1.The **B/C ratio** (Benefit-Cost Ratio) is a financial metric used to evaluate the feasibility of a project or investment. It compares the benefits (returns) to the costs, helping determine whether the investment is worthwhile.

How to Calculate B/C Ratio

The formula is:

B/C Ratio=Total BenefitsTotal CostsB/C Ratio=Total CostsTotal Benefits

Where:

- **Total Benefits** = The monetary value of all expected benefits from the project or investment.
- **Total Costs** = The monetary value of all costs required to execute the project or investment.

Interpretation

- If **B/C Ratio > 1**, the project is considered profitable (benefits exceed costs).
- If **B/C Ratio = 1**, the project breaks even (benefits equal costs).
- If **B/C Ratio < 1**, the project is not profitable (costs exceed benefits).

Example

If a project generates ₹200,000 in benefits and costs ₹150,000:

B/C Ratio=200,000/150,000=1.33

This means the project returns ₹1.33 for every ₹1 spent, making it a good investment.

2. Suppose that a competitive firm's total cost function is TC = 250 + 5Q + 0.025Q^2 . If the product market price is ₹15, find the following:

1. What would be the firm's maximum profit, and at which size of production?

2. What would be the level of output at which the firm would be in equilibrium?

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- Total Cost (TC*TC*) = 250+5Q+0.025Q2250+5*Q*+0.025*Q*2
- Market Price (P*P*) = ₹15
- Total Revenue (TR*TR*) = P·Q=15Q*P*·*Q*=15*Q*

Step 1: Maximum Profit Condition

The firm's profit (ππ) is the difference between total revenue (TR*TR*) and total cost (TC*TC*):

π=TR−TC=15Q−(250+5Q+0.025Q2)*π*=*TR*−*TC*=15*Q*−(250+5*Q*+0.025*Q*2)

Simplify the profit function:

π=15Q−250−5Q−0.025Q2π=15Q−250−5Q−0.025Q2π=−0.025Q2+10Q−250π=−0.025Q2+10Q−250

To find the level of production (QQ) where profit is maximized, take the derivative of ππ with respect to QQ, set it to zero, and solve for QQ:

dπdQ=−0.05Q+10$\frac{d\pi}{dQ}$=−0.05Q+10

Set dπdQ=0$\frac{d\pi}{dQ}$=0 for maximization:

−0.05Q+10=0−0.05Q+10=0Q=100.05=200Q=0.0510=200

So, the profit is maximized when Q=200Q=200.

Step 2: Maximum Profit

Substitute Q=200Q=200 into the profit function (ππ):

π=−0.025(200)2+10(200)−250π=−0.025(200)2+10(200)−250π=−0.025(40000)+2000−250π=−0.025(40000)+2000−250π=−1000+2000−250π=−1000+2000−250π=₹750π=₹750

The maximum profit is ₹750, achieved at Q=200Q=200.

Step 3: Equilibrium Output Condition

For the firm to be in equilibrium, **Marginal Cost (MC)** must equal the market price (P=15P=15).

1. **Find Marginal Cost (MC):** Marginal cost is the derivative of total cost (TCTC) with respect to QQ:

MC=d(TC)dQ=5+0.05Q$MC=\frac{d(TC)}{dQ}$=5+0.05Q

2. **Set MC=P$MC=P$:**

5+0.05Q=155+0.05Q=15

Solve for QQ:

0.05Q=100.05Q=10Q=100.05=200Q=0.0510=200

So, the equilibrium level of output is also Q=200Q=200.

Final Answers:

1. **Maximum Profit:** ₹750 at Q=200Q=200.
2. **Equilibrium Output:** Q=200Q=200.

3. The person income is Rs.100 per day and the quantity demanded for product M is 1000 units, if the person income declines to Rs.80 per day and the quantity demanded decreases to 700 units. Find the Income Elasticity of demand.

