

Break-even Analysis of Industrial Enterprises in the Regions of Kazakhstan

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Abstract—This article analyzes the profitability of the enterprise, which is significant and cannot be overestimated. Since profit determines the final result of the financial activity of any enterprise, which is a source of increasing the financial resources of the enterprise. Thus, the article analyzes the effectiveness of commercial activities, the impact of costs on the most important indicators, as well as various ways to reduce them. The analysis of break-even activity of the company "Bayan Sulu" JSC based on the results of the financial statements for 2017-2018 was carried out. Reducing production costs allows the company to earn high dividends from investments and sell finished products. Thus, the break-even point was calculated for the production of Bayan Sulu JSC. this indicator is significant when drawing up a plan for the production and sale of finished products at the enterprise under study. Also, the break-even point value allows us to understand the balance of costs and revenues at the enterprise and allows us to make decisions about changes in prices for products (works, services). It is natural that the state of break-even at higher (lower) fixed costs can be achieved with a significantly larger (smaller) volume of product sales than for companies with high (low) variable costs.

Keywords—break-even point, threshold of profitability, profit margin, operating leverage, safety margin.

I. INTRODUCTION

It is very important for every business to understand the moment when an enterprise can fully cover its losses and start making revenue. CVP analysis in managerial economics or cost accounting allows characterizing the economic activity of the enterprise, its effectiveness, at the same time helping to distribute manufacturing expenses and possible ways to reduce these expenses.

Based on past experience, it can be established that attempts to make the right management decisions without taking into account the behavior of expenses can lead to negative consequences. For example, the decision to increase the output in 3 times does not mean that the final revenue of the enterprise will also be tripled.

First it needs to be understood which costs are fixed and which are variable, because its understanding is essential for calculations. Fixed costs: depreciation expenses, basic salary and fringe benefits of administrative personnel (with deductions), rent expenses and others. Fixed costs remain the same for different scales of production for a certain period of time. However, in practice, it can be expected that total fixed costs remain the same for all the production levels. Most likely, they will grow by stages [2, 5, 8].

Variable costs: primary and secondary materials, components, semi-finished goods, fuel and energy for technological needs, fixed wages and benefits of workers (with deductions) and so on. So, these costs increase with increasing output of production, while decrease when output decreases.

II. METHODS

The methodological basis of the study of the work was: the general dialectical-materialistic method; general scientific methods, such as: system, analysis and synthesis, induction, deduction, methods of economic and statistical analysis, the method of expert assessments.

III. MAIN PART

To study the financial results of the activities of Bayan Sulu JSC, consider the distribution of costs. Since the availability of more detailed information on costs makes it possible to: set the price of products, services, assess the efficiency of processes, as well as the efficiency of using resources by individual departments, the importance of customers in terms of their contribution to the profit of organizations [5-9, 11-18].

Variable and fixed costs are the two main types of costs. Each is determined depending on whether the total costs change in response to fluctuations in the selected object (often referred to as volume fluctuations). Variable costs change in total directly proportional to volume changes. Permanent (fixed) - remain without changes. Consider the

available fixed and variable costs in the surveyed enterprise (see Table 1).

The table shows that for the analyzed period the largest share is occupied by variable costs, if in 2018 compared to 2017 there is an increase in variable costs by 0.41 %, then in 2019 compared to 2018 there is a decrease of 0.05%.

