Inflation effects

- **Inflation decreases the purchasing power of money**

- **Important concept:**

a. Constant dollars (Constant worth) {C_k}

- Use a real interest rate {i_r}and geometric rate {j_r}
- Free of inflation.

$$C_k = T_k\,(1+f)^{-k}$$

b. Then current dollar (Then current worth){ T_k}

- use a combined interest rate {i_c} and geometric rate {j_c}
- Including inflation.

$$T_k = C_k\,(1+f)^{k}$$

- **Inflation rate {f}**

$$(1+i_c) = (1+i_r)\,(1+f)$$

$$i_c = i_r + f + f\,i_r$$

$$j_c = j_r + f + f\,j_r$$

i_r : Real interest rate – desired – time value of money

i_c : combined interest rate –bank – market interest rate

EX.1

The following material costs are anticipated over a 5-year period: $9,000 - 11,000-14,000 - 18,000 and 23,000. It is estimated that a 4% inflation rate will apply over the time period in question.

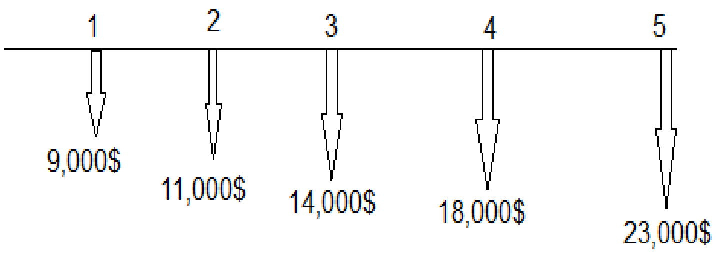
The material costs given above are expressed in then- current dollars. The time value of money excluding inflation is estimated to be 7%.

Determine the present worth equivalent for material cost using the following:

a. Then-current costs.
b. Constant worth costs.

Solution

f= 4%, i_r = 7%, n= 5 years

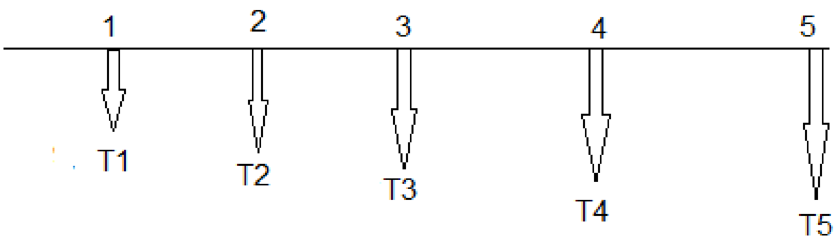


$i_c = i_r + f + f i_r$

i_c =0.07 +0.04 + (0.07) (0.04)

i_c = 11.28%

a. Then-current costs.

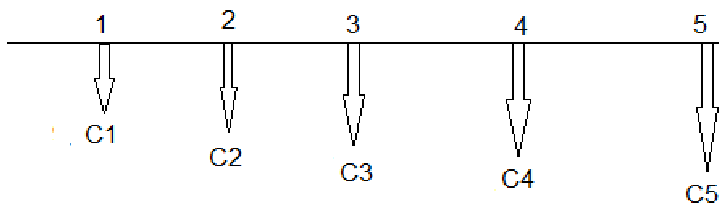


$$P_w = \sum T_K (1 + \boldsymbol{i_c})^{-k}$$

P_w = $9000(1+0.1128)^{-1}$+$11000(1+0.1128)^{-2}$ +$14000(1+0.1128)^{-3}$+$18000(1+0.1128)^{-4}$ +2300(1 + *0.1128 −5*

P_w =52347.07 SR

b. Constant worth costs



$$C_k = T_k\,(1+f)^{-k}$$

$C_1 = 9000\,(1+0.04)^{-1} = 8653.84$ SR

$C_2 = 11000\,(1+0.04)^{-2} = 10170.11$ SR

$C_3 = 14000\,(1+0.04)^{-3} = 12445.94$ SR

$C_4 = 18000\,(1+0.04)^{-4} = 15386.47$ SR

$C_5 = 23000\,(1+0.04)^{-5} = 18904.32$ SR

$$P_w = \sum C_k (1+i_r\ )^{-k}$$

$P_w = 8653.84(1+0.07\ )^{-1} + 10170.11(1+0.07\ )^{-2}$
$+12445.94(1+0.07\ )^{-3} + 15386.475(1+0.07\ )^{-4}$
$+18904.32(1+0.07\ )^{-5}$

