What is Break Even Analysis?

Break Even Analysis in economics, business, and cost accounting refers to the point in which total cost and total revenue are equal. A break-even point analysis is used to determine the number of units or dollars of revenue needed to cover total costs (fixed and variable costs).

The formula for break-even analysis is as follows:

Break even quantity = **Fixed costs / (Sales price per unit – Variable cost per unit)**

Where:

- **Fixed costs** are costs that do not change with varying output (e.g., salary, rent, building machinery).
- **Sales price per unit** is the selling price (unit selling price) per unit.
- **Variable cost per unit** is the variable costs incurred to create a unit.

It is also helpful to note that sales price per unit minus variable cost per unit is the contribution margin per unit. For example, if a book's selling price is $100 and its variable costs are $5 to make the book, $95 is the contribution margin per unit and contributes to offsetting the fixed costs.

Example of Break Even Analysis

Colin is the managerial accountant in charge of Company A, which sells water bottles. He previously determined that the fixed costs of Company A consist of property taxes, a lease, and executive salaries, which add up to $100,000. The variable cost associated with producing one water bottle is $2 per unit. The water bottle is sold at a premium price of $12. To determine the break even point of Company A's premium water bottle:

Break even quantity = $100,000 / ($12 – $2) = 10,000

Therefore, given the fixed costs, variable costs, and selling price of the water bottles, Company A would need to sell 10,000 units of water bottles to break even.

Graphically Representing the Break Even Point

The graphical representation of unit sales and dollar sales needed to break even is referred to as the break even chart or Cost Volume Profit (CVP) graph. Below is the CVP graph of the example above:
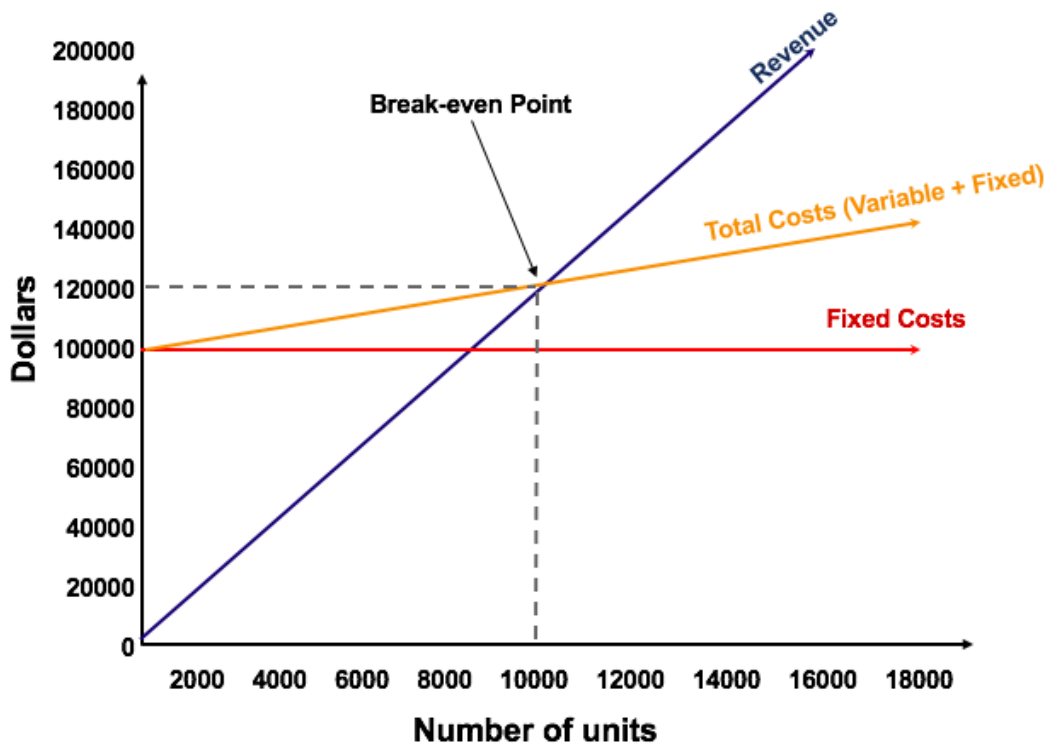
Explanation:

- The number of units is on the X-axis (horizontal) and the dollar amount is on the Y-axis (vertical).
- The red line represents the total fixed costs of $100,000.
- The blue line represents revenue per unit sold. For example, selling 10,000 units would generate 10,000 x $12 = $120,000 in revenue.
- The yellow line represents total costs (fixed and variable costs). For example, if the company sells 0 units, then the company would incur $0 in variable costs but $100,000 in fixed costs for total costs of $100,000. If the company sells 10,000 units, the company would incur 10,000 x $2 = $20,000 in variable costs and $100,000 in fixed costs for total costs of $120,000.

- The break even point is at 10,000 units. At this point, revenue would be 10,000 x $12 = $120,000 and costs would be 10,000 x 2 = $20,000 in variable costs and $100,000 in fixed costs.

- When the number of units exceeds 10,000, the company would be making a profit on the units sold. Note that the blue revenue line is greater than the yellow total costs line after 10,000 units are produced. Likewise, if the number of units is below 10,000, the company would be incurring a loss. From 0-9,999 units, the total costs line is above the revenue line.

#Examples of Cost-Benefit Analysis

An example of Cost-Benefit Analysis includes Cost-Benefit Ratio where suppose there are two projects where project one is incurring a total cost of $8,000 and earning total benefits of $ 12,000 whereas on the other hand project two is incurring costs of Rs. $11,000 and earning benefits of $ 20,000, therefore, by applying cost-benefit analysis the Cost-Benefit ratio of the first project is 1.5 ($8,000/ $12,000) and the ratio of the second project is 1.81 ($11,000/$20,000) which means project two is feasible being having high cost-benefit ratio.

