

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.

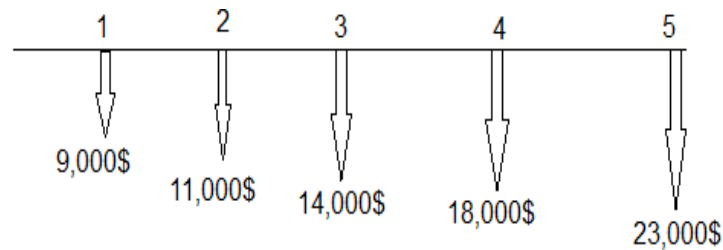
The material costs given above are expressed in then- current dollars. The time value of money excluding inflation is estimated to be 7%.

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

- Then-current costs.
- Constant worth costs.

Solution

$$f = 4\%, i_r = 7\%, n = 5 \text{ years}$$

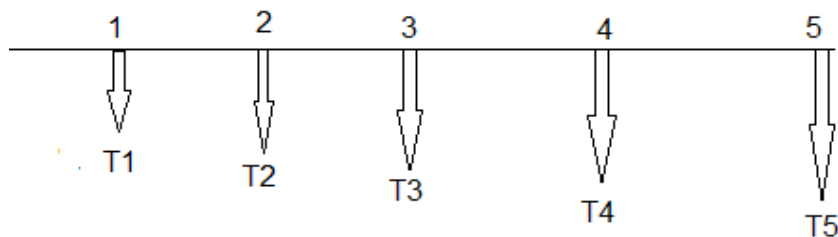


$$i_c = i_r + f + f i_r$$

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

$$i_c = 11.28\%$$

a. Then-current costs.

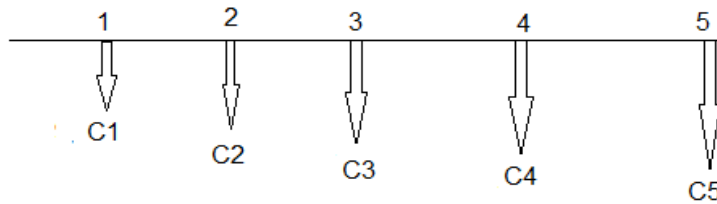


$$P_w = \sum T_k (1 + i_c)^{-k}$$

$$P_w = 9000(1 + 0.1128)^{-1} + 11000(1 + 0.1128)^{-2} + 14000(1 + 0.1128)^{-3} + 18000(1 + 0.1128)^{-4} + 23000(1 + 0.1128)^{-5}$$

$$P_w = 52347.07 \text{ SR}$$

b. Constant worth costs



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

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

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

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

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

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

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

$$\begin{aligned} P_w &= 8653.84(1 + 0.07)^{-1} + 10170.11(1 + 0.07)^{-2} \\ &+ 12445.94(1 + 0.07)^{-3} + 15386.475(1 + 0.07)^{-4} \\ &+ 18904.32(1 + 0.07)^{-5} \\ P_w &= 52347.07 \text{ SR} \end{aligned}$$

Ex.2

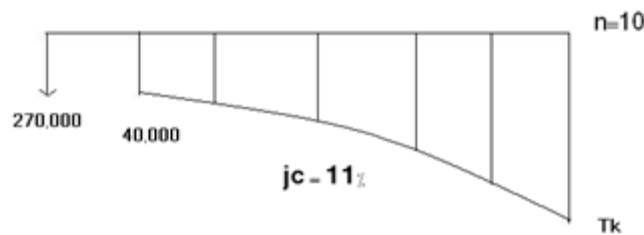
A car has a first cost of 270,000 SR. Annual operating and maintenance costs for the first year will be 40,000 SR. These costs will increase at 11% / year. The car will be in operating for 10 years. Inflation will average 8% and a real return of 3.6% is desired.

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

Solution

- Then-current dollars.

$$f = 8\%, i_r = 3.6\%$$



$$i_c = 0.036 + 0.08 + 0.036(0.08) = 0.1189 \quad i_c = 11.89\%$$

$$j_c = j_r + f + j_r(f)$$

$$0.11 = j_r + 0.08 + 0.08 j_r, \quad j_r = 2.78\%$$

A. Then current dollars:

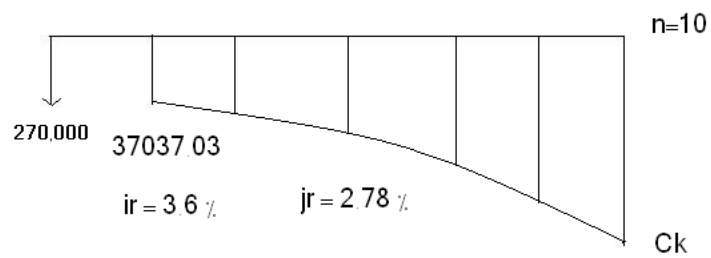
$$Pw = -270,000 - 40,000 \left[\frac{1 - (1+0.11)^{10} (1+0.1189)^{-10}}{0.1189 - 0.11} \right]$$

$$Pw = 61500 \text{ SR}$$

b. Constant worth dollars

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

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



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

$$P_w = 615,000 \text{ SR}$$

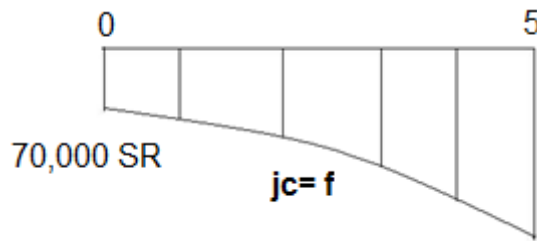
Ex.3

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:

- The cost of the car five years from now in constant and then-current SR.
- 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. $i_c=12\%$, $f=10\%$



$$T_0 = 70,000 \text{ SR}$$

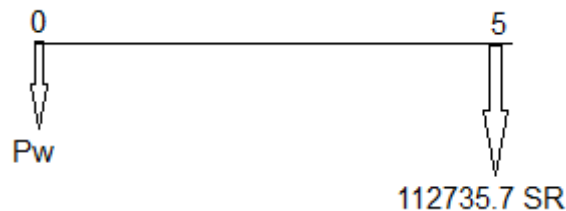
$$T_5 = T_0 (1 + j)^{5-0} , T_5 = 70,000 (1.1)^5$$

$$T_5 = 112,735.7 \text{ SR}$$

$$C_5 = T_5 (1 + j)^{-5} , C_5 = 112,735.7 (1.1)^{-5}$$

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

b. $i_c=12\%$



$$P_w = 112,735.7 (P/F \ 12, 5) = 112,735.7 (0.5674) = 63,632.8 \text{ SR}$$