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**МАРЖИНАЛЬНЫЙ АНАЛИЗ КАК ИНСТРУМЕНТ КОНТРОЛЛИНГА
ПРОМЫШЛЕННЫХ ПРЕДПРИЯТИЙ**

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Аннотация. Пивобезалкогольное производство в Алтайском крае является одной из динамично развивающихся отраслей. Благодаря широким кооперативным связям рост пивобезалкогольных компаний способствует одновременному развитию оптовой и розничной торговли, сельского хозяйства, транспорта, селекции, производства тары и упаковки. Важна роль предприятий и в сфере формирования приемлемой структуры потребления алкогольных напитков, которая предполагает замещение потребления крепкого алкоголя менее крепкими напитками. В то же время отрасль испытывает существенные ограничения в связи с реализацией государственных программ по повышению продолжительности и качества жизни населения. Введенные ограничительные меры существенно сузили возможности роста компаний, повысили значимость таких инструментов оценки деловых решений, как маржинальный анализ, который позволяет выявить оптимальные пропорции между переменными и постоянными затратами, ценой и объемом реализации, минимизировать предпринимательский риск, который существенно возрастает, когда предприятие снижает объемы продаж и работает не на полную мощность. В статье на основе фактических данных предприятия, проведен маржинальный анализ и обоснованы управленческие решения, касающиеся ассортимента продукции при неполной загрузке производственных мощностей. Принятие обоснованных управленческих решений является важным фактором повышения эффективности деятельности предприятий пивобезалкогольного сектора, имеющих многономенклатурное производство.

Ключевые слова: маржинальный анализ, пивобезалкогольное производство, безубыточность, запас финансовой прочности, операционный рычаг.

MARGIN ANALYSIS AS A TOOL FOR CONTROLLING INDUSTRIAL ENTERPRISES

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Abstract. *The article considers the problems of creating accounting and information support of controlling industrial enterprises.*

Beer and non-alcoholic production is one of the fastest growing industries in the Altai region. The broad cooperative ties of these enterprises contribute to the simultaneous development of wholesale and retail trade, agriculture, transport, selection and packaging production. These companies play an important role in shaping the optimal structure of alcohol consumption, which involves replacing strong alcohol with less strong drinks. At the same time, the industry is experiencing significant restrictions due to the implementation of state programs to improve the length and quality of life of the population. The introduced restrictive measures significantly narrowed the growth opportunities of companies and increased the importance of such a controlling tool as margin analysis. This type of analysis allows you to identify the optimal proportions between variable and fixed costs, price and sales volume, and minimize business risk, which increases significantly when the company reduces sales volumes and does not work at full capacity. In the article, based on the actual data of the enterprise, a margin analysis is carried out and management decisions concerning the product range in case of incomplete utilization of production facilities are justified. Sound management decisions are an important factor in improving the efficiency of enterprises that produce beer and soft drinks with diversified production.

Keywords: *margin analysis; break-even point; financial strength reserve; operating leverage.*

The production of beer and mineral water is one of the dynamically developing branches of the food industry, making a significant positive contribution to the economy. This production contributes to the simultaneous development of related industries, such as agriculture, transport, glass, packaging production, trade, selection. According to statistics, one job in beer production provides up to 12 jobs in related industries [2,4]. Tax revenues of beer and alcohol enterprises are

spent on social development programs, support of physical culture and sports institutions, education. The stabilization of the financial situation and the growth of economic activity of companies producing beer and soft drinks contributes to the creation of additional jobs in the region, providing the unemployed with jobs and income. International integration involves the transition to the "European" type of alcohol consumption, a characteristic feature of which is a steady decline in the number of alcoholic beverages consumed, replacing them with "light" alcohol, mainly beer. More than 20 years ago, a number of scientists (Edwards G., Anderson P., Babor T.) attempted to determine the "ideal" structure of alcohol consumption, minimizing the negative effects of alcohol consumption on public health. The share of beer consumption is 50%, wine is 35%, and spirits is 15% in this structure. Therefore, the solution of this most important state social task also requires from the management of beer and non-alcoholic enterprises balanced management decisions aimed at preserving and increasing the potential of companies in the industry. State policy should be balanced in terms of ensuring the formation of budget revenues and improving the duration and quality of life of the population. However, over the past few years, a number of significant restrictions on the sale and advertising of beer in public places, production technology has been introduced. Conditions of financial and economic activity of beer and alcohol enterprises are presented in table 1.

