Assignment-04

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01120126 2 – Sec A.

(01) Project S; 12% MARR.

Year	0	1	2	3	4
Cash flow	-8000	4000	2500	3000	500

NPV of S;

$$P_0 + P_1 + P_2 + P_3 + P_4$$

$$= -8000 + \frac{F_1}{(1+i)^{N_1}} + \frac{F_2}{(1+i)^{N_2}} + \frac{F_3}{(1+i)^{N_3}} + \frac{F_4}{(1+i)^{N_4}}$$

$$= -8000 + \frac{4000}{(1+0.12)^1} + \frac{2500}{(1+0.12)^2} + \frac{3000}{(1+0.12)^3} + \frac{500}{(1+0.12)^4}$$

$$= 17.51 > 0.$$

P.T.O

Project L;

Year	0	1	2	3	4
cash flow	-7000	3000	2000	2000	2000

NPV of L;

$$P_0 + P_1 + P_2 + P_3 + P_4$$

$$= -7000 + \frac{F_1}{(1+i)^{N_1}} + \frac{F_2}{(1+i)^{N_2}} + \frac{F_3}{(1+i)^{N_3}} + \frac{F_4}{(1+i)^{N_4}}$$

$$= -7000 + \frac{3000}{(1+0.12)^1} + \frac{2000}{(1+0.12)^2} + \frac{2000}{(1+0.12)^3} + \frac{2000}{(1+0.12)^4}$$

$$= -32.44 < 0.$$

Though both Projects are independent here, the Project L didn't fulfill the condition to be selected, it is less than zero. on the other hand Project S is greater than zero. So, Project S will be selected.

(02)

Project P; Discount rate 15%.

Year	0	1	2	3	4	5
Benefit	0	3500	4607	3787	2600	1500
Cost	7000	3000	2000	1010	750	1500

NPV (Benefit) of Project P;

$$P_1 + P_2 + P_3 + P_4 + P_5$$

$$= \frac{F_1}{(1+i)^{N_1}} + \frac{F_2}{(1+i)^{N_2}} + \frac{F_3}{(1+i)^{N_3}} + \frac{F_4}{(1+i)^{N_4}} + \frac{F_5}{(1+i)^{N_5}}$$

$$= \frac{3500}{(1+0.15)^1} + \frac{4607}{(1+0.15)^2} + \frac{3787}{(1+0.15)^3} + \frac{2600}{(1+0.15)^4} + \frac{1500}{(1+0.15)^5}$$

$$= 11249.37$$

P.T.O

NPV (cost) of Project P_3

$$P_0 + P_1 + P_2 + P_3 + P_4 + P_5$$

$$= 7000 + \frac{F_1}{(1+i)^{N_1}} + \frac{F_2}{(1+i)^{N_2}} + \frac{F_3}{(1+i)^{N_3}} + \frac{F_4}{(1+i)^{N_4}} + \frac{F_5}{(1+i)^{N_5}}$$

$$= 7000 + \frac{3000}{(1+0.15)^1} + \frac{2000}{(1+0.15)^2} + \frac{1010}{(1+0.15)^3} + \frac{750}{(1+0.15)^4} + \frac{1500}{(1+0.15)^5}$$

$$= 12959.65$$

B/C ratio = NPV (Benefit) / NPV (cost)

of

Project P. = 11249.37 / 12959.65

$$= 0.87 < 1.$$

P.T.O

project 9;

Discount rate 15%

year	0	1	2	3	4	5
Benefit	0	5000	4000	2500	2200	1800
cost	6000	1500	1700	2000	4000	1500

