARG_{x3}} = \{1 - [(1 + 0{,}5960) \cdot 1{,}0879 \cdot 1{,}8409 \cdot 0{,}2950]\} - \{1 - [(1 + 0{,}5960) \cdot 1{,}0879 \cdot 1{,}7322 \cdot 0{,}2950]\} = -5{,}568\%$.

4. $\Delta ROS_{MARG_{x4}} = \{1 - [(1 + 0{,}5960) \cdot 1{,}0879 \cdot 1{,}8409 \cdot 0{,}3006]\} - \{1 - [(1 + 0{,}5960) \cdot 1{,}0879 \cdot 1{,}8409 \cdot 0{,}2950]\} = -1{,}800\%$.

Check:

$\Delta ROS_{MARG_{x1}} + \Delta ROS_{MARG_{x2}} + \Delta ROS_{MARG_{x3}} + \Delta ROS_{MARG_{x4}} + 1{,}433 + 6{,}223 + (-5{,}568) + (-1{,}800) = 2{,}288\% = \Delta ROS_{MARG}$

According to the table, the actual profit margin ability exceeded the planned one by 0.288%. It reached the level of 3.908%, while the model's factors influenced this process in different ways. The calculations made it possible to identify a significant multidirectional effect of two factors. The debt burden ratio had a positive effect, due to which the profit margin ability could have a value of 6.223% higher than the achieved level. However, the variable asset servicing ratio of variable assets had a negative effect, "blocking" the positive effect of the debt ratio and reducing the profit margin ability by 5.568%.

A mixed but less significant effect on the dynamics of profit margin ability was exerted by the coefficient of coverage of liabilities with own capital, which led to its growth by 1.433%, and the load factor of current assets, which reduced profitability 1.800%.

In general, the influence of all four factors on the dynamics of profit margin ability was positive, but at the same time, identifying and measuring the impact of each of them gives a detailed picture to the company's management for making appropriate adjustments to the budget of the next planning period and making management decisions aimed at containing negative processes in the future.

Thanks to the methods of factor analysis and the methodology of deterministic multifactorial modeling, it becomes possible to carry out calculations of the influence of various factors not only in retrospect but also to apply this methodological approach to the procedures for predicting the impact of initial budget indicators on the performance of operational activities in the future.

In modern conditions of saturation of highly competitive markets and the lack of sufficient positive dynamics of demand, pricing is a tool with which a manufacturing company can maintain, and in some cases, increase the share of its presence in the market, thereby contributing to the formation of marginal and operating profit (Lawrenz and Oberndorfer 2018). The enterprise pricing policy should comprehensively consider the influence of various factors – market, economic, industrial, financial, organizational, and not shift only to market price trends or cost structure management.

To create efficiency of the system for managing pricing policy parameters, the so-called "value pricing" method is relevant, which allows a manufacturing company to generate operating profit at a faster pace by achieving a profitable value-to-cost ratio, subject to the best ratio between the value of the products sold and the costs on its production (Du and O'Connor 2018). The value approach allows the company to get a real idea of the costs and their structure, profit, and factors and provide control over changes in price indicators and sales volumes on financial results in general (Dailey 2004; Gerasimenko 2007).

The method under consideration provides a ranking of costs associated with the production and sale of products by variables and fixed and allows you to analyze, evaluate, and predict operating indicators based on the relationship of the volume of production, the magnitude and structure of costs, and operating profit.

To generate data on variables and fixed costs, it is necessary to build an appropriate management accounting system to obtain objective information not only about their total values but specific characteristics per unit of specific types of products, as well as the profit margin ability in terms of types of products, areas of production activity, responsibility centers, etc. (Dolan and Simon 2005; Zaykina and Nasretdinova 2016).

In our opinion, for value pricing, the most optimal model of the cost accounting method is NIFO (next-in, first-out) – an estimate of the used resources at the price that will have to be paid tomorrow to replenish the reserve of resources spent today.

Pricing based on the cost approach is to establish a lower price limit for a unit of production based on the aggregate of all costs and expenses incurred by the enterprise, starting from which, it is possible to plan a premium level, the restriction of which is determined by the maximum parameter of the market price at which these products can be sold.

To better meet customer expectations and market price changes, pricing should include a phased formation scheme - from the maximum price list for single purchases to the lowest possible price that allows you to respond to competitors' actions. At the same time, profitability standards at all price levels should reflect the relevant indicators of business profitability and be available to management in making decisions (Fairlie and Fossen 2018). The pricing system should include volume changes necessary to compensate for the price factor's impact on each price change.