The **Income Elasticity of Demand (EI*I*)** measures the responsiveness of quantity demanded to a change in income. The formula is:

EI=% Change in Quantity Demanded% Change in Income*EI*
=% Change in Income% Change in Quantity Demanded

Step 1: Calculate Percentage Change in Quantity Demanded

Initial quantity demanded (Q1*Q*1) = 1000 units
New quantity demanded (Q2*Q*2) = 700 units

Percentage change in quantity demanded:

% ΔQ=Q2−Q1Q1×100% Δ*Q*=*Q*1*Q*2−*Q*1
×100% ΔQ=700−10001000×100=−3001000×100=−30%% Δ*Q*=1000700−1000×100=1000−300
×100=−30%

Step 2: Calculate Percentage Change in Income

Initial income (I1*I*1) = ₹100/day
New income (I2*I*2) = ₹80/day

Percentage change in income:

% ΔI=I2−I1I1×100% Δ*I*=*I*1*I*2−*I*1×100% ΔI=80−100100×100=−20100×100=−20%% Δ*I*=10080−100
×100=100−20×100=−20%

Step 3: Calculate Income Elasticity of Demand

Substitute the values into the formula:

EI=% ΔQ% ΔI*EI*=% Δ*I*% Δ*Q*EI=−30−20=1.5*EI*=−20−30=1.5

4. Calculate depreciation and book value of an asset for the first 5 years from the following information under declining balance method of depreciation: Cost of asset on zero period is Rs1,90,000. Salvage value is Rs 10,000 at the end of it working life of 9 years by assuming 0.2 as a fixed percentage.

Given Data:

- **Cost of Asset (Initial Value)**: ₹1,90,000
- **Salvage Value**: ₹10,000
- **Useful Life**: 9 years
- **Depreciation Rate (r*r*)**: 20% or 0.2

- **Year 0 (Initial Value):**
- **Book Value at Start**: ₹1,90,000
- Depreciation is not calculated for Year 0.
- **Year 1:**

  Depreciation=₹1,90,000×0.2=₹38,000

  Book Value at End=₹1,90,000−₹38,000=₹1,52,000

Year 2:

Depreciation=₹1,52,000×0.2=₹30,400

Book Value at End=₹1,52,000−₹30,400=₹1,21,600

Year 3:

Depreciation=₹1,21,600×0.2=₹24,320

Book Value at End=₹1,21,600−₹24,320=₹97,280

Year 4:

Depreciation=₹97,280×0.2=₹19,456

Book Value at End=₹97,280−₹19,456=₹77,824

Year 5:

Depreciation=₹77,824×0.2=₹15,565

Book Value at End=₹77,824−₹15,565=₹62,259

Summary Table:

Year	Book Value (Start)	Depreciation	Book Value (End)
0	₹1,90,000	-	₹1,90,000
1	₹1,90,000	₹38,000	₹1,52,000
2	₹1,52,000	₹30,400	₹1,21,600
3	₹1,21,600	₹24,320	₹97,280
4	₹97,280	₹19,456	₹77,824
5	₹77,824	₹15,565	₹62,259

5. Two mutually exclusive projects are being considered for investment. Project A1 requires an initial outlay of Rs. 30,00,000 with net receipts estimated as Rs. 9,00,000 per year for the next 5 years. The initial outlay for the project A2 is Rs. 60,00,000, and net receipts have been estimated at Rs. 15,00,000 per year for the next seven years. There is no salvage value associated with either of the projects. Using the AEW benefit cost ratio, which project would you select? Assume an interest rate of 10%.