NPV (Benefit) of project 9;

$$P_1 + P_2 + P_3 + P_4 + P_5$$

$$\Rightarrow \frac{F_1}{(1+0.15)^1} + \frac{F_2}{(1+0.15)^2} + \frac{F_3}{(1+0.15)^3} + \frac{F_4}{(1+0.15)^4} + \frac{F_5}{(1+0.15)^5}$$

$$\Rightarrow \frac{5000}{(1+0.15)^1} + \frac{4000}{(1+0.15)^2} + \frac{2500}{(1+0.15)^3} + \frac{2200}{(1+0.15)^4} + \frac{1800}{(1+0.15)^5}$$

$$\Rightarrow 11168.97.$$

P.T.O

NPV (cost) of Project 9;

$$P_0 + P_1 + P_2 + P_3 + P_4 + P_5$$

$$= 6000 + \frac{F_1}{(1+i)^{N_1}} + \frac{F_2}{(1+i)^{N_2}} + \frac{F_3}{(1+i)^{N_3}} + \frac{F_4}{(1+i)^{N_4}} + \frac{F_5}{(1+j)^{N_5}}$$

$$= 6000 + \frac{1500}{(1+0.15)^1} + \frac{1700}{(1+0.15)^2} + \frac{2000}{(1+0.15)^3} + \frac{4000}{(1+0.15)^4} + \frac{1500}{(1+0.15)^5}$$

$$= 12937.60$$

B/C ratio of Project 9; = NPV (Benefit) / NPV (cost)

$$= 11168.91 / 12937.60$$

$$= 0.86 < 1.$$

Though both Projects are independent, we cannot select any Project from this two Projects. Because the B/C ratio of this two Projects are less than 1. They are not eligible for chosen. So, we cannot select any of them.

Question-03

Project N; Discount Rate 5%

Year	0	1	2	3	4	5
Benefit	0	10000	12000	5000	2500	0
cost	15000	3000	2000	1010	1500	2000

P.T.O

NPV (Benefit) of Project N;

$$P_1 + P_2 + P_3 + P_4 + P_5$$

$$= \frac{F_1}{(1+i)^{N_1}} + \frac{F_2}{(1+i)^{N_2}} + \frac{F_3}{(1+i)^{N_3}} + \frac{F_4}{(1+i)^{N_4}} + 0$$

$$= \frac{10000}{(1+0.05)^1} + \frac{12000}{(1+0.05)^2} + \frac{5000}{(1+0.05)^3} + \frac{2500}{(1+0.05)^4}$$

$$= 26784.11$$

NPV (Cost) of Project Nj

$$P_0 + P_1 + P_2 + P_3 + P_4 + P_5$$

$$= 15000 + \frac{F_1}{(1+i)^{N_1}} + \frac{F_2}{(1+i)^{N_2}} + \frac{F_3}{(1+i)^{N_3}} + \frac{F_4}{(1+i)^{N_4}} + \frac{F_5}{(1+i)^{N_5}}$$

$$= 15000 + \frac{3000}{(1+0.05)^1} + \frac{2000}{(1+0.05)^2} + \frac{1010}{(1+0.05)^3} + \frac{1500}{(1+0.05)^4} + \frac{2000}{(1+0.05)^5}$$

$$= 23344.78.$$

∴ NPV of Project N = NPV(Benefit) - NPV(cost)

= 26784.11 - 23344.78

= 3439.33 > 0

Project R;

year	0	1	2	3	4	5
Benefit	0	6000	5000	1500	2200	1800
cost	6000	1500	1700	2000	4000	1500

NPV (Benefit) of Project R;

$P_1 + P_2 + P_3 + P_4 + P_5$

$$= \frac{F_1}{(1+i)^{N_1}} + \frac{F_2}{(1+i)^{N_2}} + \frac{F_3}{(1+i)^{N_3}} + \frac{F_4}{(1+i)^{N_4}} + \frac{F_5}{(1+i)^{N_5}}$$

$$= \frac{6000}{(1+0.05)^1} + \frac{5000}{(1+0.05)^2} + \frac{1500}{(1+0.05)^3} + \frac{2200}{(1+0.05)^4} + \frac{1800}{(1+0.05)^5}$$

