

Economic Analysis

Establishing the planning horizon and the minimum attractive Rate of return

- Planning horizon Duration (when alternatives have unequal lives)
 - Shortest lives.
 - Longest lives.
 - Least common multiple of lives.
 - Standard length.

Ex.1

Two alternatives have the following net cash flow (NCF), salvage value (SV) profiles

EOY	Alternative 1		Alternative 2	
	NCF(SR)	SV(SR)	NCF(SR)	SV(SR)
0	-50K	50K	-80K	80K
1	25K	25K	15K	50K
2	30K	10K	25K	30K
3	35K	5K	35K	20K
4			45K	10K
5			55K	5K

Specify the planning horizon and complete set of cash flows for each alternative using each of the following:

- a. Longest life among a alternatives.
- b. Shortest life among a alternatives.
- c. Least common multiple of lives approach.
- d. Planning horizon of 3 year.
- e. Assuming the two a alternatives are one shot investment.

Solution

- a. Longest life among a alternatives $t=5$

EOY	Alternative 1	Alternative 2
0	-50k	-80k
1	25k	15k
2	30k	25k
3	35k+5k-50k	35k
4	25k	45k
5	30k+10k	55k+5k

- b. Shortest life among a alternatives.

EOY	Alternative 1	Alternative 2
0	-50k	-80k
1	25k	15k
2	30k	25k
3	35k+5k	35k+20k

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c. LCM = 15

EOY	Alternative 1	Alternative 2
0	-50k	-80k
1	25k	15k
2	30k	25k
3	35k+5k-50k	35k
4	25k	45k
5	30k	55k+5k-80k
6	35k+5k-50k	15k
7	25k	25k
8	30k	35k
9	35k+5k-50k	45k
10	25k	55k+5k-80k
11	30k	15k
12	35k+5k-50k	25k
13	25k	35k
14	30k	45k
15	35k+5k	55k+5k

d. t=3 years

EOY	Alternative 1	Alternative 2
0	-50K	-80K
1	25K	15K
2	30K	25K
3	35K+ 5K	35K + 20K

e. One shot investment

EOY	Alternative 1	Alternative 2
0	-50k	-80k
1	25k	15k
2	30k	25k
3	35k+5k	35k
4	0	45k
5	0	55k+5k

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Ex.2

Consider the net cash flows (NCF) and salvage values (SV) shown below . Assume the alternatives can be indefinitely renewed with same cash flows and salvage values. Specify the planning horizon and complete set of cash flows for each alternative using each of the following :

EOY	Alternative 1		Alternative 2	
	NCF	SV	NCF	SV
0	-\$100	\$100	-\$70	\$70
1	\$20	\$40	\$30	\$50
2	\$20	\$20	\$40	\$30
3	\$40		\$50	
4	\$60			

a) Least common multiple of lives

L.C.M= 12 years

EOY	Alt 1	Alt 2
0	-\$100	-\$70
1	\$20	\$30
2	\$20	\$40
3	\$40	-\$20
4	-\$40	\$30
5	\$20	\$40
6	\$20	-\$20

EOY	Alt 1	Alt 2
7	\$40	\$30
8	-\$40	\$40
9	\$20	-\$20
10	\$20	\$30
11	\$40	\$40
12	\$60	\$50

b) Shortest life among Alternatives

Shortest life = 3 years

EOY	Alt 1	Alt 2
0	-\$100	-\$70
1	\$20	\$30
2	\$20	\$40
3	\$40	\$50

c) Longest life among Alternatives

Longest life = 4 years

EOY	Alt 1	Alt 2
0	-\$100	-\$70
1	\$20	\$30
2	\$20	\$40
3	\$40	-\$20
4	\$60	\$80

Economic Analysis

Capitalized worth

A special type of cash flow series is a perpetuity.

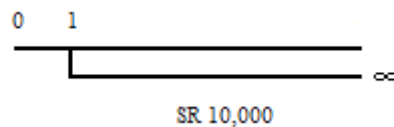
$$C_w = P_w, \text{ when } n = \infty$$

$$P_w = A \frac{(1+i)^n - 1}{i(1+i)^n}, \quad n = \infty$$

$$C_w = A \frac{(1+i)^n - 1}{i(1+i)^n} = A \frac{(1+i)^n}{i(1+i)^n} - \frac{1}{i(1+i)^n} = \frac{A}{i}$$

$$C_w = \frac{A}{i}$$

Ex.1



Find Capitalized worth if $i=10\%$

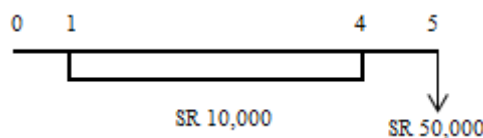
solution

$$C_w = \frac{A}{i} = \frac{10,000}{0.10} = \text{SR}100,000$$

Ex.2

Maintenance costs over a 4 years period for an urban highway are SR 10000/year and rehabilitation at end of year 5 is SR 50000. It is anticipated that this sequence will repeat itself every 5 year forever. Determine the capitalized cost of the maintenance and rehabilitation cost based on a time value of money of 10%.

Solution



$$P_w = -50,000(P/F_{10,5}) + 10,000(P/A_{10,4}) = \text{SR } 62744$$

$$A_w = 62744(A/P_{10,5}) = \text{SR } 165518.6$$

$$C_w = \frac{A}{i} = \frac{165518.6}{0.10} = \text{SR } 1655186$$

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Ex.3

Consider an investment project , the cash flow pattern of which repeats itself every 5 years forever as shown below . At an interest rate of 10% , compute the capitalized cost for this project .

EOY	0	1	2	3	4	5	6	7	8	9	10	∞
NCF(SR)	0	-1000	-1000	-400	-400	-200	-1000	-1000	-400	-400	-200	...

$$\begin{aligned}P_w &= 1000 (P/A 10,2) + 400 (P/A 10,2) (P/F 10,2) + 200 (P/F 10,5) \\&= 1000 (1.73554) + 400 (1.73554) (0.82645) + 200 (0.62092) \\&= 2433.46\end{aligned}$$

$$A_w = 2433.46 (A/P 10,5) = 2433.46 (0.26380) = 641.95$$

$$C_w = 641.95/0.1 = 6419.5$$