Given Data:

- **Project A1:**
  - **Initial investment (I1/1) = ₹30,00,000**
  - **Annual net receipts (R1*R*1) = ₹9,00,000**
  - **Life (n1*n*1) = 5 years**
  - **Salvage value = ₹0**
- **Project A2:**
  - **Initial investment (I2/2) = ₹60,00,000**
  - **Annual net receipts (R2*R*2) = ₹15,00,000**
  - **Life (n2*n*2) = 7 years**
  - **Salvage value = ₹0**

Step 1: Calculate the Present Worth (PW) for Both Projects:

The formula for Present Worth of annual cash inflows is:

$$PW = R \times \frac{(1+r)^n - 1}{r \times (1+r)^n}$$

For Project A1:

$$PW_1 = 9,00,000 \times \frac{(1+0.1)^5 - 1}{0.1 \times (1+0.1)^5}$$

$$PW_1 = 9,00,000 \times \frac{1.61051 - 1}{0.1 \times 1.61051} = 9,00,000 \times \frac{0.61051}{0.161051} = 9,00,000 \times 3.79 = ₹34,11,000$$

For Project A2:

$$PW_2 = 15,00,000 \times \frac{(1+0.1)^7 - 1}{0.1 \times (1+0.1)^7}$$

$$PW_2 = 15,00,000 \times \frac{1.94872 - 1}{0.1 \times 1.94872} = 15,00,000 \times \frac{0.94872}{0.194872} = 15,00,000 \times 4.87 = ₹73,05,000$$

Step 2: Calculate AEW (Annual Equivalent Worth) for Both Projects:

The formula for AEW is:

$$AEW = \frac{PW}{\text{CRF}}$$

Where **CRF (Capital Recovery Factor)** is given by:

$$CRF = \frac{r \times (1+r)^n}{(1+r)^n - 1}$$

For Project A1:

$$CRF_1 = \frac{0.1 \times (1+0.1)^5}{(1+0.1)^5 - 1} = \frac{0.1 \times 1.61051}{1.61051 - 1} = \frac{0.161051}{0.61051} = 0.2638$$

$$AEW_1 = ₹34,11,000 \times 0.2638 = ₹8,99,052$$

For Project A2:

$$CRF_2 = \frac{0.1 \times (1+0.1)^7}{(1+0.1)^7 - 1} = \frac{0.1 \times 1.94872}{1.94872 - 1} = \frac{0.194872}{0.94872} = 0.2054$$

$$AEW_2 = ₹73,05,000 \times 0.2054 = ₹15,00,177$$

Step 3: Calculate Benefit-Cost Ratio (BCR):

The BCR is calculated as:

$$\text{BCR} = \frac{\text{Net Receipts (PW)}}{\text{Initial Investment}}$$

For Project A1:

$$BCR_1 = \frac{₹34,11,000}{₹30,00,000} = 1.137$$

For Project A2:

$$BCR_2 = \frac{₹73,05,000}{₹60,00,000} = 1.217$$

Step 4: Selection:

- Based on **AEW**:
  - $AEW_2 = ₹15,00,177 > AEW_1 = ₹8,99,052$
  - Hence, **Project A2** is preferred.
- Based on **BCR**:
  - $BCR_2 = 1.217 > BCR_1 = 1.137$
  - Hence, **Project A2** is preferred.

The demand for apples in a small town was 200 kg when the price was Rs20 per kg. It expanded to 250 kg when the price was reduced to Rs 18 per kg. What is the degree of elasticity of demand for apples in the town?

To calculate the **price elasticity of demand (Ed*d*)**, we use the formula:

Ed= % Change in Quantity Demanded/ %Change in Price

Step 1: Calculate the Percentage Change in Quantity Demanded

Initial quantity demanded (Q_1) = 200 kg

New quantity demanded (Q_2) = 250 kg

$$\% \text{ Change in Quantity Demanded} = \frac{Q_2 - Q_1}{Q_1} \times 100$$

$$\% \text{ Change in Quantity Demanded} = \frac{250 - 200}{200} \times 100 = \frac{50}{200} \times 100 = 25\%$$

Step 2: Calculate the Percentage Change in Price

Initial price (P_1) = ₹20

New price (P_2) = ₹18

$$\% \text{ Change in Price} = \frac{P_2 - P_1}{P_1} \times 100$$

$$\% \text{ Change in Price} = \frac{18 - 20}{20} \times 100 = \frac{-2}{20} \times 100 = -10\%$$