Table 1

Complex of factors determining the peculiarities of financial and economic activity of beer and alcohol enterprises in Russia

The factors of macroeconomics	The factors of industry	The factors of organization
Implementation of the state policy to improve the quality of goods and services, Strategy for the formation of a healthy lifestyle	Legislative consolidation of the content of components in the beer (80% of malt, no more than 20% of unmalted grain products, of which no more than 2% of sugar-containing products), which creates an additional burden on malt producers, barley and brewing companies.	Continuous control of the composition and quality of products, significant costs for quality assurance, including certification according to international standards
Russia's accession to the WTO, market opening for transnational corporations, new product quality standards (ISO standardization)	Increased competition and at the same time strict regulation of beer sales (restrictions on advertising in the media, limitation of time and points of sale, the age of buyers, the use of PET-containers)	A large share of the costs associated with the promotion of goods to the market, the inability to use standard promotions requires the implementation of new formats of expensive large-scale advertising projects
Focus of state policy on increasing taxes and fees	A complex system of taxation and increased tax burden in the sale of beer	The need to constantly search for internal and external sources of stabilization of the financial position of the company, competitive advantages
Crisis phenomena, growth of foreign exchange rate, introduction of sanctions and counter-sanctions	Fall in effective demand, reduction in production and sales of products for export	The complexity of cost planning, determining the cost of production. At the same time the instability of foreign exchange rates reduce the reliability of the budget of material costs

Lack of coordinated state support for related enterprises supplying rye, corn, wheat	A complex branched system of interaction with the enterprises-subcontractors, lack of development of cooperative ties. Seasonality in agriculture, raw material dependence on foreign suppliers.	Additional load on the planning system, the need for temporary synchronization of supply processes, production, sales. High material consumption of products, the presence of returnable waste determines the need for detailed cost control
State regulation of food production organization	Features of the organization of the production process	The production process is a sequence of main and auxiliary technological stages, side productions.

Source: compiled by the author

Restrictive and prohibitive norms of recent years have a negative effect, create unequal market conditions for doing business in the beer-non-alcoholic industry and hamper the development of companies.

The financial and economic conditions of beer and non-alcoholic enterprises are presented in table 2.

Table 2

Indicators characterizing the activity of beer and alcohol enterprises in the Altai region for 2015-2018

Indicators	Period, year				Absolute deviation (2018-2015)	Growth rate,% (2018/2015)
	2015	2016	2017	2018		
Produced, million dal:						
- beer	20,12	22,1	21,4	21,042	0,922	104,58
- mineral water	305,47	315,8	311,71	350,84	45,37	114,85
- other soft drinks	12,52	12,7	12,132	13,09	0,57	104,55
Production index, coefficient (by type of economic activity "production of drinks")	103,7	111,1	103,6	96,8	-6,9	93,35
Financial result (profit minus loss), mln. rub.	302,06	293,27	264,20	430,3	128,24	142,45
Share of unprofitable organizations, %	21	23	25	40	-	190,48
Profitability,%:						
- products	14	14,8	14,4	9,8	-4,2	70,00
- assets	5,8	6,9	6,4	4,7	-1,1	81,03
Level of production capacity utilization, %:						
- production of beer	81	86	83	79	-	97,53
- production of drinks	50,4	53,5	51,8	54	-	107,14

Source: compiled by the authors according to the data of the Federal state statistics service for the Altai territory and the Republic of Altai, <https://akstat.gks.ru>

Table 2 shows an increase in beer production by 5.58%, mineral water by 14.85% and other soft drinks by 4.55%. However, the production of alcoholic and non-alcoholic beverages has not

reached the level of the pre-crisis period. This is evidenced by the value of the production index, equal to 96.8. The growth of the financial result by 42.45% , while the share of unprofitable enterprises almost doubled, had a negative impact on the level of profitability. Thus, the profitability of products decreased by 30% and the return on assets-by 29%. A negative trend is also a reduction in the level of beer production capacity utilization by 2.57%. This indicates a significant underutilization of production capacity. This factor should be taken into account when evaluating business decisions.

The expenses of enterprises were supplemented by such atypical elements as the development and support of websites, the organization of surveys, membership in associations and unions, the holding of charity events and the maintenance of a positive image. In conditions of significant legislative pressure, beer-non-alcoholic enterprises need reliable tools for assessing business decisions, one of which is marginal analysis. It allows you to determine the optimal proportions between variables and fixed costs, price and sales volume, minimize business risks, which is a significant increase in conditions of incomplete production capacity utilization. The margin analysis methodology is based on the separation of costs into fixed and variable depending on the reaction to changes in production volume [4,5,10,25]. The calculated indicators are the breakeven point in the monetary, physical and temporal dimension, the reserve of financial stability, and operational leverage.

Calculations are made on the example of the existing beer and non-alcoholic enterprise, which produces seven product lines: mineral water, soft drinks with different formulations ("Pear", "Extra – Citro", "Cream soda", "Pinocchio", "Lemon"), beer "Hop". The calculations are presented in table 3.

