Subject :- "Construction Financial Management"

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Q1 :- What is net present value & equivalent Annual Cost? what is the benefit of benefit-cost ratio?

ANS :-

NET PRESENT VALUE :- NPV is a method used to determine the current value of all future cash flows generated by a project, including the initial capital investment. It is widely used in capital budgeting to establish which projects are likely to turn the greatest profit.

The formula for NPV is:

$$NPV = \frac{\text{Cash flow}}{(1+j)^t} - \text{initial investment}$$

where:

j = Required return or discount rate.

t = Number of time period.

IF analyzing a long-term project with multiple cash flows, the formula for the net present value of a project is:

$$NPV = \sum_{t=0}^{n} \frac{R_t}{(1+j)^t}$$

where, R_t = net cash inflow - out flows during a single period "t".

⇒ **EQUIVALANT Annual Cost** :- EAC is the annual cost of owning, operating and maintaining an asset over its entire life. equivalent annual cost is often used by firms for capital budgeting decisions, as it allows a company to compare the cost-effectiveness of various assets that have unequal lifespans.

The formula for equivalent annual cost is:

$$EAC = \frac{\text{Asset price} \times \text{discount rate}}{1 - (1 + \text{discount rate})^{-n}}$$

where:

Discount rate = Return required to make project worthwhile

n = Number of periods.

BENEFIT-Cost Ratio :-

The benefit-cost ratio (or B/C ratio) is defined as.

(a) $B/C \text{ ratio} = \dfrac{\text{Present worth of total benefits}}{\text{present worth of total cost}}$

OR

(b) $B/C \text{ ratio} = \dfrac{\text{Equivalent annual total benefits}}{\text{equivalent annual total costs}}$

Both definitions will give the same answer.

⇒ If the Benefit-cost ratio is greater than 1, the project is worthwhile and vice versa. When B/C ratio is exactly 1, the project is break-even one. A project having a positive net present value or a positive net annual benefit must have a B/C ratio greater than 1. Similarly, a project having a negative net present value or a negative annual benefit will have B/C ratio less than 1.

(ii) Given data:

* Cost of service reservior for supplying water to housing-state = 9,000,000,000 (PKR).
* annual operation & maintenance cost (per year) = 375,000,000 (PKR)
* The annual income of water supply fee = 1,050,000,000.

⇒ Assuming Time horizon $t = 30$ years

⇒ Assuming Required return or discount rate, $i = 5\%$.

⇒ Find out if a project is financially feassible=?

Solution:-

By using net present value:

$$NPV = \frac{\text{Cash flow}}{(1+i)^t} - \text{initial investment}$$

$$NPV = \frac{1,050,000,000}{(1+0.05)^{30}} - 9,000,000,000$$

$$NPV = \frac{1,050,000,000}{33.66} - 9,000,000,000$$

$$NPV = 31,194,295 - 9,000,000,000$$

$$\boxed{NPV = -896,666,667 \text{ PKR}}$$

⇒ By using Equivalent Annual Cost.

$$EAC = \frac{\text{Asset price} \times \text{discount rate}}{1 - (1 + \text{discount rate})^{-n}}$$

~~$EAC = \frac{9,000,000,000 \times 0.05}{1 - (1+0.05)^{-30}}$~~

First we will calculate the annuity factor.

$$\text{Annuity factor} = \frac{1 - \frac{1}{(1+r)^t}}{r}$$

Where r = cost of capital.

t = Number of periods.

$$\text{Annuity factor} = \frac{1 - \frac{1}{(1+0.05)^{30}}}{0.05}$$

$$\boxed{\text{Annuity factor} = 19.2} \Rightarrow EAC = \frac{9,000,000,000}{19.2} + 375,000,000$$

$$\Rightarrow \boxed{EAC = 66,406,250 \text{ p.a}}$$

⇒ BENEFIT-COST ratio :-

$$B/C \text{ ratio} = \frac{\text{Equivalent annual total benfits}}{\text{equivalent annual total costs.}}$$

$$= \frac{1,050,000,000}{66,406,250}$$

B/C ratio = 1.58

The end of Question No. 1

Q2)

Ans: Internal Rate of Return:

The internal rate of return on an investment or project is the annualized effective compounded return rate or the rate of return that sets the net present value of all cash flows (both positive & negative) from the investment equal to zero. Equivalently it is the discount rate at which the net present value of the future cash flows is equal to the initial investment & it is also the discount rate at which the total present value of costs (negative cash flows) equals the total present value of the benefits.

Difference between Internal Rate of Return & Net Present Values

* Outcomes: The NPV method results in a dollar value that a project will produce, while IRR generates the percentage return that the project is exposed to create.

Purpose: The NPV method focuses on project surpluses, while IRR is focused on the breakeven cash flow level of a project.

Decision support: The NPV method presents an outcome that forms the foundation for an investment decision since it presents a dollar return. The IRR method does not help in making this decision since its percentage return does not tell the investor how much money will be made.

