GE 403
Engineering Economy

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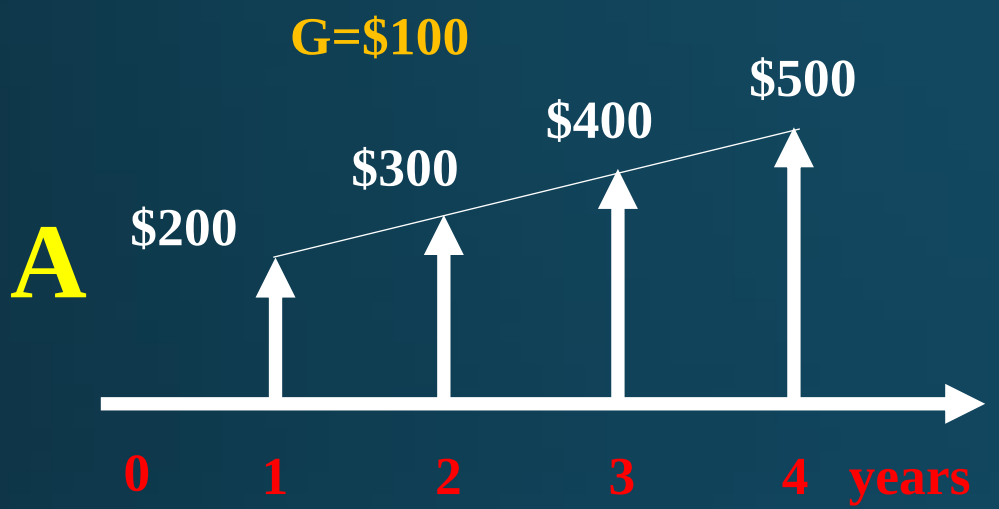
Equivalence & Indifference

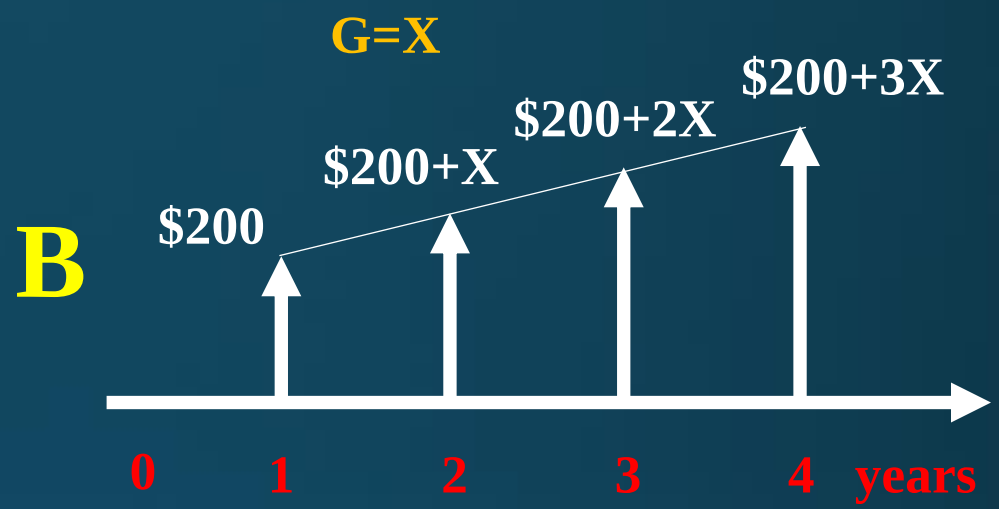
- Two cash flow streams are said to be **equivalent** at k% interest if and only if their present worth are equal at k% interest.
- OR Two cash flow profiles are **equivalent** if their time value of money worth at a **common point** in time are equal.
- In engineering economic analyses, **indifference** means “to have no preference.”
- Specifically, a potential investor is **indifferent** between two (or more) cash flow profiles if they are **equivalent**.

Ex. Determine the value of X if the two cash flows are equivalent at 10% compounded annually .