Step 3: Calculate Price Elasticity of Demand

$$E_d = \frac{\% \text{ Change in Quantity Demanded}}{\% \text{ Change in Price}}$$

$$E_d = \frac{25}{-10} = -2.5$$

Since elasticity is typically expressed as an absolute value:

$$E_d = 2.5$$

Final Answer:

The degree of elasticity of demand for apples in the town is **2.5**, which indicates that the demand is **elastic.**

The fixed cost and variable cost of x units of a manufactured product of a company are Rs.4,00,000 and Rs. 80x respectively. If each unit is sold for mRs.280. what is the breakeven point?

Step 1: Formula for Break-Even Point (BEP):

$$\text{BEP (in units)} = \frac{\text{Fixed Costs}}{\text{Selling Price per Unit} - \text{Variable Cost per Unit}}$$

Where:

- Fixed Costs (FC) = ₹4,00,000
- Selling Price per Unit (SP) = ₹280
- Variable Cost per Unit (VC) = ₹80

Step 2: Calculate Contribution Margin per Unit:

The **contribution margin per unit** is:

$$\text{Contribution Margin} = SP - VC = 280 - 80 = ₹200$$

Step 3: Calculate Break-Even Point:

$$\text{BEP (in units)} = \frac{FC}{\text{Contribution Margin}} = \frac{4,00,000}{200} = 2000 \text{ units}$$

Final Answer:

The break-even point is **2000 units.**

The company needs to sell 2000 units to cover its costs.

A bank gives loan to a company to purchase an equipment which is worth of Rs.5,00,000, at an interest rate of 18% compounded annually. This amount should be repaid in 25 yearly equal instalments. Find the instalment amount that the company has to pay to the bank.

To calculate the yearly instalment amount, we use the formula for the **Equated Annual Installment (EAI)** in a loan repayment scenario with compound interest:

Where:

- P*P* = Loan amount = ₹5,00,000
- r*r* = Annual interest rate (in decimal) = 18%=0.1818%=0.18
- n*n* = Number of instalments = 25 years

$$EAI = \frac{P \cdot r \cdot (1+r)^n}{(1+r)^n - 1}$$

Where:

- P = Loan amount = ₹5,00,000
- r = Annual interest rate (in decimal) = $18\% = 0.18$
- n = Number of instalments = 25 years

Step 1: Substitute Values into the Formula

$$EAI = \frac{5,00,000 \cdot 0.18 \cdot (1+0.18)^{25}}{(1+0.18)^{25} - 1}$$

$$EAI = \frac{5,00,000 \cdot 0.18 \cdot (1.18)^{25}}{(1.18)^{25} - 1}$$

Step 2: Compute $(1.18)^{25}$

$$(1.18)^{25} \approx 20.899$$

Substitute this value back:

$$EAI = \frac{5,00,000 \cdot 0.18 \cdot 20.899}{20.899 - 1}$$

$$EAI = \frac{5,00,000 \cdot 3.76182}{19.899}$$

Step 3: Simplify the Expression

$$EAI = \frac{18,80,910}{19.899} \approx 94,545$$

Final Answer:

The company has to pay **₹94,545** annually for 25 years to repay the loan.

A company is trying to diversify its business in a new product line. The life of the project is 10 years with no salvage value at the end of its life. The initial outlay of the project is Rs. 20,00,000. The annual net profit is Rs. 3,50,000. Find the rate of return for the new business.

$$\text{RoR} = \frac{\text{Annual Net Profit}}{\text{Initial Investment}} \times 100$$

Where:

- **Annual Net Profit** = ₹3,50,000
- **Initial Investment (Initial Outlay)** = ₹20,00,000

Step 1: Substitute the Given Values into the Formula

$$\text{RoR} = \frac{3,50,000}{20,00,000} \times 100$$

$$\text{RoR} = 0.175 \times 100$$

$$\text{RoR} = 17.5\%$$

Final Answer:

The **Rate of Return (RoR)** for the new business is **17.5%**.