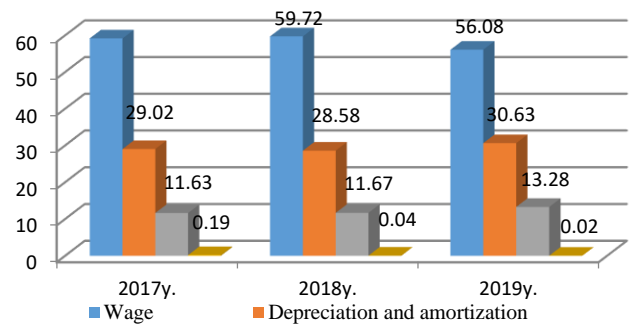


Fig. 1. The structure of fixed costs of Bayan Sulu JSC, %

TABLE I. DISTRIBUTION OF CONSTANTS AND VARIABLES FOR THE PERIOD FROM 2017 TO 2019, BAYAN SULU JSC, THOUSAND TENGE

Cost types	2017 y.		2018 y.		2019 y.		Change in specific gravity,%
	thousand tenge	specific gravity, %	thousand tenge	specific gravity, %	thousand tenge	specific gravity, %	
General fixed costs	1730373	17,37	1929608	16,96	2155827	17,01	-0,36
Wage	1023654	59,16	1152364	59,72	1208931	56,08	-3,08
Depreciation and amortization	502211	29,02	551430	28,58	660223	30,63	1,60
Repair costs	201277	11,63	225132	11,67	286243	13,28	1,65
Expense for creating a provision for depreciation of raw materials and supplies	3231	0,19	682	0,04	430	0,02	-0,17
General variable costs	8232250	82,63	9447708	83,04	10517029	82,99	0,36
Raw materials and supplies	7300623	88,68	8514234	90,12	9323546	88,65	-0,03
Utilities	310403	3,77	321021	3,40	334056	3,18	-0,59
Finished goods and work in progress	621224	7,55	612453	6,48	859427	8,17	0,63
Total costs	9962623	100	11377316	100	12672856	100	

This testifies to the rational use of raw materials and materials, to a lesser purchase of semi-finished products and components, to save electricity and heat. The structure of fixed and variable costs is shown in Figures 1 and 2.

In Bayan Sulu JSC, depending on the purposes for which information on costs is used, they can be classified in the following three areas: to determine the cost, financial results; for making management decisions; for control and regulation.

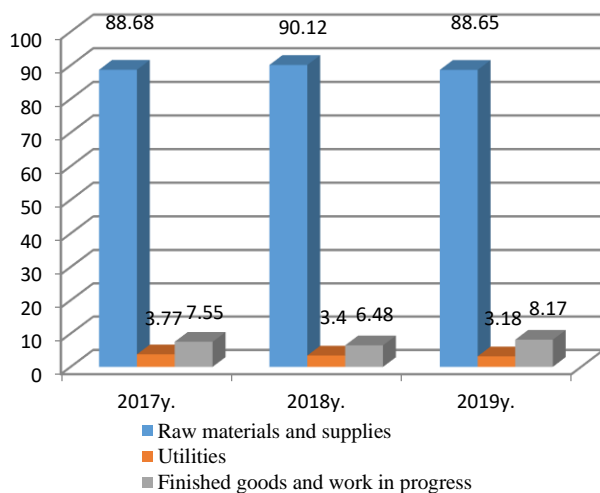


Fig. 2. The structure of variable costs of Bayan Sulu JSC, %

According to the first direction of classification, costs are subdivided: direct and indirect, production costs and costs of the period, main and overhead, by elements and cost items, those that include in the cost of production and those that do not include in the cost.

According to the second direction of classification, costs are divided into: relevant, which depend on the adoption of managerial decisions and irrelevant, marginal (marginal), differential (incremental), v - Alternative.

The classification of costs according to the third direction "For control and regulation" contains two types of costs: controlled and uncontrolled.

The CVP analysis shows how changes in production volume can affect the level of profit in the short term, and we can see changes in indicators in the long term. For example, the growth of fixed costs. The value of the analysis of break-even activity is to find a critical acceptable (minimum) volume of production, at which production at the company will be break-eve.

The break-even point (this indicator is also called the "profitability threshold") is formed when the amount of revenue received fully covers the costs of the enterprise and the profit has a value equal to zero. The net profit indicator is determined by the following formula

$$\text{Net Income} = (\text{Units of Output} * \text{Price}) - (\text{Units of Output} * \text{Variable Costs per unit}) - \text{Fixed Costs} \quad (1)$$

In the future, the following formulas are used to find the break-even point in physical and monetary terms

$$\text{Break - even point (units)} = \frac{\text{Fixed costs}}{\text{Contribution Margin per unit}} \quad (2)$$

$$\text{Break - even point (dollars)} = \frac{\text{Fixed costs}}{\text{Contribution Margin ratio}} \quad (3)$$

$$\text{Contribution Margin Ratio} = \frac{\text{Contribution Margin}}{\text{Revenue}} \quad (4)$$

The impact of changes in sales volume on the company's profit reflects the operating leverage indicator. To find out how many percent of the profit will change, you should multiply the percentage change in sales volume by the level of operating leverage. The operating leverage indicator is defined as the ratio of margin income to profit.