The lower price limit is variable costs, but the company needs to reimburse all costs, including fixed costs, and make a profit. The method that allows you to connect pricing with financial targets and manage them in real-time is the margin analysis method, according to which the price of the product compensates for the elements of variable costs, forming a profit margin, which, in turn, is a source of covering fixed costs and obtaining the necessary level of operating profit and profitability. It is possible to solve the problem of determining sales volumes' changes to balance the influence of volume and price using a marginal approach and break-even analysis. In cases of changes in sales volumes, prices, or costs, an advance forecast and adjustment of changes necessary to increase revenue, profit, and margin can be performed by factor analysis.

In cases of changes in sales volumes, prices, and costs, an advance forecast and adjustment of changes necessary to increase revenue, profit, marginal, and operating profitability can be performed based on factor analysis.

In pricing, the pricing method based on accounting for marginal costs is called the marginal cost method. This method involves considering the price of products in terms of variable (marginal) costs. This method's application is based on the principle of profit margin, due to which fixed costs are reimbursed. The marginal cost method is more complex than the full cost method, as it focuses on a multi-factor approach to pricing. In the case of its use, the enterprise should evaluate the potential sales volume in the context of assortment price parameters. The marginal cost method is advisable to apply in situations where the enterprise has sufficient production capabilities, provided that the achieved volume of product sales fully compensates for fixed costs, and also provided that the company realizes the task of optimizing the price line by varying their parameters for individual types of products, individual orders, contracts, etc. (Wei and Lan 2019).

Besides, this method is relevant when the company implements a price component to increase its market share, while prices are set at a lower level than competing companies.

When constructing prices based on the full cost, the company is limited in flexible changes in prices. Besides, the distribution of fixed costs by type of product may distort data on the product's real level of profitability. Since when constructing prices based on only variable costs, the company runs the risk of not fully covering the total costs, to build a multifunctional and flexible system of pricing, within its structure, it is necessary to distinguish not only variable and fixed operating costs, but also profit margin, which should compensate for other fixed costs associated with the functions of product sales and the general management system (commercial and administrative expenses). The minimum specific indicator of the part of the price necessary to cover commercial and administrative expenses can be determined based on the company's financial statements.

To implement the proposed approach to the justification of price parameters, a production company was chosen whose fixed costs for the reporting year amounted to 32.49% (Table 3) of the total revenue from sales. Therefore this value will be the minimum level of projected profit margin when setting threshold price values.

Table 3. *Calculation of the Unit Fixed Costs Indicator.*

Index	Standard period	Reporting period	±Δ	Growth ratio, %
1. Sales revenue, million rubles	81741	79919	-1822	97,8
2. Total production expenses, million rubles	41034	41625	591	101,4
3. Fixed business and management expenses, million rubles	24740	25964	1224	104,9
4. The relative share of business and management expenses in sales revenue, %	30,27	32,49	2,22	107,3

Source: *Developed by the authors.*

For possible price changes, it is necessary to calculate the specific cost elements' particular indicators – specific variables, specific constants, and the specific profit margin in the product's price. The higher the level of profit margin for a particular type of product, the more maneuver the company has in reducing costs to increase sales (Table 4).

Table 4. *Unit Price Elements.*

Index	Sum, rubles	Relative share in the price, %
1. Variables	220	22,68
2. Total fixed manufacturing costs	324	33,40
3. Fixed business and management expenses	315	32,47
4.Profit margin	750	77,32
5. Unit price	970	100,00

Source: *Developed by the authors.*

At the next stage, it is necessary to determine the criteria for evaluating decisions in the field of pricing, that is, to determine the level of operating margin standard, which is one of the main issues of pricing. It is necessary to determine the minimum, current, and desired level of operating profitability and calculate the relevant indicators of sales profitability, cost-effectiveness, and the amount of sales revenue necessary to achieve the desired level of profitability, based on the available resource capabilities of the manufacturing enterprise. The calculations are as follows:

Calculations are made according to the following formulas:

1. Profit margin: PMmin = (ROAmin×TA) / S × 100

where:

PM – profit margin;

ROA – return on assets (the ratio of profit (revenue minus all expenses and before interest on capital and taxes) to the total value of assets);

TA – total assets;

S – sales profit;

2. Return on costs: PTC = PM / (1 – PM) × 100,

where:

PTC – profit to cost;

3. Revenues to achieve a given level of profitability:

Revenue = Gross input × (PTC + 1)

Next, the minimum, current and desirable indicators of the ratio of profitability, gross profit, and costs are determined (Table 5).

