Objective of lecture.

To understand the following points

1- Capital recovery.

2-EUAB,EUAC,EUAW.

Solved examples

Capital Recovery and AW Value

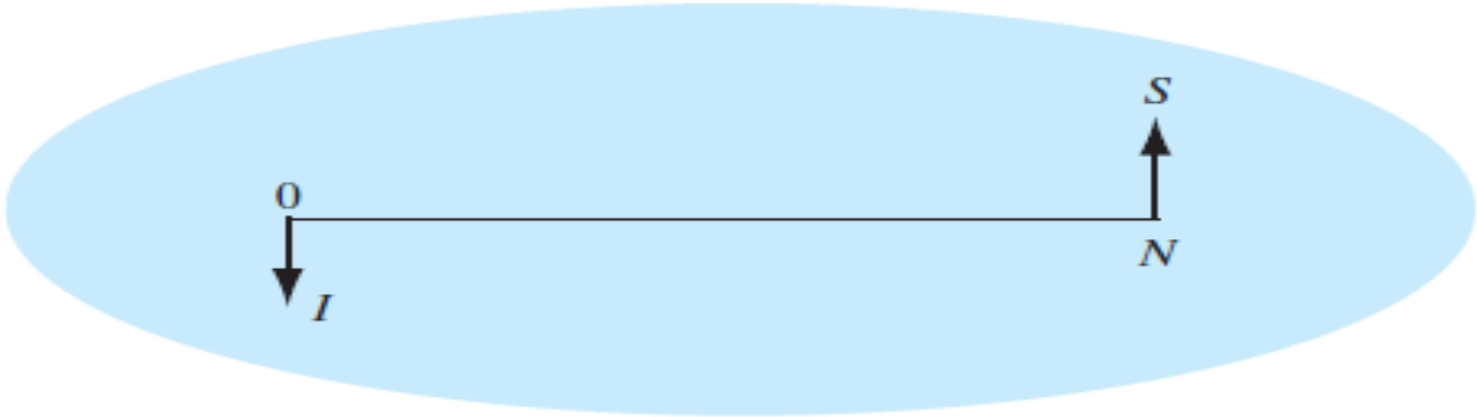
استرداد راس المال

- Capital Recovery is the **equivalent annual cost** of obtaining the asset plus the salvage
- CR is a function of {P, SV, i%, and n }
- AW is comprised of two components: capital recovery for the initial investment P at a stated interest rate (MARR) and the equivalent annual amount A

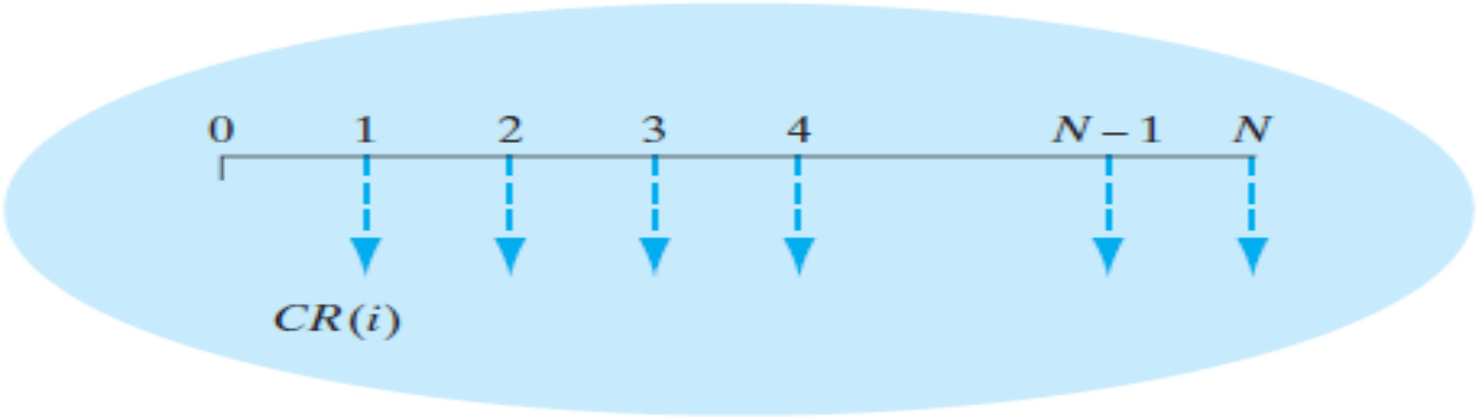
- An alternative usually has the following cash flow estimates:
  - **Initial Investment (P)** – the total first cost of all assets and services required to initiate the alternative.
  - **Salvage Value (SV)** – the terminal estimated value of assets at the end of their useful life.
  - **Annual Amount (A)** – the equivalent annual amount; typically this is the annual operating cost (AOC).