The financial security margin is the edge (margin) of an enterprise's security. By calculating this value, you can assess the possibility of further reduction in sales revenue within the break-even point. Therefore, the financial security margin represents the difference between sales revenue and the profitability threshold

The subject of the research in this article was the company "Bayan Sulu" JSC. The main purpose of the joint-stock company is the production and sale of confectionery products (wholesale and retail), the company exports its products to the CIS countries and abroad, and also trades its products such as flour, wheat, sugar and others on the territory of the

Republic of Kazakhstan.

According to table 1, we can see that revenue increased by 2576.91 thousand US dollars or 35.5%, and the Deposit margin increased by 3941.37 thousand US dollars or 30.8 %.

Thus, the company under study increased its sales to cover its fixed costs. As a result, the Deposit margin ratio increased by 1%. That is, for every 100 dollars of the sales contribution, the margin is equal to 1 dollar.

In the future, the company may reduce its operating leverage by 0.06 %. A low level of operational leverage will mean, with a decrease in fixed costs, an increase in variable costs. As a result, it can be argued that the presence of fixed costs results in a percentage change in sales volume increasing the percentage change in operating profit or resulting in a loss. We also see that the company's revenue increases by 10 %, its profit will increase by 16.9 % or by \$ 1,606. 5 per year. Operating leverage increases both the company's profit and its losses

The estimation of the ratio of costs, sales and profit of Bayan Sulu JSC is presented in table 2.

TABLE II. THE VOLUME OF SALES AND THE PROFIT OF JSC "BAYAN SULU", THOUSANDS OF US DOLLARS

Indicators	2017 y.	2018 y.	Deviation (+,-)	Specific gravity,%			Increase rate,%, (+,-)
				2017 y.	2018 y.	Deviation (+,-)	
Total costs, including	30074,03	38726,49	8652,461	100	100	0	27,19
Variable	24850,58	32138,58	7288,005	82,61	82,989	0,357	27,747
Constant	5223,452	6587,908	1364,456	17,41	17,02	-0,359	24,587
Total revenue	37003	48232,38	11229,37	-	-	-	28,758
Total margin income	12152,43	16093,8	3941,368	-	-	-	30,81
Total profit	6928,976	9505,889	2576,912	-	-	-	35,5
Contribution MR	0,33	0,33	0,01	-	-	-	-
Break-even point	15904,92	19743,66	3838,742	-	-	-	22,64
security margin	21098,08	28488,72	7390,633	-	-	-	-
security margin, %	57,01	59,06	2,06	-	-	-	-
Operation leverage	1,76	1,68	-0,06	-	-	-	-3,48

In monetary terms, the break-even point b shows the amount of revenue, this value allows the company to recoup variable and fixed costs in full. So the break-even point of the enterprise was 19743.66 thousand US dollars. With revenue growing by 28.8 % and costs by 27.21 %, the break-even point growth rate was 22.6 %. Therefore, the break-even point will increase in direct proportion to the company's revenues and costs.

The margin of safety shows that sales volumes can be reduced to 28488.72 thousand US dollars before businesses

start to receive losses. Businesses will suffer losses when actual revenue is less than budgeted, or sales are reduced by 59.1% to the break-even point. The increase in the safety margin by 7130.81 thousand US dollars compared to 2017 at the enterprise is one of the positive aspects.

Figure 3 shows the break-even point of the company's revenue and expenses for 2018.

