

#### Al Farabi University

Alamperor



Cost-Volume-Profit Analysis
Management Department
"Cost Management" Course
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### Essence and meaning

- When planning production activities, CVP analysis or cost-volume-profit analysis is often used.
- CVP analysis is a cost-volume-profit analysis. CVP analysis is an analysis of cost behavior, which is based on the relationship between costs, revenue (income), production volume and profit. It is a management planning and control tool Administration

The traditional definition of variable costs assumes a linear relationship between costs and volume. If we use fabric worth 2.5 thousand dollars to sew one suit, then to sew 10 suits we will need 10 times more fabric.



# However, most costs are not linearly related to production volumes.

- For example, we purchase fabrics for a garment factory and pay a fixed price per meter, but if the volume of purchases is large, the supplier can provide significant discounts, and in this case, the cost of purchased fabrics is not directly proportional to the number of meters of fabric purchased.
- Variable costs with a linear relationship are easy to analyze and predict. Nonlinear costs are difficult to plan, but they also need to be taken into account when making management decisions. CVP analysis solves this problem

- Many costs are semi-variable, i.e. behave both as constants (one component) and as variables (another component) - conditionally constant, conditionally variable.
- For planning and control purposes, such costs should be divided into variable and fixed components.

### Example

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Volume	Month	Level of activity, machine-hours	Costs
Highest	December	6450	24700
Lowest	August	6050	23600
Deviation		400	1100
Annual		75150	290500

Let's define the variable component: Variable costs per 1 machine-hour = 1100: 400 = 2.75Fixed costs Cost of pr Variable fixed for December: 24,700 - (6,450\*2.75) = 6,962.5For August: 23,600 -  $(6\ 050\ *\ 2.75) = 6,962.5$ Let's divide the total costs for the year into variable and constant components: Variable costs 75,150 \* 2.75 = 206,662.5 Fixed costs 290,500 -  $(75,150\ *\ 2.75) = 83,837.5$ 

CVP analysis is an analysis of cost behavior, which is based on the relationship between costs, revenue (income), production volume and profit. This is a tool for management planning and cost control. The results of CVP analysis are used by the manager for short-term planning and evaluation of alternative solutions.

The relationship under consideration can be expressed by the formula: Sales revenue (SR) = variable costs (VC) + fixed costs (FC) + profit (P). The relationship in question can also be expressed by the formula:  $PQ = v \times Q + F + Pr$ , where P is the selling price; Q production volume; v - variable costs per unit of production; F fixed costs; Pr - profit.

- The purpose of analysis at the break-even point is to find the level of activity (production volume) when sales revenue becomes equal to the sum of all variable and fixed costs, and the organization's profit is zero.
- The value at the critical point can be Amague expressed in units of sales or dollars of sales.
- The basic equation for finding the break-even point is: PQ\* = v × Q\* + F, where Q\* is the critical production volume.
- From here, the critical production volume can be found using the formula:  $Q^* = F/(P-v)$

### Example. Finding the break-even point.

- ▶ The company produces tables.
- Variable costs are \$50 per unit and fixed costs are \$20,000 per year. Selling price: \$90 per unit.
- Using this information and using X as the unit sales volume
- we can write the equation
- ▶ 90X = 50X + 20,000
- ▶ 40X = 20,000
- X = 500 units physical form
- Or in dollars: 90\*500 = 45,000 \$ monetary form

### CVP analysis for Profit planning.

Analysis of the values at the break-even point, taking into account the profit factor, can be used to assess the profitability of the organization. The manager can calculate the corresponding amount of possible profit for various alternative production plans.



### Example.

- ▶ The company wants to make a profit of \$10,000 next year.
- Variable costs are \$50 per unit.
- What volume of production must be produced to obtain a given amount of profit?
- The formula for calculating the volume of production at a certain level of profit is as follows:
- Q = SR = VC + FC + P
- ▶ 90x = 50X + 20,000 + 10,000
- 40X = 30,000 X = 750 (units)



CVP - analysis can be applied in that case , if the company produces several types of products.