= 14765.69

NPV (cost) of Project R:

$$P_0 + P_1 + P_2 + P_3 + P_4 + P_5$$

$$= 6000 + \frac{F_1}{(1+i)^{N_1}} + \frac{F_2}{(1+i)^{N_2}} + \frac{F_3}{(1+i)^{N_3}} + \frac{F_4}{(1+i)^{N_4}} + \frac{F_5}{(1+i)^{N_5}}$$

$$= 6000 + \frac{1500}{(1+0.05)^1} + \frac{1700}{(1+0.05)^2} + \frac{2000}{(1+0.05)^3} + \frac{4000}{(1+0.05)^4} + \frac{1500}{(1+0.05)^5}$$

$$= 15164.296$$

NPV of Project R = NPV(Benefit) − NPV(cost)

$$= 14765.69 - 15164.296$$

$$= -398.606 < 0.$$

P.T.O →

Project N is greater than 0, but Project R is less than 0. So, In that case, we must chose Project N, because it fulfills the condition to be selected.

Question-04

Project N;

Years	0	1	2	3	4	5
Cash flow	-4000	2000	1500	1000	2042	1500

NPV of Project N $= P_0 + P_1 + P_2 + P_3 + P_4 + P_5$

$$\Rightarrow \quad 0 = -4000 + \frac{F_1}{(1+i)^{N_1}} + \frac{F_2}{(1+i)^{N_2}} + \frac{F_3}{(1+i)^{N_3}} + \frac{F_4}{(1+i)^{N_4}} + \frac{F_5}{(1+i)^{N_5}}$$

Let, $1+i = x$,

$$\Rightarrow \quad 0 = -4000 + \frac{2000}{x^1} + \frac{1500}{x^2} + \frac{1000}{x^3} + \frac{2042}{x^4} + \frac{1500}{x^5}$$

$$\Rightarrow -4000x^5 + 2000x^4 + 1500x^3 + 1000x^2 + 2042x + 1500 = 0 \quad --(i)$$

P.T.O

Trial and Error method:

$x = 1.1$ R.H.S = 3438.86

$x = 1.3$ R.H.S = 0.58

$x = 1.4$ R.H.S = -3394.96

$\therefore \quad x = 1.3$

$\Rightarrow 1+i = 1.3 \quad [1+i = x]$

$\Rightarrow i = 1.3 - 1 = 0.3 = 30\% > 20\%.$

Project M;

Year	0	1	2	3	4	5
Cash flow	-5000	2500	1200	1500	2000	1200

P.T.O

NPV of Project M = $P_0 + P_1 + P_2 + P_3 + P_4 + P_5$

$$\Rightarrow 0 = -5000 + \frac{F_1}{(1+i)^{N_1}} + \frac{F_2}{(1+i)^{N_2}} + \frac{F_3}{(1+i)^{N_3}} + \frac{F_4}{(1+i)^{N_4}} + \frac{F_5}{(1+i)^{N_5}}$$

Let, $1+i = x$,

$$\Rightarrow 0 = -5000 + \frac{2500}{x^1} + \frac{1200}{x^2} + \frac{1500}{x^3} + \frac{2000}{x^4} + \frac{1200}{x^5}$$

$$\Rightarrow -5000x^5 + 2500x^4 + 1200x^3 + 1500x^2 + 2000x + 1200 = 0 \quad \text{---(ii)}$$

Trial and Error method

$x = 1.1$	H.S = 2419.9
$x = 1.2$	H.S = 576
$x = 1.3$	H.S = -2453
$x = 1.22$	H.S = 76.41
$x = 1.23$	H.S = -191.97

Difference between 1.22 and 1.23;

$$1.23 \rightarrow -191.97$$
$$(-);\ 1.22 \rightarrow 76.41$$
$$0.01 \rightarrow -268.38$$

268.38 এর জন্য x এর ভিন্নতা 0.01

$\therefore$ 1 " " " " " $\frac{0.01}{268.38}$

$\therefore$ 76.41 " " " " " $\frac{0.01 \times 76.41}{268.38}$

$= 0.00284708$

$\therefore x = 1.22 + 0.00285$

$= 1.22285$

$\Rightarrow 1+i = 1.22285$

$\Rightarrow i = 1.22285 - 1 = 0.22285$

$= 22.285\% > 20\%$

P.T.O

Both Projects are independent and both Projects IRR are greater than given percentage. So, if we want we can chose both Projects.