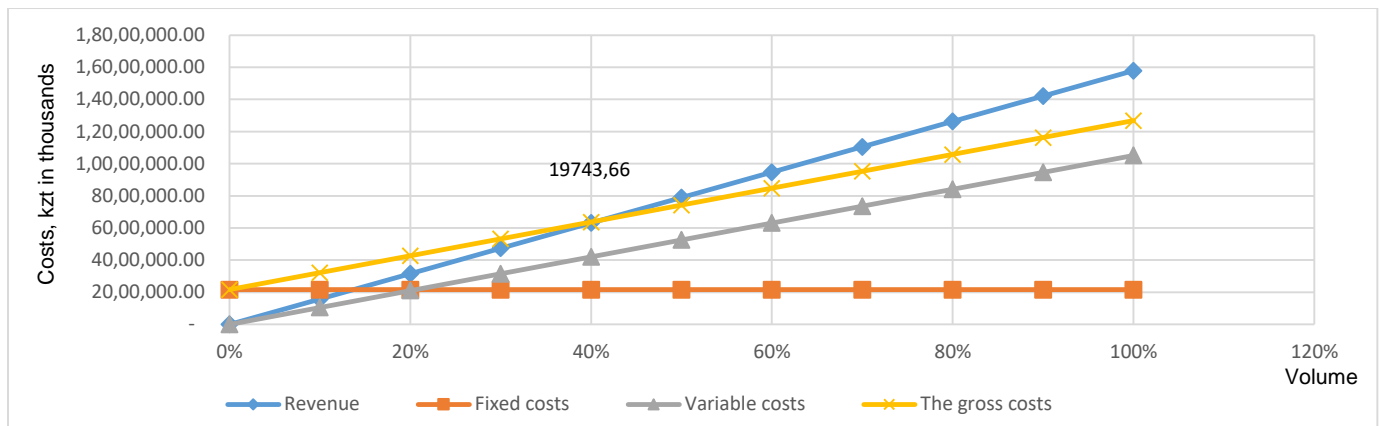


Fig. 3. Break- even point, thousands of US dollars

Table 3 discusses the impact of changes in variable costs on the Deposit margin, operating leverage, margin of safety, profit and break-even point.

In 2017, with an increase in variable costs by 6896,41 thousands of US dollars, the increase rate amounted to 27,8%. This influenced the decrease in contribution margin by the same amount (-6896,41 thousands of US dollars), and arrived at the similar amount. Since profit decreased, the contribution margin ratio decreased to 56,8 %. The break-even point has increased by 20871,26 thousands of US dollars and amounted

to 36774,74 thousands of US dollars.

As a result, under influence of break-even point effect changes, the margin of safety has been reduced by 20871,3 thousands of US dollars and amounted to 224,914 thousands of US dollars. Thus, it can be concluded that increase in variable costs lead to number of negative consequences like decrease of revenue by 99,5 %, while condition of break-even when the enterprise will have neither losses nor income increased significantly and equal 131,2 %.

TABLE III. THE IMPACT OF CHANGES IN VARIABLE COSTS ON THE PERFORMANCE OF, THOUSANDS OF US DOLLARS

Indicators	2017 y.	Nominal value	Deviation (+,-)	Increase rate,% (+,-)	2018 y.	Deviation (+,-)	Increase rate,% (+,-)
Total costs, including	30071,3	36967,71	6896,41	22,93	38726,49	1300,13	3,5
Variable	24848,32	31744,73	6896,41	27,75	32138,58	0	0
Constant	5222,98	5222,98	0	0	6587,908	1300,13	24,6
Total revenue	36999,65	36999,65	0	0	48232,38	10773,68	28,8
Total margin income	12151,33	5254,923	-6896,41	-56,75	16093,8	10773,68	202,5
Total profit	6928,35	31,94	-6896,41	-99,54	9505,89	9473,5	29293,4
Contribution MR	0,33	0,14	-0,19	-56,75	0,33	0,2	134,9
Break-even point	15903,48	36774,74	20871,3	131,24	19743,66	-17487,3	-46,97
security margin	21096,17	224,914	-20871,3	-98,93	28488,71	28261,0	12411,2
security margin, %	57,01	0,61	-56,4	-98,93	59,07	58,46	9616,6
Operation leverage	1,76	164,5	162,74	9279,6	1,69	-162,8	-98,97

With the growth of variable costs for 6896,41 thousands of US dollars in 2017, the increment was 27,8 %. This fact affected the reduction of the revenue margin by the same amount (-6896,41 thousands of US dollars). As a result of the decrease in profit, the marginal revenue indicator also fell by 56,8 %.

But the CVP point (profitability threshold), on the contrary, increased by 20871,26 thousands of US dollars and reached the level of 36774,74 thousands of US dollars.

Consequently, due to the change in the critical threshold of profitability, there was a reduction in the security boundaries, by 20871,3 thousands of US dollars which amounted to 224,914 thousands of US dollars.

Based on this, it can be concluded that an increase in variable costs entails a range of negative consequences, such as a reduction in profit by 99,5%, and the financial situation in which the company will not suffer losses or profit has clearly increased significantly by 131,2 %.

Figure 4 shows how the break-even point has changed with an increase in variable costs.

Table 4 discusses the impact of fixed costs on changes in marginal revenue, security margin, profit, operating leverage, and break-even point.