Example #1

Financial analysis International Ltd is planning to undertake one project. It has two alternatives, with the following benefits and costs.

Given,

Alternative 1

- The total value of the Costs from project 1 = $ 60 million.
- Benefits available from project 1 = $ 100 million

Alternative 2

- The total value of the Costs from project 2 = $ 10 million.
- Benefits available from project 2 = $ 21 million

I am using the Cost-benefit analysis; which Project the company should choose?

Solution

For deciding which project, the company should opt using the cost-benefit analysis, the **benefit-cost ratio** will be calculated for both of the projects.

Benefit-Cost ratio = Benefits available from the project / Total value of the Costs

Alternative 1

The benefit-cost ratio can be calculated as,

B5	▼	f_x =B3/B2		Benefit- Cost Ratio = Benefits available from the project / Total value of Costs	
		A			C
1		**Particulars**			
2		Total Value of the Costs from the Project		$60	
3		Benefits Available from the Project		$100	
4					
5		**Benefit Cost Ratio**		1.667	
6					

= $ 100 million / $ 60 million

Benefit-Cost Ratio = 1.667

Alternative 2

The benefit-cost ratio can be calculated as,

= $ 21 million / $ 10 million

Benefit-Cost Ratio = 2.1

Analysis: Being both the projects have positive outcomes; both of the projects are beneficial for the company, i.e., the company will be in profit if it undertakes any of the projects. However, as the company has to choose one out of two, the project with a higher benefit-cost ratio will be selected. In the present case, project 2 has a higher benefit-cost ratio, so as per Cost-benefit analysis, project two will be selected by financial analysis International Ltd.

Example #2

Sports International limited is planning to expand its business, and for that, it will require four new employees in the organization. For analyzing whether the expansion is beneficial or not, the management of the company decides to use the cost-benefit analysis. The following are the information available related to benefits and costs related to expansion:

- Within the time frame of one year, it is expected that if the company hires four employees for the expansion, then the revenue of the company will increase by 50 %, i.e., the revenue benefit will be around $ 250,000.
- Also, due to the new hiring, the company value of the business will increase, which would result in additional revenue of $ 30,000.
- The salary of the new employees is estimated to be $ 160,000.
- The additional cost of hiring is estimated to be $ 15,000.

- The cost of additional hardware and software required will come at around $ 25,000

Analyze the expansion using Cost-benefit analysis.

Solution

- Total benefit from the project = Increase in revenue from expansion
- Total benefit from the project = **$ 250,000 + $ 30,000 = $ 280,000**
- Total Cost from expansion = **Salary of new employees + Cost of hiring + Cost of additional hardware and software**
- Total Cost from expansion = $ 160,000 + $15,000 + $25,000
- Total Cost from expansion = **$ 200,000**

Now the benefit-cost ratio will be calculated for the expansion.

= $280,000 / $ 200,000=1.40
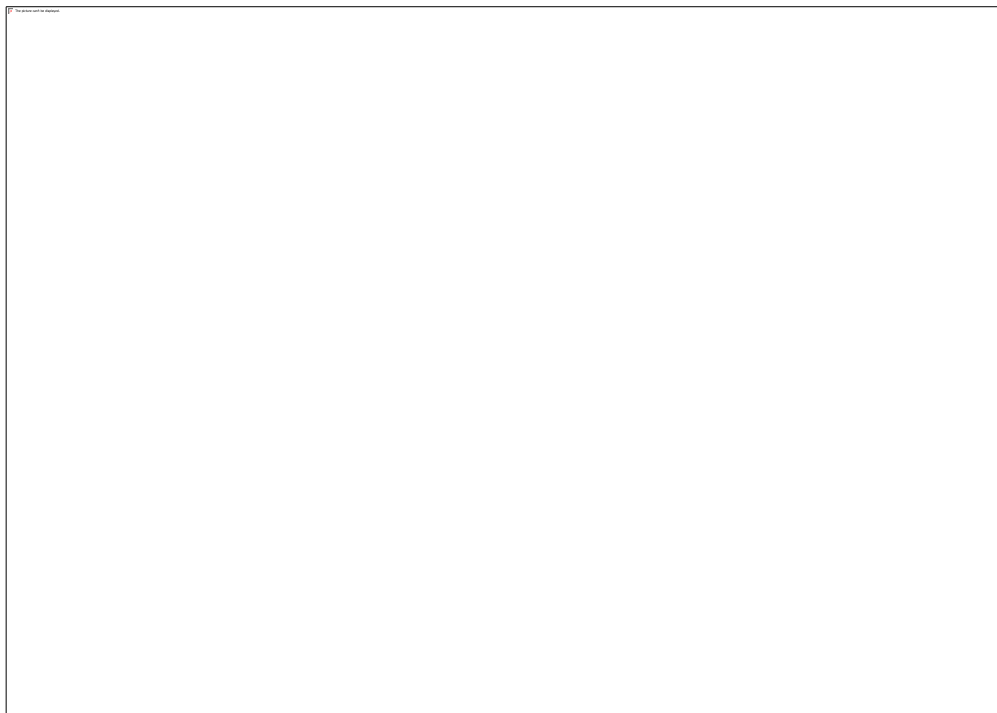
Benefit-Cost Ratio = 1.40

As the expansion has a positive benefit-cost ratio (the total benefits due to expansion is greater than total cost), the company should go ahead with the expansion of the project and hire new employees as that will be beneficial for the company.