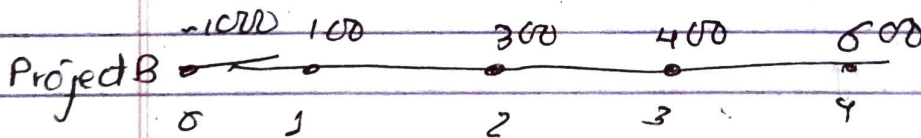
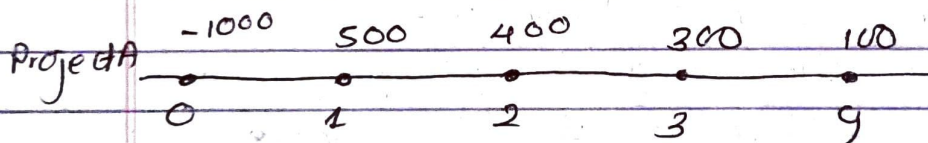


$$0 = NPV = \sum_0 C$$

Year	Project A	Project B
0	-1000	-1000
1	500	100
2	400	300
3	300	400
4	100	600

Find the IRR when the cost of capital is 10%.



$$PV = \frac{F}{(1+i)^n}$$

Net Present value = PV(cash outflow) - PV(cash inflow)

$$NPV=0 = PV_0 + PV_1 + PV_2 + PV_3 + PV_4$$

for (PA); or, $0 = -1000 + \frac{500}{(1+R)} + \frac{400}{(1+R)^2} + \frac{300}{(1+R)^3} + \frac{100}{(1+R)^4}$

for 14%,

$$NPV = -1000 + \frac{500 \times 50}{1.14} + \frac{400 \times 1.14}{1.14^2} - 2500$$
$$NPV = -1000 + 438.596 + 392.3107 + 299.179$$
$$NPV = -8.335$$

or

$$NPV = -1000 + 438.596 + 392.3107 + 299.179$$
$$NPV = -8.335$$

$$NPV = -8.335$$

Suppose, $r = 15\%$, $NPV = -8.335$.

$$NPV = -1000(1+r)(1+r^2)(1+r^3)(1+r^4)$$

For 14% \uparrow

$$NPV = -1000(1+r)^4 + 500(1+r)^3 + 400(1+r)^2$$
$$NPV = -1000(1.14)^4 + 500(1.14)^3 + 400(1.14)^2 + 100$$
$$NPV = -1689 + 740.75 + 519.84 + 442$$
$$NPV = 8.08 > 0$$

for $r = 15\%$.

$$NPV = -8.335$$

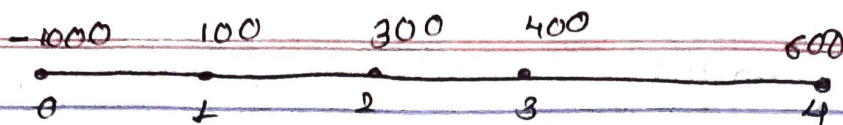
15%	14%
-8.335	8.08

$$2 \times 16.415 = 1 \times 8.335$$

$$x = \frac{1 \times 8.335}{16.415} = 0.507$$

$$IRR = 15 - 0.507 = 14.493$$

Proj 88



$$PV = \frac{F}{(1+r)^n}$$

Now, lets take $i = 12\%$.

$$\begin{aligned} \text{NPV} &= PV_0 + PV_1 + PV_2 + PV_3 + PV_4 \\ &= -1000 + \frac{100}{(1+0.12)} + \frac{300}{(1+0.12)^2} \\ &\quad + \frac{400}{(1+0.12)^3} + \frac{600}{(1+0.12)^4} \\ &= -1000 + 89.286 + 239.158 \\ &\quad + 284.712 + 381.31 \\ &= -5.53 \end{aligned}$$

Since NPV is negative, we ~~have~~ calculate NPV with lower rate,

So, lets take $i = 11\%$.

$$\begin{aligned} \text{NPV} &= \cancel{PV_0} - 1000 + \frac{100}{1+0.11} + \frac{300}{(1.11)^2} + \frac{400}{(1.11)^3} \\ &\quad + \frac{600}{(1.11)^4} \\ &= -1000 + 90.09 + 243.487 \\ &\quad + 292.477 + 395.239 \\ &= 21.293 \end{aligned}$$

$$\begin{aligned} \text{Now, } IRR &= L + \left[\frac{N_L}{N_L - N_H} \times (H - L) \right] \\ &= 11\% + \left[\frac{21.293}{21.293 + 5.53} \times (12 - 11) \right]\% \\ &= 11\% + 0.79 \\ \therefore IRR &= 11.79\% \end{aligned}$$

Your local foundry is adding a new furnace. There are several different styles and types of furnaces, so the foundry must select from among a set of mutually exclusive alternatives. Initial capital investment and annual expenses for each alternative are given in the table below. None have any market value at the end of its useful life. Using a MARR of 15%, which furnace should be chosen?

	F1	F2	F3
Investment	\$110,000	\$125,000	\$138,000
Useful life	10 years	10 years	10 years
Total annual expenses	\$33,800	\$51,625	\$45,033

Present value in terms of annual expense,

$$(P/A, i\%, N) = \frac{1 - (1+i)^{-N}}{i} \rightarrow \textcircled{1}$$

For F_1 ,

$$\begin{aligned} P.W_{F_1} &= -110000 - 33800(P/A, 15\%, 10) \\ &= -110000 - 33800 \left(\frac{1 - (1.15)^{-10}}{0.15} \right) \\ &= -110000 - 33800 \times 5.019 \\ &= -\$380,009.792 \end{aligned}$$

Also, for F_2 ,

$$\begin{aligned} P.W_{F_2} &= -125000 - 51625(P/A, 15\%, 10) \\ &= -\$384,093.93 \end{aligned}$$

For F_3

$$PW_{F3} = -138000 - 48033 (P/A, 15\%, 10)$$

$$= -\$364020.622$$

since F_3 costs less than F_1 and F_2 , so, it has large P.W and ~~be~~ economically best.

3. given	MARR = 12% , Life = 8 years				
capital	A	B	C	D	E
capital	\$12,000	\$12,500	\$14,400	\$16,250	\$20,000
Investment	\$				
Net annual income	\$2,500	\$2,520	\$3,050	\$3,620	\$4,400
IRR	12.99%	13.48%	14.99%	14.99%	14.61%

Sol^y

As $IRR > MARR$, every alternatives are acceptable.

$$\therefore (P/A, i\%, N) = \frac{1 - (1+i)^{-N}}{i}$$

$$\text{So, } PW_A = -12000 + 2500 (P/A, 12\%, 8)$$

$$= -12000 + 2500 \left(\frac{1 - (1.12)^{-8}}{0.12} \right)$$

$$= -12,000 + 2500 \times 4.968$$

$$= \$420,$$

$$\text{Hwy, } PW_B = -12500 + 2520 (P/A, 12\%, 8) = \$19.36$$

$$PW_C = -14,400 + 3,050 (P/A, 12\%, 8) = \$752.9$$

$$PW_D = 16,250 + 3,620 (P/A, 12\%, 8) = \$1,734.16$$

$$PW_E = -20,000 + 4,400 (P/A, 12\%, 8) = \$1,859.2$$

since alternative E has the highest PW, it is economically best to choose.