Table 5. *Break-Even Point Calculation According to Reporting Data.*

Index	Standard period	Reporting period	±Δ	Growth ratio, %
1. Sales revenue, million rubles	81741	79919	-1822	97,8
2. Total expenses, million rubles	41034	41625	591	101,4
3. Fixed selling and administrative costs, million rubles	24740	25964	1224	104,9
4. Breakeven point, million rubles	59718	63331	3614	106,1

Source: *Developed by the authors.*

For the minimum level of profitability, you can take the level of profitability necessary to reach the breakeven point:

ROS = PM = (ROA × TA) / S × 100

ROS min = PM_{marg} = (T – FC) / S = (63,331 – 41,625 million rubles) / 63,331 million rubles = 0,34%;

ROA = ROS / 100 ×S / TA = 41 /100 × 63,331 million rubles / 117,470 million rubles = 18,5%;

PTC = 0,41 / (1 – 0,41) = 52,14%.

The current (reporting, actually achieved) and desirable indicators are calculated similarly.

Current performance:

PM = 47,9%;

ROA = ROS/100 ×S/TA = 47,9 /100 × 79,919 million rubles / 117,470 million rubles = 32,6%

PTC = 0,479 / (1 – 0,479) = 69,2%;

Indicators required to achieve (Table 6):

PM = 50%

ROA = ROS / 100 ×S / TA = 50 /100 × 83,250 million rubles / 117,470 million rubles = 35,4%;

PTC = 0,5 / (1 – 0,5) = 100%.

Table 6. *Calculation of Indicators of the Ratio of Profit to Costs.*

Cost level	ROS (PM), %	ROA, %	PTC, %	S, mln.rub.
Minimum	34,3	18,5	52,14	63,331
Current	47,9	32,6	92,00	79,919
Desirable	50,0	35,4	100,00	83,250

Source: *Developed by the authors.*

Next, you need to add an extra charge corresponding to the level of profitability to the expense portion. It is necessary to calculate several price levels - with minimal profitability, current, and target profitability (Table 7).

Table 7. *Calculation of Indicators for Several Levels of Price Offers.*

Expenses	Rubles per 1 unit of production	Specific indicator in the price,%
Variable cost	220	-
Fixed cost	324	-
Minimum profit level	115	34,27%
Profit level 1	284	34,27%
Profit level 2	500	47,92%
Profit level 3	707	56,52%
Minimum price	335	
Price for profit level1	828	-
Price for profit level2	1 044	-
Price for profit level3	1 251	-
Standard price	1 675	-

Source: *Developed by the authors.*

Thus, in the structure of the price, some influences are considered:

- Cost elements (variable and fixed);
- Average and specific cost indicators;
- Profit margin and its particular level;
- Options of mark-up levels corresponding to the financial indicators of the company.

Price options calculated with different margins are the deviation levels from the standard price list and allow the company management to decide on possible discounts based on the generated data on the profitability of specific transactions. Moreover, all the necessary financial calculations and possible parameters of price changes can be prepared in advance (Yamori et al. 2017). Thus, the management of the company gets the opportunity to make decisions regarding price dynamics, knowing the financial parameters of transactions, and focusing on its relevance to the goals of the manufacturing enterprise.

Conclusions and Further Research

The study presented universal methods for factor analysis of profit margin and profitability and calculated the influence of various factors on them using two multifactor models – profit margin and profit margin ability provide ample opportunities to use them to manage the operating activities of a manufacturing company (Franklin and Marshall 2019). As a result of retrospective calculations, the most significant factors that influenced the dynamics of profit margin and profitability were identified. Using similar models to predict the possible impact of various factors on the effectiveness of the company's operating activities in the coming budget period is justified.

The versatility of multivariate performance modeling is based on a marginal approach using historical data. It allows the user to assess the impact of various factors in the practice, the most important price. The proposed algorithms are also relevant to the following tasks:

- Formation of a pricing policy for the future when developing operating and financial budgets in conditions of significant volatility of market prices;
- Determination of measures to optimize sales policy;
- Justification of proactive measures aimed at minimizing financial losses;
- Prevention of negative trends to reduce market share and reduce business risks (Chen and Waters 2017).

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