Two general monetary transactions are associated with the purchase and eventual retirement of a capital asset: its initial cost (I) and its salvage value (S). Taking into account these sums, we calculate the capital recovery factor as follows:

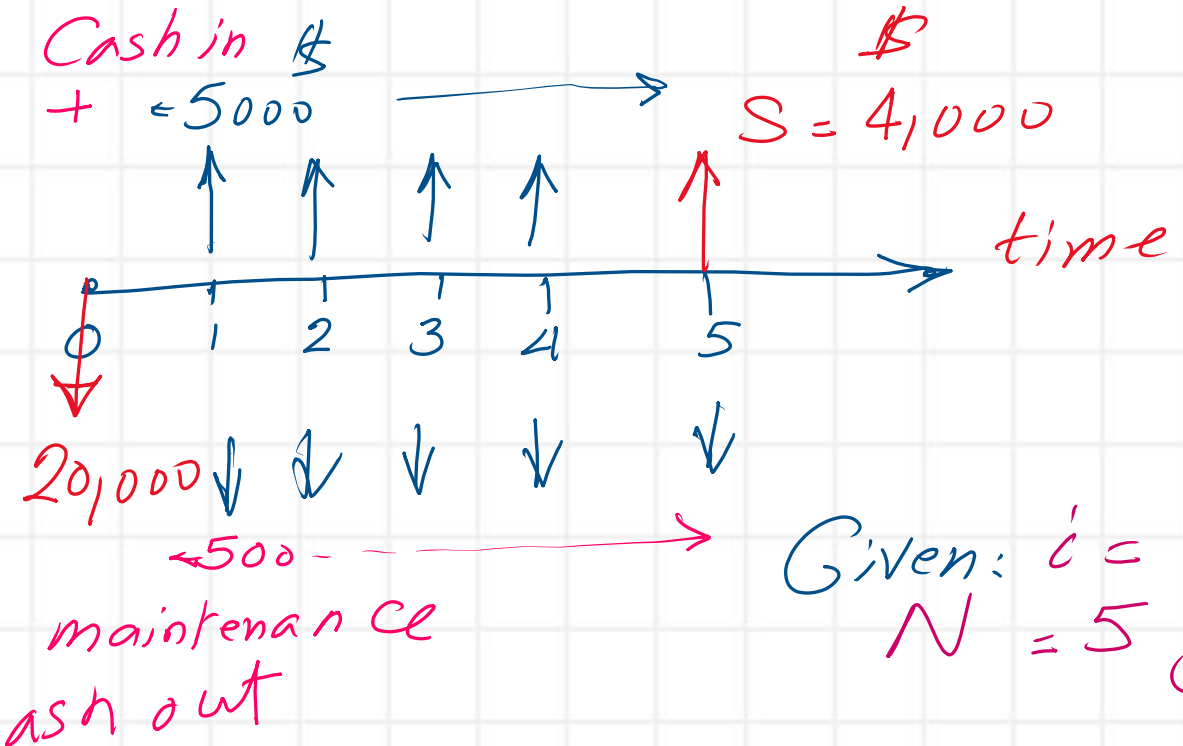
$$CR(i) = I(A/P, i, N) - S(A/F, i, N). \tag{6.2}$$



$$CR(i) = (I - S)(A/P,i,N) + iS$$



Consider a machine that costs $20,000 and has a five-year useful life. At the end of the five years, it can be sold for $4,000 after tax adjustment. The annual operating and maintenance (O&M) costs are about $500. If the firm could earn an after-tax revenue of $5,000 per year with this machine, should it be purchased at an interest rate of 10%? (All benefits and costs associated with the machine are accounted for in these figures.)



$P = 20,000$ (-ve)

$S = 4000$

Revenue $A = +5000$

Maintenance $= 500$ (-ve)

Given: $i = 10\%$

$N = 5$ years

$CR = I(A/P, i\%, N) - S(A/F, i\%, N)$

From APPENDIX C

$i = 10\%$

10% Compound Interest Factors 10%

	Single Payment		Uniform Payment Series				Arithmetic Gradient		
n	Compound Amount Factor Find F Given P F/P	Present Worth Factor Find P Given F P/F	Sinking Fund Factor Find A Given F A/F	Capital Recovery Factor Find A Given P A/P	Compound Amount Factor Find F Given A F/A	Present Worth Factor Find P Given A P/A	Gradient Uniform Series Find A Given G A/G	Gradient Present Worth Find P Given G P/G	n
1	1.100	.9091	1.0000	1.1000	1.000	0.909	0	0	1
2	1.210	.8264	.4762	.5762	2.100	1.736	0.476	0.826	2
3	1.331	.7513	.3021	.4021	3.310	2.487	0.937	2.329	3
4	1.464	.6830	.2155	.3155	4.641	3.170	1.381	4.378	4
5	1.611	.6209	.1638	.2638	6.105	3.791	1.810	6.862	5