EOY	Cash Flow A	Cash Flow B
0	$0	$0
1	$200	$200
2	$300	$200+X
3	$400	$200+2X
4	$500	$200+3X

Solution





$Pw_A = 200(P/A\ 10\%, 4)+100(P/G\ 10\%, 4)$

$Pw_A = 200(3.16987)+100(4.37812)$

$Pw_A = \$1071.786$

$Pw_B = 200(P/A\ 10\%, 4)+X(P/G\ 10\%, 4)$

$Pw_B = 200(3.16987)+X(4.37812)$

$Pw_B = \$\ 633.974 +4.37812X$

$$Pw_A = Pw_B$$

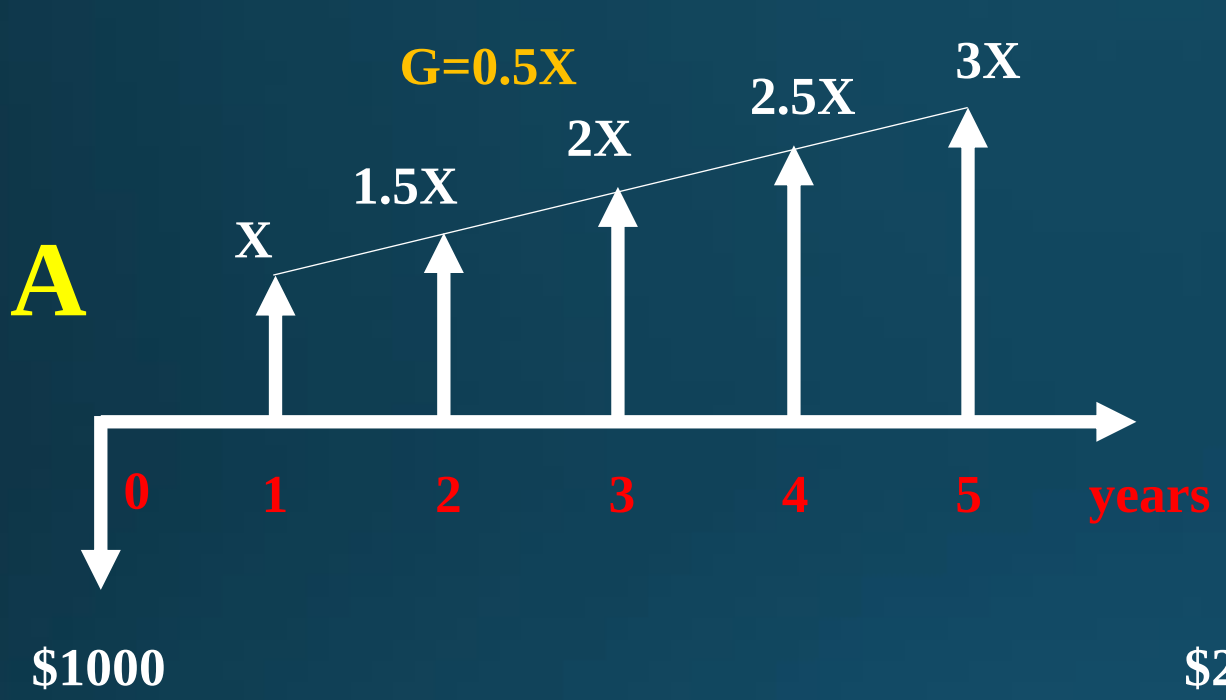
$1071.786 = 633.974 +4.37812X$ ⇒ $X = \$100$

Ex. Consider the following two cash flow series

EOY	Cash Flow A	Cash Flow B
0	-$1000	-$2500
1	X	$3000
2	1.5X	$2500
3	2X	$2000
4	2.5X	$1500
5	3X	$1000

Determine the value of X if two cash flows are equivalent at an interest rate of 15 percent per year compounded annually.

