Benefit-Cost Ratio (BCR):-

- it is a financial metric that compares the benefits of a project to its costs.
- it is used in cost-benefit analysis to find out the value for money of a project.

- It is calculated by dividing the present value of benefits by the present value of costs.

$$BCR = \frac{\sum_{t=0}^{T} \frac{CBt}{(1+r)^t}}{\sum_{t=0}^{T} \frac{Ct}{(1+r)^t}}$$

where,

- BCR is Benefit-Cost Ratio.
- $\sum_{t=0}^{T}$ → denotes sum over time periods from 0 to T
- CBt → net cash benefit during the time period t
- Ct → net cash cost during the time period t
- r is discount rate

$$BCR = \frac{\frac{CB_0}{(1+r)^0} + \frac{CB1}{(1+r)^1} + \frac{CB2}{(1+r)^2} + \cdots + \frac{CBT}{(1+r)^T}}{\frac{C_0}{(1+r)^0} + \frac{C1}{(1+r)^1} + \frac{C_2}{(1+r)^2} + \cdots \frac{CT}{(1+r)^T}}$$

CB_0 → net cash benefit at time 0.

C_0 → net cash cost at time 0

CBt → net cash benefit at time t.

Ct → net cash cost at time t.

r → discount rate.

- A BCR ≥ 1 means, it states project is viable (feasible)
- BCR < 1 —"— project is not feasible.

Q4) Consider a project with the following cash flows:

1) Initial investment (C_0): 20,000
2) Cash Benefits (B_t): 8,000 per year for t=1,2,3
3) Cash costs (C_t): 5,000 per year for t=1,2,3

Discount rate (r) is 10%.

Calculate BCR

$$BCR = \frac{\sum_{t=0}^{T} \frac{BC_t}{(1+r)^t}}{\frac{C_t}{(1+r)^t}}$$

$$= \frac{\frac{8,000}{(1+0.10)^1} + \frac{8,000}{(1+0.10)^2} + \frac{8,000}{(1+0.10)^3}}{\frac{20,000}{(1+0.10)^0} + \frac{5,000}{(1+0.10)^1} + \frac{5,000}{(1+0.10)^2} + \frac{5,000}{(1+0.10)^3}}$$

$$= \frac{NUM}{DEN}$$

$$NUM = \frac{8,000}{1.10} + \frac{8,000}{1.21} + \frac{8,000}{1.331}$$

$$= 7272.72727 + 6611.57025 + 6010.518$$

$$= 19894.8159$$

$$= 19894.81$$

$$DEN = \frac{20,000}{1.10^0} + \frac{5,000}{1.10} + \frac{5,000}{1.21} + \frac{5,000}{1.331}$$

$$= 18,181.81 + 4545.45 + 4132.23 + 3750$$

$$= 32,428.33$$

$$BCR = 0.61$$