Reinvestment rates: The presumed rate of return for the reinvestment of intermediate cash flows is the firms cost of capital when NPV is used while it is the internal rate of return under IRR method.

* Inflation: inflation is a quantitative measures of the rate at which the average price level of a basket of selected goods and services in an economy increases over some period of time. It is the rise in the general level

of prices where a unit of currency effectively buys less than it did in prior periods. often expressed as a percentage inflation thus indicates a decrease in the purchasing power of a nation's currency.

Inflation can be contrasted with deflation, which occurs when prices instead decline.

(ii) Given data:

⇒ Asset purchased four years ago at = PKR 9,000,000.

⇒ Had a life of = 4 years.

⇒ Actual annual cash receipt of 1st year = 2,100,000.

" " " " " 2nd year = 2,700,000.

" " " " " 3rd year = 3,450,000.

" " " " " 4th year = 4,200,000.

⇒ The average inflation rate in these four years = 4%

Find:

Real internal rate of return = IRR = ?

Solution :-

Formula and Calculation of IRR :-

it is important for a business to look at the IRR as the plan for future growth and expansion The formula & calculation used to determine this figure follows.

$$0 = NPV = \sum_{t=1}^{T} \frac{C_t}{(1+IRR)^t} - C_0$$

where:

C_t = Net Cash inflow during the period t.

C_0 = Total initial investment costs.

To Find : IRR = The internal rate of return.

t = The number of time periods.

To Calculate IRR using the formula, one would set NPV equal to zero and solve for the internal rate of return IRR.

So,

$$NPV = 0 \Rightarrow (1 + IRR)^t = \sum_{t=1}^{T} C_t - C_0$$

Taking power "1/t" on b.s.

$$\left[(1 + IRR)^t\right]^{1/t} = \sum_{t=1}^{T} (C_t - C_0)^{1/t}$$

$$IRR = (C_t - C_0)^{1/t} - 1$$

$$IRR = \left(2,100,000 + 2,700,000 + 3,450,000 + 4,200,000 - 9,000,000\right)^{1/4} - 1$$

$$IRR = (3,450,000)^{1/4} - 1$$

IRR = [illegible]

IRR = 13.8%

Q3:-

Pipe Rs	P	V Rs	Volume (% Rs sales)
Cast iron	450,000	300,000	25%
Steel	525,000	375,000	35%
Concrete	600,000	450,000	40%

Solution:-

Contribution per unit expressed in percentage $= \{(P-V)/P\} \times 100\%$

⇒ Contribution per unit due to cast iron pipe

$= \{(450,000 - 300,000)/450,000\} \times 100 = 33.33\%$

⇒ Contribution per unit due to steel pipes

$= \{(525,000 - 375,000)/525000\} \times 100 = 28.57\%$

⇒ Contribution per unit due to concrete:

$= \{(600,000 - 450,000)/600,000\} \times 100 = 25.00\%$

Contribution % of Sales

Cast iron pipes	33.33% × 25%	= 8.33%
Steel pipes	28.57% × 35%	= 10.00%
Concrete pipes	25.00% × 40%	= 10.00%
		28.33%

This 28.33% is the total contribution per overall sales PKR.

(a) BEP = Fc / contribution

$$= \frac{\$200m}{0.283}$$

BEP = $706m.

Therefore, at BEP, the subcontractor is operating at 78.4% of capacity (i-e $\frac{706}{900} = 78.4\%$)

(b) At 95% of Capacity

$$\text{Profit} = TR - TC$$

$$= (900m \times 95\%) - VC - FC$$

$$= 855m - 810m \times (1 - 0.2833) - 200m$$

$$= 855m - 580m - 200m$$

Profit = $75 million

Q4

ANS:- Scheme A:

Equivalent annual cost of installation and maintanance.

$$= \$120,000 \times \left[\frac{0.05(1+0.05)^{14}}{(1+0.05)^{14}-1} + \$200,000 \times \left[\frac{0.05(1+0.05)^{30}}{(1+0.05)^{30}-1}\right] + \$18000.\right.$$

$$= \$129000 \times 0.1010 + \$200,000 \times 0.0651 + \$18000 = \$43,140.$$

Scheme B:-

Equivalent annual cost of installation & maintanance

$$= \$190,000 \times \left[\frac{0.05(1+0.05)^{16}}{(1+0.05)^{16}-1} + \$160,000 \times \left[\frac{0.05(1+0.05)^{30}}{(1+0.05)^{30}-1}\right] + \$16,500\right.$$

$$= \$ 44,453$$

SCHEME C:-

$$= \$285,000 \times \left[\frac{0.05(1+0.05)^{20}}{(1+0.05)^{20}-1}\right] + \$100,000 \times \left[\frac{0.05(1+0.05)^{30}}{(1+0.05)^{30}-1}\right] + \$16,00$$

$$= \$285,000 \times 0.0802 + \$100,000 \times 0.0651 + \$16000$$

$$= \$45,367.$$