$P_w = 52347.07$ SR

Ex.2

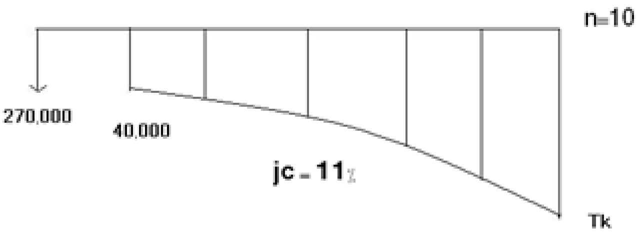
A car has a first cost of 270,000 SR. Annual operating and maintenance costs for the first year will be 40,000 SR. These costs will increase at 11% / year. The car will be in operating for 10 years. Inflation will average 8% and a real return of 3.6% is desired.

a. Determine (Pw) using then-current dollars.
b. Determine (Pw) using constant worth dollars.

Solution

a. Then-current dollars.

f = 8%, i_r= 3.6%



i_c = 0.036 + 0.08 + 0.036 (0.08) = 0.1189 i_c =11.89%
$j_c = j_r + f + j_r\ (f)$

0.11 = j_r + 0.08 + 0.08 j_r , j_r =2.78%

A. Then current dollars:

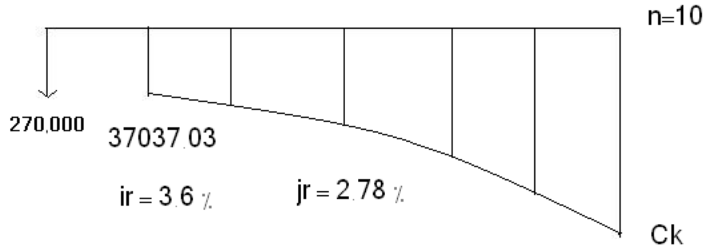
Pw = -270,000 – 40,000 [$\frac{1-(1+0.11)^{10}\quad (1+0.1189)^{-10}}{0.1189-0.11}$]

Pw = 61500 SR

b. Constant worth dollars

$C_k = T_k\ (1 + f)^{-k}$ $C_0 = T_0$

$C_1 = 40{,}000\ (1 + 0.08)^{-1} = 37037.03$ SR



Pw= -270,000 – 37037.03 [$\frac{1-(1+0.0278)^{10}(1+0.036)^{-10}}{0.036-0.0278}$]

Pw = 615,000 SR

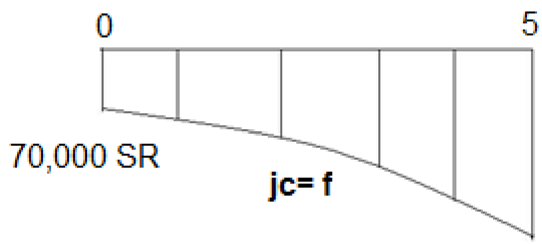
Ex.3

The car of your dream cost SR 70,000 today. If you expect the cost of your dream car to increase (due to inflation) by 10% per year, and the market interest rate (i) is 12% compounded annually, find the following:

a. The cost of the car five years from now in constant and then-current SR.
b. How much would you need to invest now (i.e. the present worth) for the purchase of the car 5 years from now?

Solution

a. i_c=12% , f=10%



T_0=70,000 SR

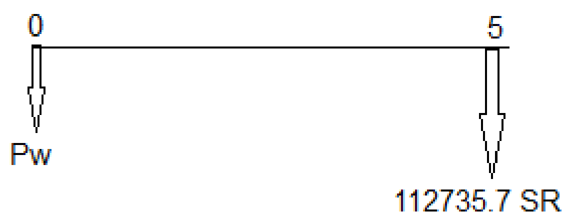
$$T_5 = T_0\,(1+j)^{5-0} \qquad , T_5=70{,}000\ (1.1)^5$$

$$T_5=112735.7 \text{ SR}$$

$$C_5 = T_5\,(1+j)^{-5} \ , C_5=112735.7\ (1.1)^{-5}$$

$$C_5= 70{,}000 \text{ SR (no inflation)}$$

b. i_c=12%



P_w= 112735.7(P/F 12, 5) = 112735.7(0.5674) = 63632.8 SR