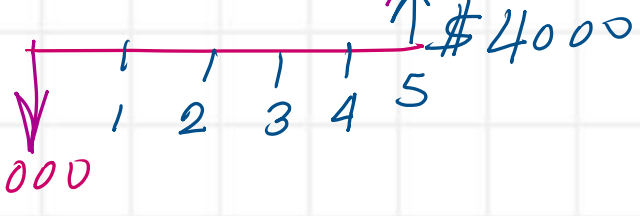
$A/P = 0.2638$

For $N = 5$ years

$A_1 = 20{,}000(0.2638)$ ← $P = 20{,}000$

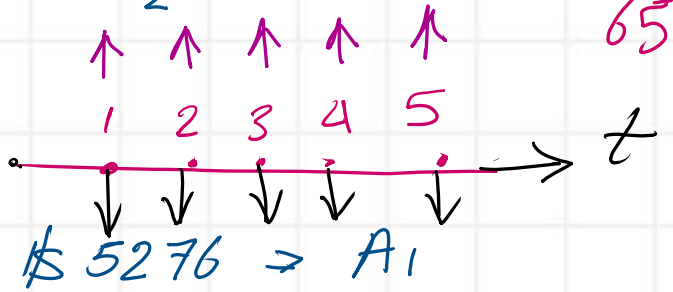
$= 5276$

while $A/F = 0.1638$



$=$

$A_2 = 4000(0.1638) =$ $655.2



From APPENdix C

10% Compound Interest Factors 10%

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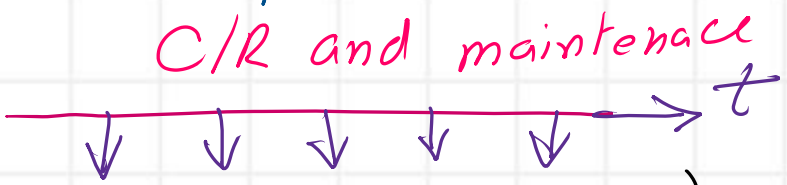
A_3: operation Cost = $500

C/R and maintenace

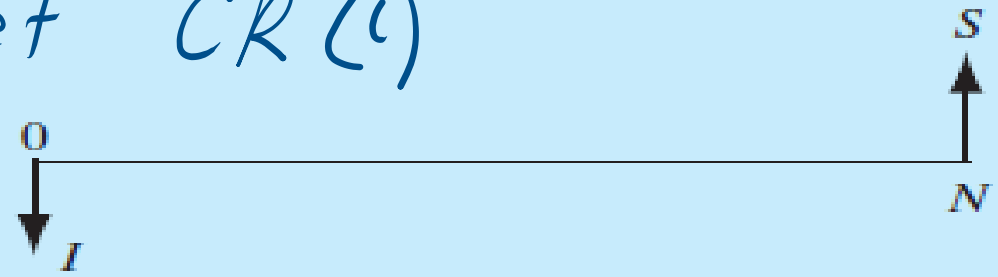


$\Sigma A = 500 + 5276 - (655.2) = 5120.8$

$A_2 = 4000(0.1638) = \$655.2$

The second Formula
Can be used to get CR(i)