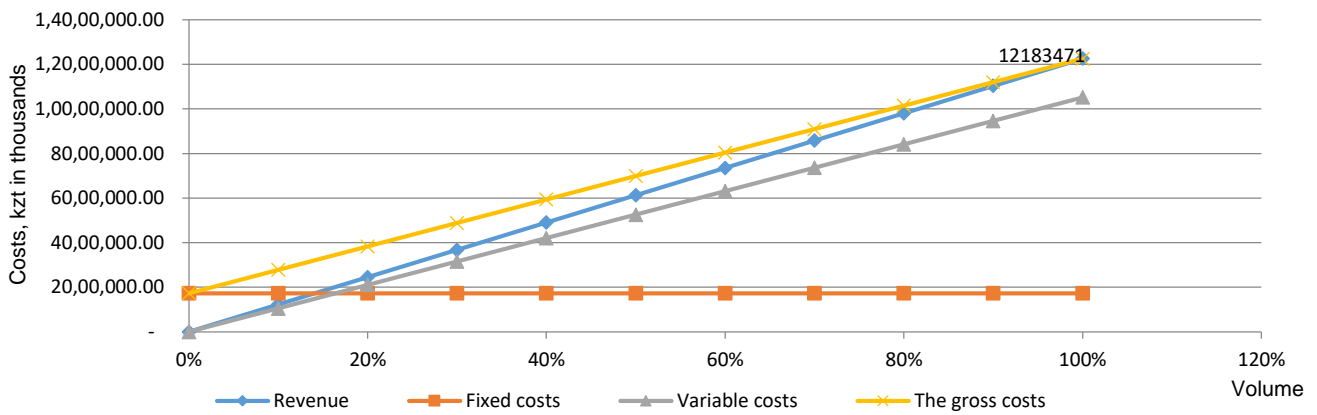


Fig. 4. The effect of changes in variable costs on the break-even point

TABLE IV. THE IMPACT OF FIXED COSTS ON THE PERFORMANCE OF, THOUSANDS OF US DOLLARS

Indicators	2017 y.	Nominal value	Deviation (+,-)	Increase rate,% (+,-)	2018 y.	Deviation (+,-)	Increase rate,% (+,-)
Total costs, including	30071,3	31355,5	1284,19	4,27	38726,49	6981,97	21,99
Variable	24848,32	24848,32	0	0	32138,58	6981,97	27,8
Constant	5222,98	6507,175	1284,19	24,59	6587,91	0	0
Total revenue	36999,65	36999,65	0	0	48232,38	10773,68	28,8
Total margin income	12151,33	12151,33	0	0	16093,8	3791,71	30,8
Total profit	6928,35	5644,15	-1284,2	-18,5	9505,89	3791,71	66,4
Contribution MR	0,33	0,33	0	0	0,3	0,005	1,6
Break-even point	15903,48	19813,74	3910,26	24,6	19743,66	-103375	-1,6
Security margin	21096,17	17185,92	-3910,26	-18,5	28488,71	3628953	63,7
Security margin, %	57,01	46,45	-10,57	-18,5	59,07	12,6	27,2
Operation leverage	1,75	2,15	0,4	22,75	1,69	-0,46	-21,4

Based on the analysis, it is clearly visible that in 2017, with the growth of fixed costs in the amount of 1284,2 thousands of US dollars (the increment indicator 24,6 %), this did not have a significant impact on the overall profitability indicator, and the amount of profit decreased by 1284,2 thousands of US dollars (the increment indicator 18,46 %).

Operating leverage increased by 22,81% which indicates an increase in fixed costs in the company.

CVP-point (profitability threshold) increased by 24,61 % this reflects a corresponding increase in fixed costs on the

same scale. At the CVP point, the difference between planned revenue and revenue decreased by 18,5. In addition, in 2018, there is a positive phenomenon as an increase in the safety margin for 63,7 %. In this regard, the critical CVP point has decreased by 1,6%.

Figure 5 clearly shows how the break-even point changes when fixed costs increase.