Table 3

Information on income and expenses of beer and non-alcoholic enterprises

Product	Volume, liter	Revenue, ruble	Total variable cost, ruble	Total fixed cost, ruble	Marginal profit, ruble	Total cost, ruble	Profit, ruble
Mineral water	600900	4154689	1550897	909170	2 603 792	2 460 067	1 694 622
Soft drinks "Pear"	723 407	8 824 749	5 531 925	401 220	3 292 824	5 933 145	2 891 604
Soft drinks "Extra – Citro"	198 934	2 516 964	988 415	325 630	1 528 549	1 314 045	1 202 919
Soft drinks "Cream soda"	32 405	438 462	203 815	55 740	234 647	259 555	178 907
Soft drinks "Pinocchio"	154 035	656 436	518 470	141 564	137 966	660 034	-3 598
Soft drinks "Lemon"	139 368	1 735 675	502 120	111 926	1 233 555	614 046	1 121 629
Beer "Hop"	70 487	7 780 438	5 588 744	405 250	2 191 694	5 993 994	1 786 444
Total	-	26107413	14884386	2 350 500	11223027	17234886	8 872 527

Source: compiled by the author

According to reports, the drink "Pinocchio" is unprofitable. However, if it is removed from production, the total financial result will be reduced by the amount of margin income of 137966 rubles. That is, if the product has a positive margin income, then its withdrawal from production will only worsen the financial situation of the enterprise. Analysis of the assortment based on the total cost leads to negative consequences.

Using margin analysis to make decisions about the product range allows you to calculate the critical volume of production (break-even point) in physical, monetary and time terms [2,11,12]. The break-even point is the volume of sales, the revenue from the sale of which covers all costs, the company does not have a profit or loss. If the actual sales volume is below the break-even point, the company incurs losses, and if it is above the break-even point, the company makes a profit. Break-even sales in the production of several products can be determined by the formula 1.

$$\sum_{i=1}^n Q_i \times P_i - \sum_{i=1}^n Q_i \times AVC_i - FC = 0, \quad (1)$$

where Q_i is break-even volume of the i -th type of production;

P_i is the price of the i -th type of production;

AVC_i is average variable cost of the i -th type of production;

FC is total fixed cost.

The break-even point is calculated mathematically, the variable "x" is equal to the minimum sales volume.

Table 4

Initial data for the calculation of break-even production

Indicators	Mineral water	Soft drinks "Pear"	Soft drinks "Extra – Citro"	Soft drinks "Cream soda"	Soft drinks "Pinocchio"	Soft drinks "Lemon"	Beer "Hop"
Volume, liter	600 900	723 407	198 934	32 405	154 035	139 368	70 487
Calculation index	18,54x	22,32x	6,14x	x	4,75x	4,30x	2,18x
Price, ruble	6,91	12,20	12,65	13,53	4,26	12,45	110,38
Average variable cost, ruble	2,58	7,65	4,97	6,29	3,37	3,60	79,29

Source: compiled by the author

Using formula 1, we obtain the following expression:

$$18,54x \cdot 6,91 - 18,54x \cdot 2,58 + 22,32x \cdot 12,2 - 22,32x \cdot 7,65 + 6,14x \cdot 12,65 - 6,14x \cdot 4,97 + 13,53x - 6,29x + 4,75x \cdot 4,26 - 4,75x \cdot 3,37 + 4,3x \cdot 12,45 - 4,3x \cdot 3,60 + 2,18x \cdot 110,38 - 2,18x \cdot 79,29 - 2350500 = 0$$

$x = 6\,788$ liter. This is break-even sales of soft drinks "Cream soda".

Then 125 844 liters is the breakeven sales volume of mineral water, 151 502 liters is the breakeven sales volume of Soft drinks "Pear", 41 677 liters is the breakeven sales volume of soft drinks "Extra – Citro", 32 242 liters is the breakeven sales volume of soft drinks "Pinocchio", 29 188 liters is the breakeven sales volume of soft drinks "Lemon", 14 798 liters is the breakeven sales volume of beer "Hop".

Thus, the enterprise has no profit, but also does not bear losses if realizes the given volume of production. The actual sales volume significantly exceeds the break-even volume; therefore, the

company makes a profit and has a financial strength reserve, which is calculated by the formulas 2, 3[15,16,18]:

$$\text{Financial strength reserve, rubles} = \frac{\text{Revenue, rubles}}{\text{Breakeven sales, rubles}} - 1 \quad (2)$$

$$\text{Financial strength reserve, \%} = \frac{\frac{\text{Revenue, rubles}}{\text{Breakeven sales, rubles}} - 1}{\frac{\text{Revenue, rubles}}{\text{Breakeven sales, rubles}}} \times 100\%, \quad (3)$$

The breakeven-point in rubles is calculated by the formula 4:

$$\text{Breakeven point, rubles} = \frac{\text{FC}}{K_m} \times 100\%, \quad (4)$$

where FC is the fixed cost, rubles;
K_m is margin profit ratio, coefficient.

