GE 403
Engineering Economy

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Ex.1 Consider the following cash flow profile and assume MARR is 10% per year compounded annually.

EOY	0	1	2	3	4	5	6
NCF	-$70,000	$30,000	$30,000	$30,000	$30,000	$30,000	$32,000

- Determine the IRR for this project.
- Is this project economically attractive?

Solution ***By Compound interest formulas***

Pw (IRR) = $-70,000 + 30,000\frac{(1+i)^5-1}{i(1+i)^5} + 32,000(1+i)^{-6} = 0 \quad \Rightarrow \text{IRR} = 36.35\%$

Since IRR > MARR, the project is economically attractive.

Solution ***By Compound interest tables***

Pw (IRR) = $-70,000 + 30,000\ (P/A\ \ i\%, 5) + 32,000\ (P/F\ \ i\%, 6)$

Pw (30%) = $9696.73

Pw (40%) = -$4695.15

By using interpolation IRR = 36.74% which is Pw equals to Zero

Since IRR > MARR, the project is economically attractive.

Ex.2 Consider the following cash flow profile and assume MARR is 10% per year compounded annually.

EOY	0	1	2	3	4	5	6
NCF	-$100,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000

- Determine the ERR for this project.
- Is this project economically attractive?

Solution

(+)Fw (MARR) = (-)Fw (ERR)

$$25{,}000\ (F/A\ 10\%, 6) = 100{,}000\ (1 + ERR)^6$$

$$25{,}000\ (7.71561) = 100{,}000\ (1 + ERR)^6 \qquad \Rightarrow ERR = 11.57\%$$

Since ERR > MARR, the project is economically attractive.

Ex.3 The engineering team at a company is planning to purchase an enterprise resource planning (ERP) system. The software and installation from Vendor **A** costs **$380,000** initially and is expected to increase revenue **$125,000** per year every year. The software and installation from Vendor **B** costs **$280,000** and is expected to increase revenue **$95,000** per year. The company uses a 4-year planning horizon and a 10 percent per year MARR. (The "do nothing" alternative is feasible) Which ERP system should be purchased based on **IRR & ERR** analyses?

Solution

Incremental Approach IRR Method

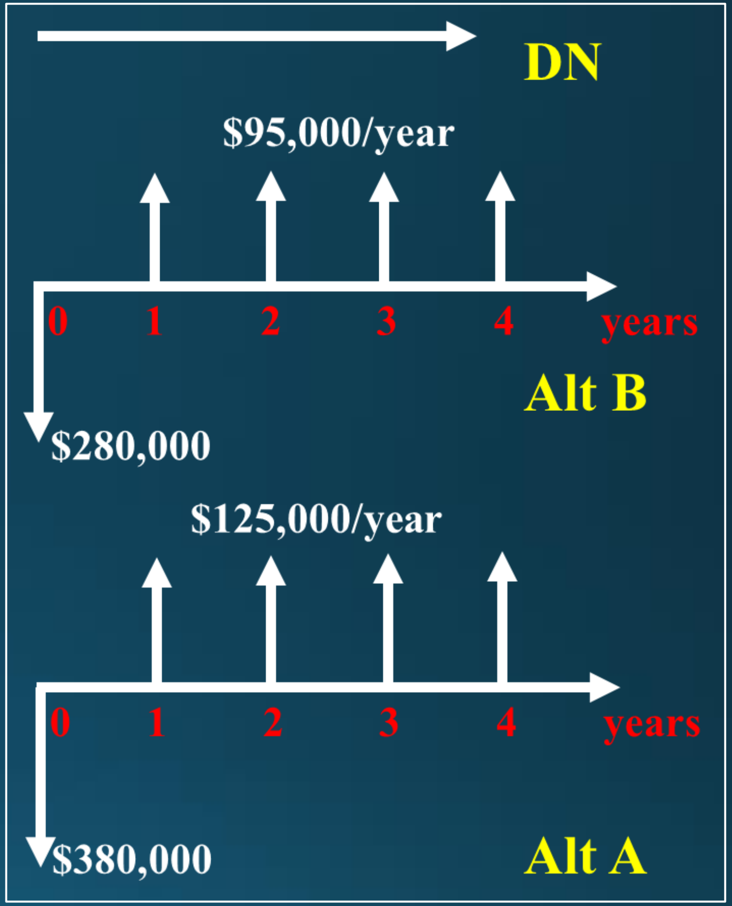
- Order alternatives from lowest to highest initial investment
- Determine incremental cash flows between alternatives
- Calculate IRR on incremental cash flows