Question - 05

Project A;

year	0	1	2	3	4
cash flow	-7000	4000	2500	3000	500
Discount cash flow	~~-7000~~ -7000	~~3636.36~~ 3333.33	1736.11	1736.11	241.13
comulative cash flow	-7000	-3666.67	-1930.56	-194.45	46.68

P.T.O

$$\therefore P_1 = \frac{F_1}{(1+i)^{N_1}} = \frac{4000}{(1+0.2)^1} = 3333.33$$

$$\therefore P_2 = \frac{F_2}{(1+i)^{N_2}} = \frac{2500}{(1+0.2)^2} = 1736.11$$

$$\therefore P_3 = \frac{F_3}{(1+i)^{N_3}} = \frac{3000}{(1+0.2)^3} = 1736.11$$

$$P_4 = \frac{F_4}{(1+i)^{N_4}} = \frac{500}{(1+0.2)^4} = 241.13$$

Pay back Period of Project A; $= 3 + \frac{104.45}{241.13}$

$= 3.806$ years.

P.T.O

Project B;

year	0	1	2	3	4
cash flow	-7000	4500	2000	1700	2000
Discount cash flow	-7000	3750	1388.89	983.796	964.51
Cumulative cash flow	-7000	-3250	-1861.11	-877.314	87.196

$$\therefore P_1 = \frac{F_1}{(1+i)^{N_1}} = \frac{4500}{(1+0.2)^1} = 3750$$

$$\therefore P_2 = \frac{F_2}{(1+i)^{N_2}} = \frac{2000}{(1+0.2)^2} = 1388.89$$

$$\therefore P_3 = \frac{F_3}{(1+i)^{N_3}} = \frac{1700}{(1+0.2)^3} = 983.796$$

$$\therefore P_4 = \frac{F_4}{(1+i)^{N_4}} = \frac{2000}{(1+0.2)^4} = 964.51$$

Pay back Period of Project B $= 3 + \frac{877.314}{964.51}$

$= 3.9096$ years.

When the Project of A and the Projects of B is mutually exclusive, we have to chose only one project. In that case the Pay back Period of A is less than Pay back Period of Project B. So, we will chose Project A. On the other hand, if two Projects are indepent, we can chose both of them and if we want we can chose only one also. As, here the time of Pay back of A is less than B, I think every one prefers to chose Project A instead of choosing B. But if we want we can chose both of them. Their is no condition or limitation.

P.T.O

Now let's do NPV method

Project A:

$$(NPV)_A = P_0 + P_1 + P_2 + P_3 + P_4$$

$$= -7000 + \frac{F_1}{(1+i)^{N_1}} + \frac{F_2}{(1+i)^{N_2}} + \frac{F_3}{(1+i)^{N_3}} + \frac{F_4}{(1+i)^{N_4}}$$

$$= -7000 + \frac{4000}{(1+0.2)^1} + \frac{2500}{(1+0.2)^2} + \frac{3000}{(1+0.2)^3} + \frac{500}{(1+0.2)^4}$$

$$= 46.68 > 0$$

$$(NPV)_B = P_0 + P_1 + P_2 + P_3 + P_4$$

$$= -7000 + \frac{F_1}{(1+i)^{N_1}} + \frac{F_2}{(1+i)^{N_2}} + \frac{F_3}{(1+i)^{N_3}} + \frac{F_4}{(1+i)^{N_4}}$$

$$= -7000 + \frac{4500}{(1+0.2)^1} + \frac{2000}{(1+0.2)^2} + \frac{1700}{(1+0.2)^3} + \frac{2000}{(1+0.2)^4}$$

$$= 87.19 > 0$$

P.T.O

Both Projects NPV are greater than 0. But Projects are mutually exclusive so, we have to chose only one. In this case, we will chose Project B, because Project B > Project A. on the otherhand if Both Projects are independents we can chose both of them because they are greater than zero, that means they fulfilled the conditions to be selected one. So, we will chose both of them if we want.

