

IEGR 350: Engineering Economy

Fall 2015

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Quiz 2 Solution Key

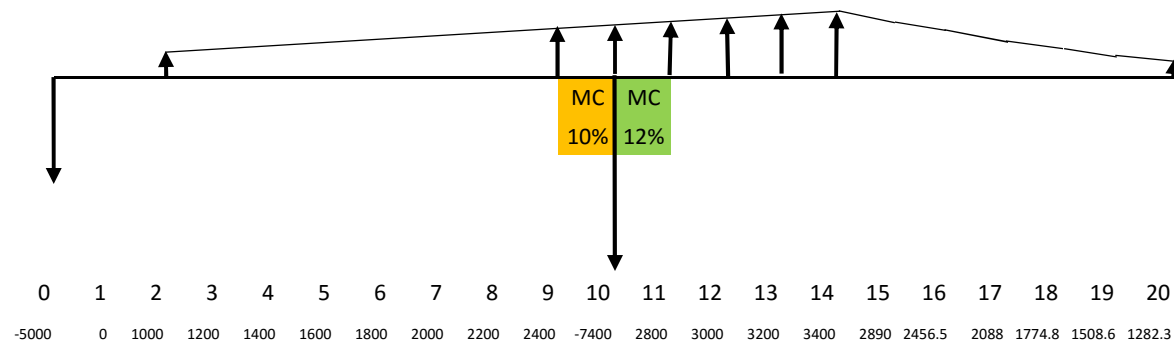
Write the complete statement that would calculate the present worth of the following transactions. All values that are known and can be calculated must be indicated in the formulas but you do not need to find the actual values of factors or perform actual calculations.

Duration: 20 years

Interest rates: 10% from 0-10, 12% from 10-20, compounding annually except between years 9-11 which is compounding monthly

Investment: 5000 in year 0, 10000 in year 10

Withdrawals: 1000 in year 2 increasing yearly by 200 to year 14 then reducing by 15% each year to year 20



Effective Interest rate calculation:

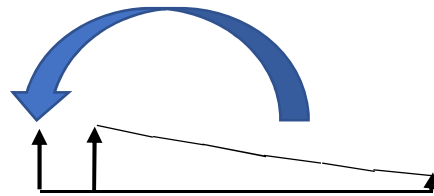
Nominal: 10%, ,momthly compounding (MC)

$$r = (1 + i/n)^n - 1 = (1 + 0.10/12)^{12} - 1 = 1.1268 - 1 = 0.1268 \text{ or } 12.68\%$$

Effective Interest rate calculation:

Nominal: 12%, ,momthly compounding (MC)

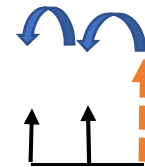
$$r = (1 + i/n)^n - 1 = (1 + 0.12/12)^{12} - 1 = 1.1074 - 1 = 0.1074 \text{ or } 10.74\%$$



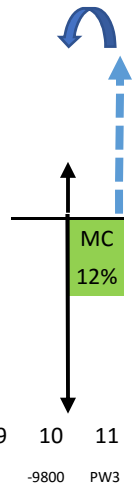
0	1	2	3	4	5	6	7
13	14	15	16	17	18	19	20
3200	3400	2890	2456.5	2088	1774.8	1508.6	1282.3

PW1: geometric series with decreasing by 15% ($g = -0.15$)
 $PW1 = A1 (P/A1, g, i, n) (P/F, 12\%, 1) = \{A1 [1 - ((1 + g)/(1 + i))^n] / (i - g)\} (P/F, 12\%, 1)$
 $PW1 = 3400 \{[1 - (0.85/1.12)^7] / (0.12 - (-0.15))\} (P/F, 12\%, 1)$
 PW2: Adding PW1 with the payment at year 13
 $PW2 = 3400 \{[1 - (0.85/1.12)^7] / (0.12 - (-0.15))\} (P/F, 12\%, 1) + 3200$

$$PW3 = [PW2 (P/F, 12\%, 1) + 3200] (P/F, 12\%, 1)$$

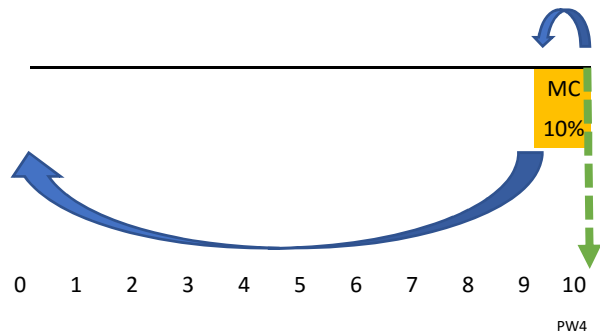


12	13
2800	3000
	PW2

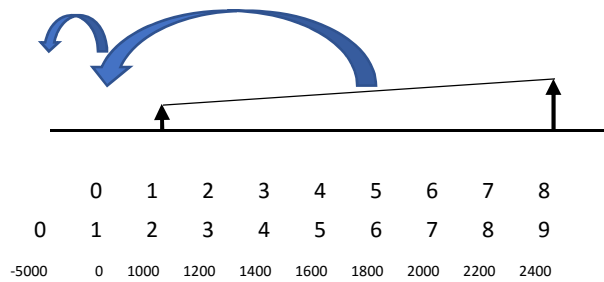


$$PW4 = PW3 (P/F, 12.68\%, 1) + 2600 - 10000$$

9	10	11
-9800		PW3



$$PW5 = [PW4 (P/F, 10.74\%, 1)] (P/F, 10\%, 9)$$



$$PW6 = [1000(P/A, 10\%, 8) + 200(P/G, 10\%, 8)] (P/F, 10\%, 1)$$

$$PW = -5000 + PW5 + PW6$$