### Assumptions of CVP analysis

- Analysis of the cost-volume-profit relationship and analysis of break-even point values can be useful and provide accurate information if the underlying assumptions are met:
- The behavior of fixed and variable costs can be measured accurately
- 2. costs and sales revenue have a linear relationship
- 3. performance within the relevant activity level does not change
- 4. Variable costs and prices do not change during the planning period.
- 5. The product structure does not change during the planning period
- 6. Sales volume and production volume are approximately equal

## The following concepts are used in the CVP analysis methodology:



#### Operating Leverage

[a-po-ri-tin le-vo-rij] A cost-accounting formula that measures the degree to which a firm or project can increase operating income by increasing revenue.

Cinvestopedia

Operating leverage

### Marginal profit

- Marginal profit is the excess of sales revenue over all variable costs associated with sales volume. It shows the enterprise's contribution to covering fixed costs and making a profit.
- In other words, marginal profit is the difference between sales revenue and variable costs: MP = P×Q – VC
- If we subtract fixed costs from marginal profit, we obtain the profit amount: Pr = MP - F
- ▶ The break-even point Q\* can be defined as the point , in which marginal profit is equal to fixed costs, that is:
- ▶ MP per unit × Q\* = F, Q\* = F/MP per unit
- The marginal profit category can also be used for profit planning. The volume of production that needs to be achieved to obtain the planned profit can be found using the formula:
- Q\* = (F+Pr) / MP per unit



### Threshold revenue



- Threshold revenue is the break-even volume of production in value terms. It is determined by the formula:
- REVENUE threshold = Q\* P,
- where Q\* is the break-even production volume; P unit price.

The margin of safety in dollars is the excess of budgeted or actual sales over the break-even volume of sales dollars. It is the amount by which sales can drop before losses are incurred. The higher the margin of safety, the lower the risk of not breaking even and incurring a loss.

- The margin of safety is an indicator characterizing the excess of actual sales revenue over the threshold that ensures break-even sales.
- The margin of safety = (Actual revenue Threshold revenue)/Actual revenue × 100%,
- A high value of the margin of safety is the best result for the enterprise.



### Example.

- The sewing company produces and sells men's suits. The indicators characterizing its activities are as follows:
- Revenue \$375,000.
- Total variable costs \$250,000.
- Fixed costs \$80,000.
- Profit \$45,000.
- Production volume 500 units.
- Selling price \$750.
- The margin of safety is: (375000-240000)/375000 × 100% = 36%.
- The value of The margin of safety of 36% shows that if, due to a change in the market situation (reduction in demand, worsening market conditions), the company's revenue decreases by less than 36%, then the company will make a profit; if by more than 36%, it will be at a loss.

### Operating leverage Adambekova

- Operating leverage is a mechanism for managing the profit of an enterprise, based on optimizing the ratio of fixed and variable costs.
- With its help, you can predict changes in the profit of an enterprise depending on changes in sales volume, as well as determine the break-even point of the enterprise.
- The operating leverage effect arises from the uneven cost structure of an enterprise. Changes in variable costs are directly proportional to changes in production volume and sales revenue, while fixed costs over a long period of time almost do not respond to changes in production volume. The higher the share of fixed costs in the total costs of the enterprise, the more the profit will change with the growth of the enterprise's revenue.
- Operating leverage is determined using one of two formulas:
- Opl = MP/Pr (1), where MP is marginal profit; Pr operating profit, Opl = (F+Pr)/Pr= 1 + (F/Pr) (2).

### Example.

The sewing company produces and sells men's suits. The indicators characterizing its activities are as follows:

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- ▶ 1. Revenue \$375,000
- 2. Total variable costs \$250,000
- 3Fixed costs \$80,000
- ▶ 4. Profit \$45,000
- ▶ 5. Marginal income \$125,000
- 6. Production volume 500 units.
- ▶ 7. Selling price \$750.
- ▶ In this example, the operating leverage effect is 2.78 (5) : (4).
- The operating leverage effect of 2.78 means that if revenue decreases by 1%, profit will decrease by 2.78%, and if revenue decreases by 36%, profit will decrease by 36% \* 2.78 = 100%, that is, it will become zero. Let's assume that the company's revenue decreased by 10% and amounted to \$337,500 (375,000 375,000 \* 10%). Under these conditions, the enterprise's profit will decrease by 27.8% and amount to (45,000 45,0000 \* 27.8: 100) = \$32,490.