NOW let's do IRR method

For Project A;

$$\text{NPV of } A = P_0 + P_1 + P_2 + P_3 + P_4$$

$$\Rightarrow 0 = -7000 + \frac{F_1}{(1+i)^{N_1}} + \frac{F_2}{(1+i)^{N_2}} + \frac{F_3}{(1+i)^{N_3}} + \frac{F_4}{(1+i)^{N_4}}$$

P.T.O

Let, $1+i = x$

$$\Rightarrow 0 = -7000 + \frac{4000}{x^1} + \frac{2500}{x^2} + \frac{3000}{x^3} + \frac{500}{x^4}$$

$$\Rightarrow -7000x^4 + 4000x^3 + 2500x^2 + 3000x + 500 = 0 \text{ --- (i)}$$

Trial and error method;

$x = 1.1$ R.H.S = 1900.3

$x = 1.20$ R.H.S = 96.8

$x = 1.3$ R.H.S = -2579.7

$x = 1.21$ R.H.S = -128.63

Difference between 1.20 and 1.21;

	1.21	→	-128.63
(-);	1.20	→	96.8
	0.01	→	-225.43

P.T.O

225.43 এর জন্য x এর ডিফারেন্স 0.01

∴ 1 " " " " " $\frac{0.01}{225.43}$ এ 6.8

∴ 6.8 " " " " " $\frac{0.01 \times 1.20}{225.43}$

$= 0.0042940$

∴ $x = 1.20 + 0.0042940$

$= 1.204294$

$\Rightarrow 1+i = 1.204294$

$\Rightarrow i = 1.204294 - 1$

$= 0.204294$

$= 20.43\%$ which is $> 20\%$.

For Project B;

NPV of B $= P_0 + P_1 + P_2 + P_3 + P_4$

$\Rightarrow 0 = -7000 + \frac{F_1}{(1+i)^{N_1}} + \frac{F_2}{(1+i)^{N_2}} + \frac{F_3}{(1+i)^{N_3}} + \frac{F_4}{(1+i)^{N_4}} + \frac{F_5}{(1+i)^{N_5}}$

P.T.O

Let, $1+i=x$

$$\Rightarrow 0 = -7000 + \frac{4500}{x^1} + \frac{2000}{x^2} + \frac{1700}{x^3} + \frac{2000}{x^4}$$

$$\Rightarrow -7000x^4 + 4500x^3 + 2000x^2 + 1700x + 2000 = 0 \quad \text{---(ii)}$$

Trial and error method!

$x = 1.1$ R.H.S = 2030.8

$x = 1.20$ R.H.S = 180.8

$x = 1.3$ R.H.S = -2516.2

$x = 1.21$ R.H.S = -47.897

difference between 1.21 and 1.20;

1.21 $\longrightarrow$ -47.897

(-); 1.20 $\Rightarrow$ 180.8

0.01 $\rightarrow$ -228.697

P.T.O

228.697 এর জন্যে n এর ডিফারেন্স 0.01

∴ 1 " " " " $\frac{0.01}{228.697}$

∴ 180.8 " " " " " $\frac{0.01 \times 180.8}{228.697}$

$= 0.00790565\overline{7}$

∴ $n = 1.20 + 0.00790565\overline{7}$

$\Rightarrow 1+i = 1.2079056\overline{57}$

$\Rightarrow i = 1.2079057 - 1$

$= 0.2079057$

$= 20.797\% > 20\%$.

When both projects are mutually exclusive, we will select only one Project. In that case, Project A and B fulfill the condition to be selected but Project A < Project B. So, we will chose only project B. on the other hand when the two Projects are Independent, then If we want we can chose both of them because Both of them are greater than given percentage of MARR. So, we can select both of them If we want.