S = 4000

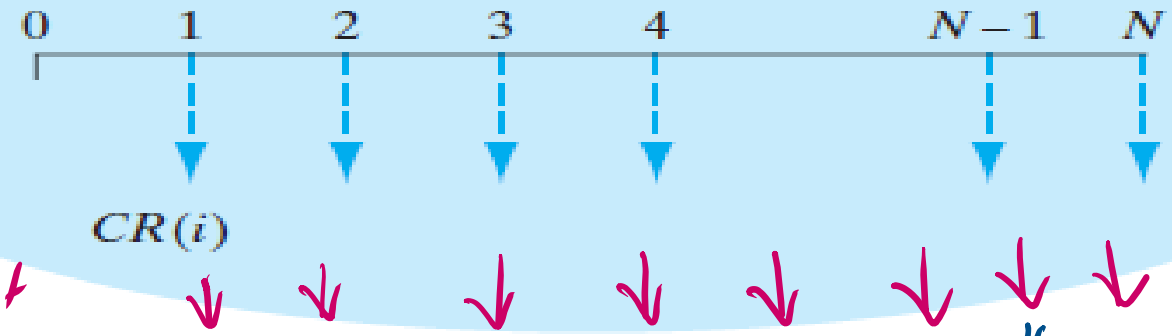


N = 5
i = 10 %

I = 20000

$(CR(i) = (I - S)(A/P, i, N) + iS) \rightarrow$ #

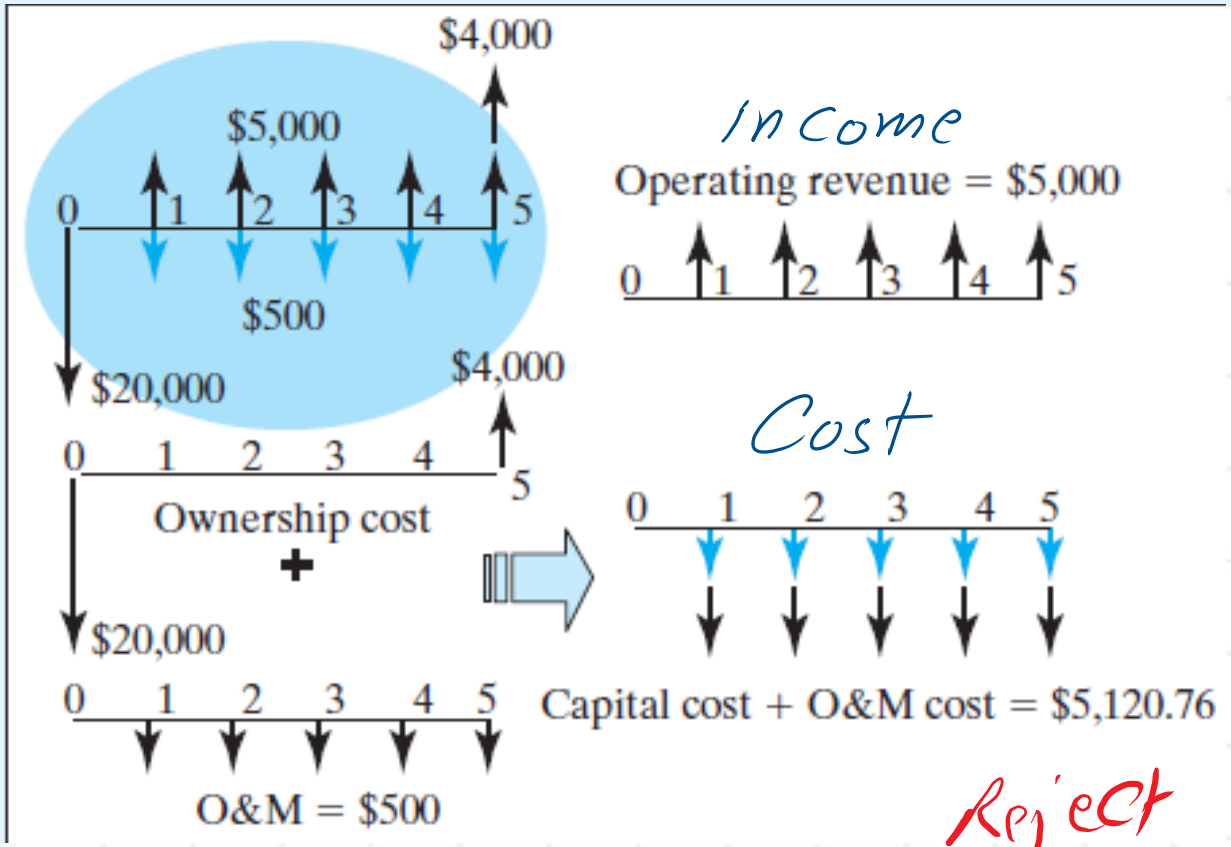
$CR = (20{,}000 - 4{,}000)\,0.2638 + (0.10)(4000) = 4620.8$



A2: Maintenance cost
= 500

$CR(i) = 4620.8 - 500 = 5120.80$

Consider a machine that costs $20,000 and has a five-year useful life. At the end of the five years, it can be sold for $4,000 after tax adjustment. The annual operating and maintenance (O&M) costs are about $500. If the firm could earn an after-tax revenue of $5,000 per year with this machine, should it be purchased at an interest rate of 10%? (All benefits and costs associated with the machine are accounted for in these figures.)



Reject

$CR = I\left(\frac{A}{P}, i\%, n\right) - S\left(\frac{A}{F}, i\%, n\right)$

$i = 10\%$

$n = 5$

$\frac{A}{P} = 0.2638$

$\frac{A}{F} = 0.1638$

$CR = -(0.2638(20,000)$

$+(0.1638(40$

$= -5276 + 6552$

$= -4620.8 - 500$

ADD O.M

$= -5120.8$

Rev < CR + Ma