NET PRESENT VALUE

Space for Marks | Question No.

①

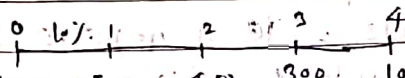
Assume the following cash flows for 2 projects

Year	Project S (Rs)	Project L (Rs)
0	-1000	-1000
1	500	100
2	400	300
3	300	400
4	100	600

Assume that the cash flows are occuring at the end of each year. Find out the NPV for these projects if the cost of capital is 10% for both the projects.

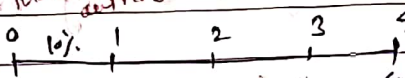
→

Project S



-ve indicates outflow +ve indicates inflow

Project L



Consider project S:-

Step 1:- Find the present value of each cash flow, including both inflow & outflows, discounted at the projects cost of capital. Present value $PV_1 = \frac{FV_1}{(1+i)^{n_1}} = \frac{500}{(1+0.1)^1} = \frac{500}{1.1} = 454.55$ (future value; n_1: year; i: discount rate, ie. 10% = 0.1)

$PV_0 = -1000$

$FV_1 = 500$

$FV_2 = 400$

$FV_3 = 300$

$FV_4 = 100$

Similarly $PV_2 = \frac{FV_2}{(1+i)^{n_2}} = \frac{400}{(1+0.1)^2} = \frac{400}{(1.1)^2} = 330.58$

$PV_3 = \frac{FV_3}{(1+i)^{n_3}} = \frac{300}{(1.1)^3} = 225.39$

$PV_4 = \frac{FV_4}{(1+i)^{n_4}} = \frac{100}{(1.1)^4} = 68.3$

Step 2:- Sum these discounted cash flows to find Net Present Value.

$NPV = PV_0 + PV_1 + PV_2 + PV_3 + PV_4$

$= -1000 + 454.55 + 330.58 + 225.39 + 68.3$

NPV = Rs 78.82 for project S.

Consider Project L:-

$PV_0 = -1000$
$FV_1 = 100$
$FV_2 = 300$
$FV_3 = 400$
$FV_4 = 600$

$$PV_1 = \frac{FV_1}{(1+i)^{n_1}} = \frac{100}{(1+0.1)^1} = \frac{100}{1.1} = 90.909$$

$$PV_2 = \frac{FV_2}{(1+i)^{n_2}} = \frac{300}{(1.1)^2} = \frac{300}{1.21} = 247.933$$

$$PV_3 = \frac{FV_3}{(1+i)^{n_3}} = \frac{400}{(1.1)^3} = \frac{400}{1.331} = 300.5259$$

$$PV_4 = \frac{FV_4}{(1+i)^{n_4}} = \frac{600}{(1.1)^4} = \frac{600}{1.4641} = 409.836$$

$NPV = PV_0 + PV_1 + PV_2 + PV_3 + PV_4$
$= -1000 + 90.901 + 247.933 + 300.5259 + 409.836$

NPV = Rs 49.19 for project L.

Step 3:- If the NPV is positive, the project should be accepted, while if the NPV is negative, it should be rejected. This is because a positive NPV indicates that the project is profitable while a negative NPV indicates that it is not profitable. Also, if the NPV is zero, the project does not generate any profit or loss.

If there are two projects and only one one of them can be selected ie they are mutually exclusive, then the one with higher NPV should be chosen. (if not specified such condition, both the projects here are profitable)

So, here if condn specified & selecting only one project, project S will be selected as it has higher NPV than L.

Space for Marks	Question No.	

(10)

May-17

Swanson Industries has four potential projects all with the initial cost of 2,00,000. The capital budget for the year will only allow Swanson industries to accept one of the four projects. Given the discount rates and the future cash flows of each project, which project should they accept using NPV mtd.

Cash flows	Project A	Project B	Project C	Project D
First Year	500000	600000	1000000	300000
Second Year	500000	600000	800000	500000
Third Year	500000	600000	600000	700000
fourth Year	500000	600000	400000	900000
Fifth Year	500000	600000	200000	11,00,000
Discount rate	6%	9%	15%	22%

→ (1) for project A,

$PV_0 = -2,00,000$, $i = 6\% = \frac{6}{100} = 0.06$

$PV_1 = \frac{FV_1}{(1+i)^{n_1}} = \frac{500000}{1.06} = 471,698.113$

$PV_2 = \frac{FV_2}{(1+i)^{n_2}} = \frac{500000}{(1.06)^2} = \frac{500000}{1.1236} = 444,998.22$

$PV_3 = \frac{FV_3}{(1+i)^{n_3}} = \frac{500000}{(1.06)^3} = \frac{500000}{1.191} = 419,815.281$

$PV_4 = \frac{FV_4}{(1+i)^{n_4}} = \frac{500000}{(1.06)^4} = \frac{500000}{1.26} = 396,825.397$

$PV_5 = \frac{FV_5}{(1+i)^{n_5}} = \frac{500000}{(1.06)^5} = \frac{500000}{1.338} = 373,692.078$