Solution



$Pw_A = -1{,}000+X(P|A\ 15\%,5)+0.5X(P|G\ 15\%,5)$

$Pw_A = -\$1{,}000+6.239730X$

$Pw_B = -2{,}500+3{,}000\ (P|A\ 15\%,5)-500\ (P|G\ 15\%,5)$

$Pw_B = \$4{,}668.91$

$$Pw_A = Pw_B$$

$-\$1{,}000+6.239730X = \$4{,}668.91 \rightarrow X = \$908.5$

Variable Interest Rates

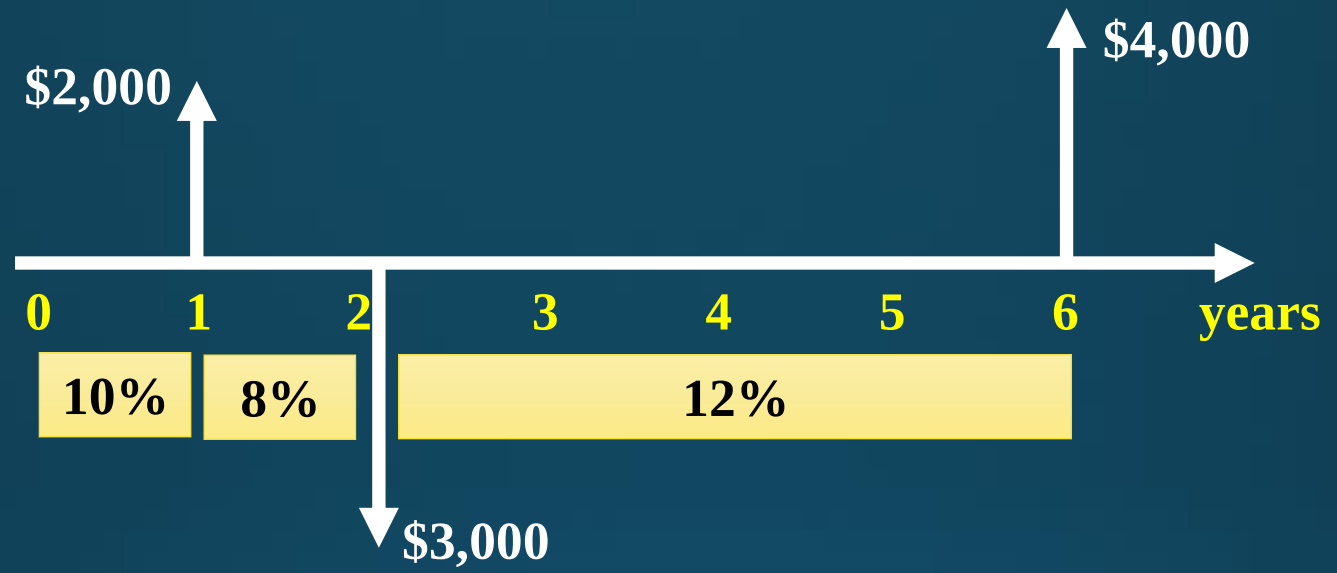
Consider the following cash flows and interest rates:

End of Year	0	1	2	3	4	5	6
Cash Flow at End of Period	$0	$2000	-$3000	$0	$0	$0	$4000
Interest Rate during Period		10%	8%	12%	12%	12%	12%

- Determine the present worth of this series of cash flows.
- Determine the future worth of this series of cash flows.
- Determine a 6-year uniform annual series that is equivalent to the original series.