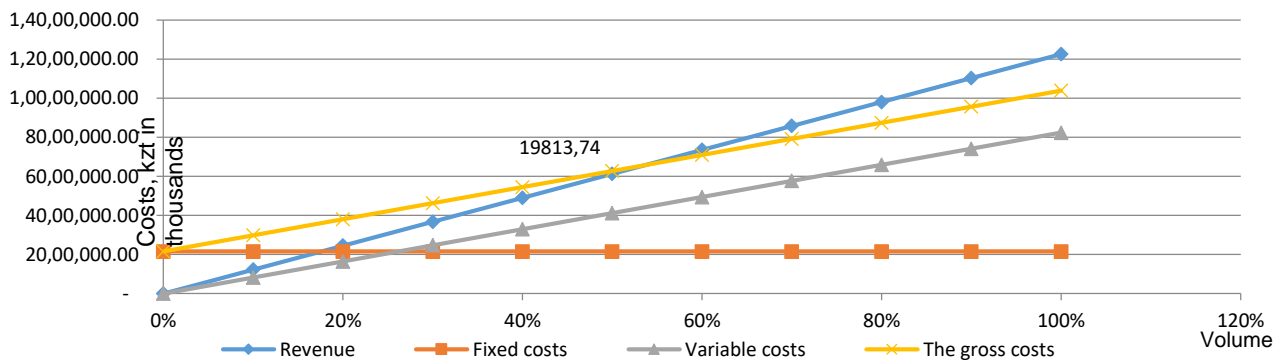


Fig. 5. Effect of changes in fixed costs on the break-even point

For a more complete definition of the results of the company's financial and economic activities, let us consider

the profitability of its activities, which characterizes the quality of the company's work (see Table 5).

TABLE V. INDICATORS CHARACTERIZING THE PROFITABILITY OF «BAYAN SULU» JSC FOR 2017-2019 Y

Index	2017 y.	2018 y.	2019 y.
Revenue, millions of US dollars	52,70308	59,7324	50,6051
Gross profit, millions of US dollars	6,631168	10,32489	8,407981
Net profit (retained earnings (uncovered loss), millions of US dollars	11,22551	11,55708	13,44612
Return on equity, %	16,46	25,2	21,62
Return on assets, %	2,29	1,86	6,71
Net profitability ratio, %	59,07	89,34	62,53
Profitability of products (sales),%	12,58	17,29	16,61
Capital turnover	1,31	1,46	1,3
Net profit millions of US dollars	1,231576	1,438327	4,507357
The amount of uncovered loss at the reporting date millions of US dollars	0	0	0
Equity	40,28068	40,97275	38,88475
Currency balance	53,83278	77,36188	67,16015

Analyzing the indicators characterizing profitability, we can conclude that for the period under study, the company's revenue and profit has a positive growth trend. Also, the return on equity in 2019 increased by 5.16% compared to 2017, the return on assets by 4.42%, the net profit ratio by 3.46% and the return on sales - 4.03%. In this regard, the company managed to close the uncovered losses.

IV. CONCLUSION

In conclusion, it should be noted that the critical point of the profitability threshold becomes one of the main indicators necessary for forecasting and planning production scales and sales. In addition, this factor can be used to compare revenues and total costs, and, accordingly, to make further financial and management decisions regarding the correction of pricing policies for manufactured goods, works and services provided. At the same time, it is possible to determine trends in the further break-even position at various (high/low) levels of constant fixed costs achieved at the maximum (minimum) volumes of costs, in contrast to companies that have the maximum (minimum) sizes of variable costs.

Undoubtedly, the break-even point analysis is implemented on the basis of reports on production costs and sales volumes.

A necessary factor is the distribution of fixed and variable costs. Increasing the volume of costs due to expanded reproduction and resource strengthening of the firm necessarily entail an increase in fixed costs. For example, an increase in production scale affects the growth of costs associated with maintenance and repair of technical equipment. This expansion process is also accompanied by the lease of new premises, the attraction of additional employees, the growth of their salary costs, and the constantly growing costs of marketing, promotion and advertising of manufactured products.

After increasing the indicators that characterize sales volumes, the company rises to a higher level and a high critical threshold of profitability.

Keep in mind that the break-even analysis involves minor limitations and assumptions, such as the scope of materiality, assumptions, and limitations.

In addition, CVP analysis is characterized by the interdependence of cash revenue and the scale of production, and the relationship between profitability and the size of production costs in the short term.

When calculating the break-even point, organizations use the following assumptions and simplifications of reality:

- Product output and costs have a linear relationship (have a linear trend of change);
- Variable costs and prices are constant for products during the future considered period;
- Production capacity is constant, the structure of products and services does not change;
- Stocks of finished goods are not significant and cannot distort the assessment of the organization's break-even point. In other words, the size of production equals the volume of sales;
- Variable costs can be predicted and accurately estimated in the future period;

The ideal conditions for assessing the break-even point are taken: stable market, production and organizational conditions. In reality, production output, sales and costs are influenced by many external factors that are difficult to predict in the planning period.

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