$NPV = PV_0 + PV_1 + PV_2 + PV_3 + PV_4 + PV_5$

$= -200000 + 471698.113 + 444,998.22 + 419,815.281 + 396,825.397 + 373,692.078$

$NPV = ₹ 1,478,213.81$

(2) for project B,

$PV_0 = -2,00,000$, $i = 9\% = 0.09$

$PV_1 = \frac{FV_1}{(1+i)^{n_1}} = \frac{600000}{(1+0.09)^1} = \frac{600000}{1.09} = 550,458.716$

$PV_2 = \frac{FV_2}{(1+i)^{n_2}} = \frac{600000}{(1.09)^2} = \frac{600000}{1.188} = 505,050.505$

$PV_3 = \frac{FV_3}{(1+i)^{n_3}} = \frac{600000}{(1.09)^3} = \frac{600000}{1.295} = 463,320.463$

$PV_4 = \frac{FV_4}{(1+i)^{n_4}} = \frac{600000}{(1.09)^4} = \frac{600000}{1.411} = 425,230.33$

$PV_5 = \frac{FV_5}{(1+i)^{n_5}} = \frac{600000}{(1.09)^5} = \frac{600000}{1.538} = 390,117.035$

$NPV = PV_0 + PV_1 + PV_2 + PV_3 + PV_4 + PV_5$

NPV = ₹ 2,134,177.05

(3) For project C,

$PV_0 = -200000$, $i = 15\% = 0.15$

$PV_1 = \frac{FV_1}{(1+i)^{n_1}} = \frac{1000000}{(1+0.15)^1} = \frac{1000000}{1.15} = 869,565.217$

$PV_2 = \frac{FV_2}{(1+i)^{n_2}} = \frac{800000}{(1.15)^2} = \frac{800000}{1.3225} = 604,911.934$

$PV_3 = \frac{FV_3}{(1+i)^{n_3}} = \frac{600000}{(1.15)^3} = \frac{600000}{1.52} = 394,736.842$

$PV_4 = \frac{FV_4}{(1+i)^{n_4}} = \frac{400000}{(1.15)^4} = \frac{400000}{1.749} = 228,702.115$

$PV_5 = \frac{FV_5}{(1+i)^{n_5}} = \frac{200000}{(1.15)^5} = \frac{200000}{2.011} = 99,453.0085$

$NPV = PV_0 + PV_1 + PV_2 + PV_3 + PV_4 + PV_5$

NPV = ₹ 1,997,372.12

(4) For project D,

$PV_0 = -200000$, $i = 22\% = 0.22$

$PV_1 = \frac{FV_1}{(1+i)^{n_1}} = \frac{300000}{(1+0.22)^1} = \frac{300000}{1.22} = 245901.639$

$PV_2 = \frac{FV_2}{(1+i)^{n_2}} = \frac{500000}{(1.22)^2} = \frac{500000}{1.488} = 336,021.505$

$PV_3 = \frac{FV_3}{(1+i)^{n_3}} = \frac{700000}{(1.22)^3} = \frac{700000}{1.815} = 385,674.931$

$PV_4 = \frac{FV_4}{(1+i)^{n_4}} = \frac{900000}{(1.22)^4} = \frac{900000}{2.215} = 406,320.542$

$PV_5 = \frac{FV_5}{(1+i)^{n_5}} = \frac{1100000}{(1.22)^5} = \frac{1100000}{2.70} = 407,407.407$

$NPV = PV_0 + PV_1 + PV_2 + PV_3 + PV_4 + PV_5$

NPV = ₹ 1,581,326.02

Since NPV of project B is greatest in all the projects, project B should be selected.

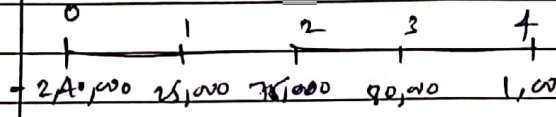
Space for Marks	Question No.	
		(10)
May-19		Determine the net present value for a project that costs Rs. 2,40,000/- & would yield after-tax cash flows as follows. Assume cost of capital is 10%.

Year	Cash flow (Rs)
1	25,000
2	75,000
3	80,000
4	1,00,000

Comment on feasibility of project based on NPV.

→ initial investment (I_0) = Rs 2,40,000

discount rate = 10% = 0.1



(I_0) $PV_0 = 2,40,000$

$PV_1 = \frac{FV_1}{(1+i)^{n_1}} = \frac{25,000}{(1+0.1)\,1} = \frac{25000}{1.1} = 22,727.27$

$PV_2 = \frac{FV_2}{(1+i)^{n_2}} = \frac{75,000}{(1.1)^2} = \frac{75000}{1.21} = 61,983.47$

$PV_3 = \frac{FV_3}{(1+i)^{n_3}} = \frac{80,000}{(1.1)^3} = \frac{80000}{1.331} = 60,105.184$

$PV_4 = \frac{FV_4}{(1+i)^{n_4}} = \frac{1,00,000}{(1.1)\,4} = \frac{100000}{1.4641} = 68,301.3455$

$NPV = -I_0 + PV_1 + PV_2 + PV_3 + PV_4$

$= -240000 + 22,727.27 + 61,983.47 + 60,105.184 + 68,301.3455$

NPV = Rs −26,882.73

Question No.	
	Since NPV is negative, this project is not profitable & there will be a loss.