Solution

Pw

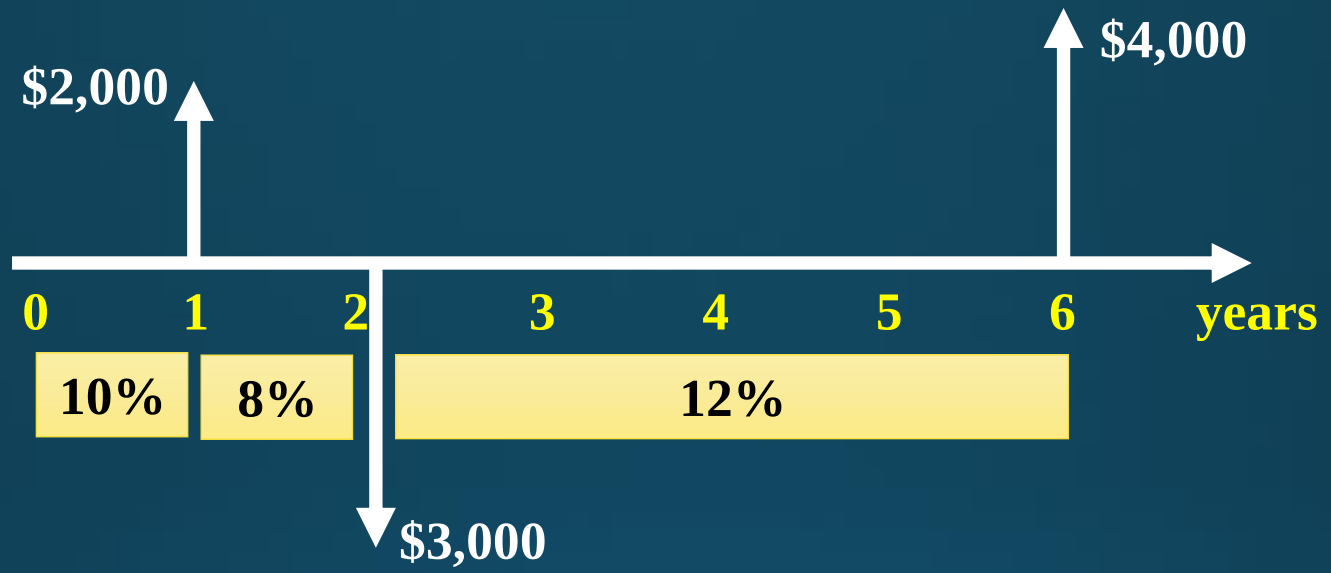


Pw =2,000 (P|F 10%,1)- 3,000 (P|F 10%,1) (P|F 8%,1)+ 4,000 (P|F 10%,1) (P|F 8%,1) (P|F 12%,4)

Pw=2,000 (0.90909)- 3,000 (0.90909) (0.92593)+ 4,000 (0.90909) (0.92593)(0.63552)= **$ 1,432.72**

Solution

Fw



FW= 2,000 (F|P 8%,1) (F|P 12%,4)- 3,000× (F|P 12%,4)+ 4,000

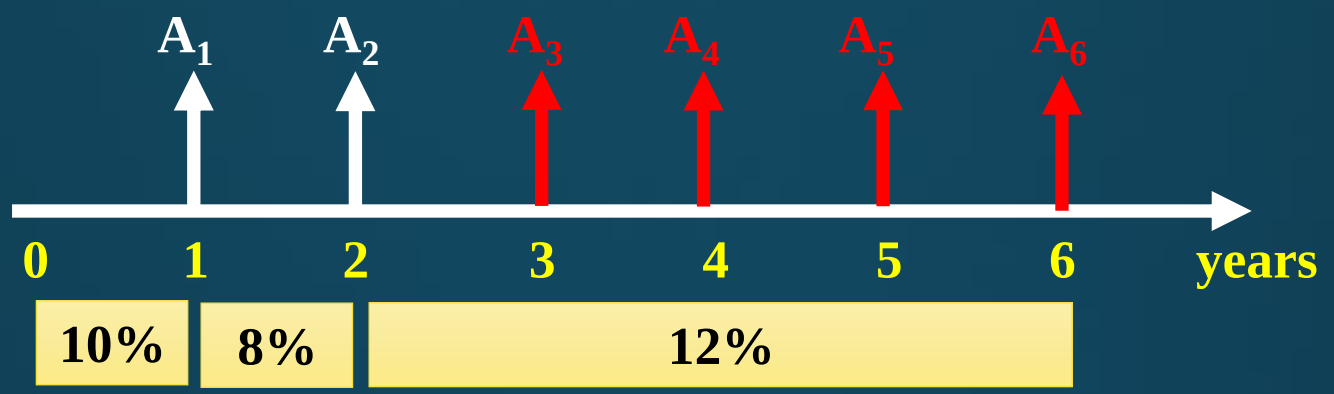
FW= 2,000 (1.08000) (1.57352)- 3,000× (1.57352)+ 4,000= **$2,678.24**

OR

FW= Pw (F|P 10%,1)(F|P 8%,1)(F|P 12%,4)= **$2,678.24**

Solution

Aw



Pw $= A_1(P|F\ 10\%,1) + A_2(P|F\ 10\%,1)(P|F\ 8\%,1) + A(P|A\ 12\%,4)\ (P|F\ 10\%,1)$

$(P|F\ 8\%,1)$

\$1,432.72 $= A(0.90909) + A(0.90909)(0.92593) + A(3.03735)(0.90909)(0.92593)$

→ **A=\$332.6**