In turn the margin profit ratio is calculated by the formula 5:

$$\text{Margin profit ratio} = \frac{\text{Margin profit, rubles}}{\text{Revenue, rubles}} \times 100\%, \quad (5)$$

The indicators calculated by the formulas 2,3,4 and 5 are presented in table 5.

Table 5

The calculation of the financial strength reserve

Indicators	Value of indicators
Revenue, ruble	26 107 413
Total variable cost, ruble	14 884 376
Margin profit, ruble	11 223 027
Margin profit ratio, coefficient	0,43
Breakeven-point, ruble	5 467 818
Financial strength reserve, ruble	20 639 585
Financial strength reserve, %	79,05

Source: compiled by the author

Let's supplement the margin analysis with the calculation of the break-even point in time units (days), which will allow us to consider the achievement of this indicator in relation to the time period. If the company received revenue in the amount of 26 107 413 rubles per month (30 days), the break-even point was made:

$$\frac{30 \text{ days} * 5467818}{26107413} = 6.3 \text{ days}$$

The rest of the time (23.7 days) the company worked for profit.

Break-even point calculation in days is crucial for the organization of control over planned indicators. It represents one of the reference points. Monitoring its achievement is mandatory due to the above circumstances. Deviations of the system from the planned trajectory in the process of its movement to the target are caused by positive and negative parametric disturbances. Equipment breakdowns, malfunctions in logistics, power outages and unplanned work occur are negative parametric disturbances. They have the effect of reducing speed and increasing time to reach the target. While the introduction of scientific developments, improving the quality of raw materials and increasing labor discipline are considered as positive parametric disturbances. They are associated with increased speed and reduced time. It is the presence of disturbances that determines the need for monitoring the achievement of planned targets and implementing managerial impacts in appropriate situations. Note that monitoring the progress of the scheduled task can be carried out continuously or discretely. However, continuous monitoring, as well as monitoring with a high frequency, causes an excessive load on the information system and leads to an increase in costs. The organization of measurement and control of technological processes is rational if it is based on critical principles of profitability and rationality. Profitability and rationality suggests that the cost of the process should always be lower than the results obtained from its use.

Figure 1 graphically presents a theoretical model of the process aimed at achieving the target.

Fig. 1. – Process graphical representation.

In the case under consideration, $A_1(t)$, $A(t)$, $A_2(t)$ is the amount of work performed during the time of $t_{\min}$, t_{pl} , $t_{\max}$ at a speed of $V_{\min}$, V_{pl} , $V_{\max}$.

There are various methods for determining the frequency of monitoring. The control time of reaching break-even volume is one of the control points. Figure 2 shows seven process control points. At point t_2 , the break-even volume is monitored. Timely achievement of the breakeven point acts as an important factor in the implementation of the plan for operating profit, the reality of the schedule for repayment of receivables and cash balances on accounts.

An important element of margin analysis is the calculation of operating leverage, which characterizes the level of entrepreneurial risk. The effect of the operating lever is that any change in revenue always necessarily leads to a stronger change in profits. The impact of the operating lever depends on the amount of fixed costs: the higher the level of fixed costs, the greater the impact of the operating lever [24].

Calculate the effect of the operating lever by the formula 6:

$$\text{Operating lever, coefficient} = \frac{\text{Marginal profit, rubles}}{\text{Profit}} = \frac{11223027}{8872527} = 1.26 \quad (6)$$

Operating leverage shows that when revenue changes by 1%, profit increases by 1,26%. Under favorable market conditions, the high value of the operating lever allows the company to increase its profits. However, in conditions of economic instability, with a decrease in the effective demand of consumers of products, the high value of the operating lever significantly worsens the financial results of the enterprise. This is due to the fact that each percentage decrease in revenue leads to an even greater drop in profits and the company enters the zone of losses.

Thus, the use of margin analysis tools in management decision-making will help the management of beer and non-alcoholic enterprises:

- to justify management decisions at incomplete loading of production capacities;
- to select the product groups that bring the greatest profit;
- to make decisions on the volume of production of certain types of products;
- to determine the break-even volume production;
- to determine the financial strength reserve;
- to assess the level of business risk.

Margin analysis on beer and non-alcoholic enterprises is used only if the calculation of variable cost.

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