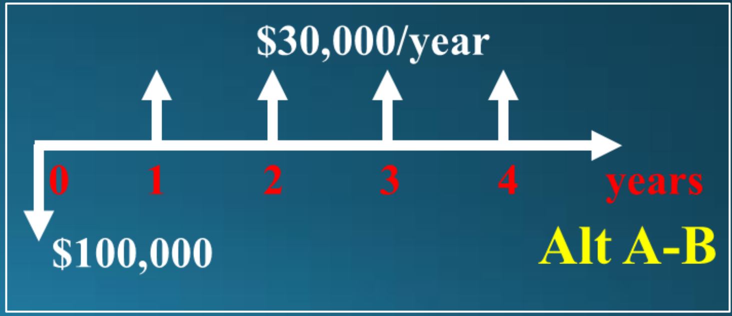
$Pw)_{B\text{–}DN}$ = -280,000 + 95,000(P/A IRR%, 4) = 0 ⇒ IRR =13.44%

Since $IRR)_{B\text{–}DN}$ > MARR, therefore B is better than doing nothing

$Pw)_{A\text{-}B}$ = -100,000 + 30,000(P/A IRR%, 4) = 0 ⇒ IRR =7.71%

Since $IRR)_{A\text{–}B}$ < MARR, therefore B is better than A





Solution

Incremental Approach ERR Method

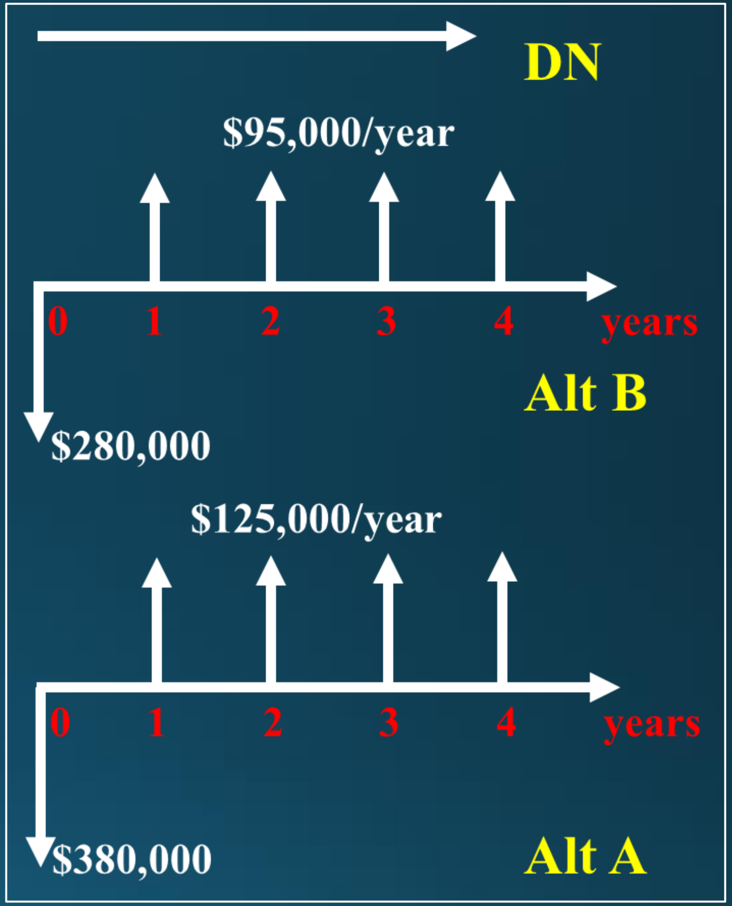
- Order alternatives from lowest to highest initial investment
- Determine incremental cash flows between alternatives
- Calculate ERR on incremental cash flows

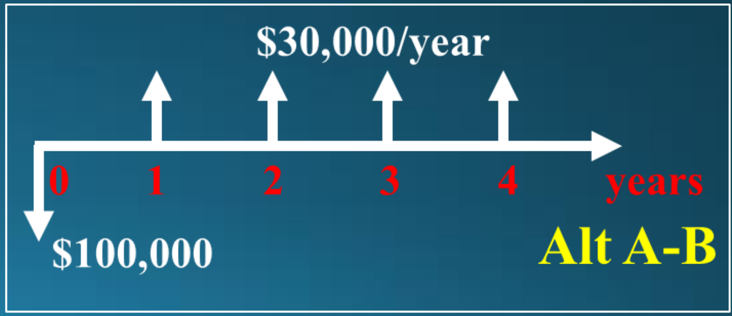
$$95{,}000\,\frac{(1+0.1)^4-1}{0.1} = 280{,}000\,(1+ERR_{B\_DN})^4 \;\Rightarrow\; \text{ERR=12\%}$$

Since ERR$)_{B\text{–}DN}$ > MARR, therefore B is better than doing nothing

$$30{,}000\,\frac{(1+0.1)^4-1}{0.1} = 100{,}000\,(1+ERRA\_{}_{B})^4 \;\Rightarrow\; \text{ERR=8.63\%}$$

Since ERR$)_{A\text{–}B}$ < MARR, therefore B is better than A





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