IEGR 350: Engineering Economy
Fall 2015
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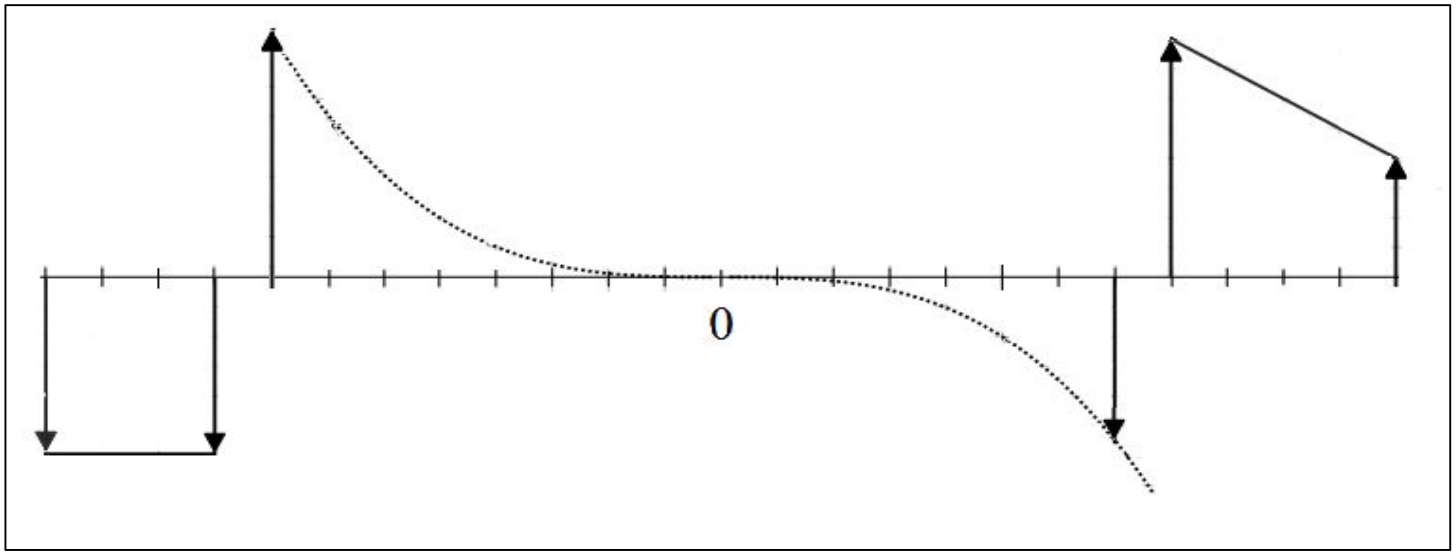
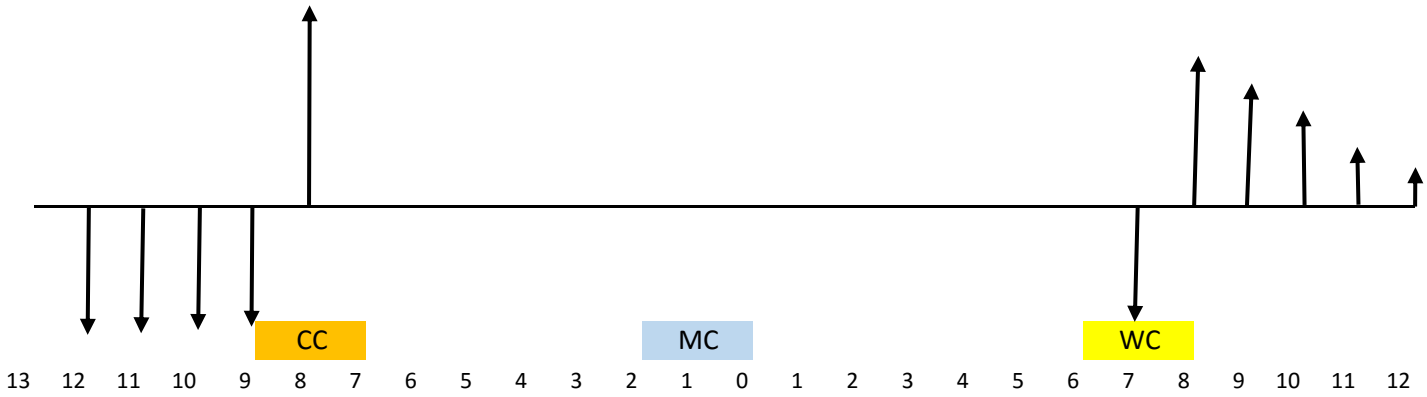
Assignment 3 Solution Key

For the cash flow diagram presented below find the present worth. Nominal interest rate is 16% compounded annually except for the following periods:

- between 9 and 7 years ago, continuous compounding
- last two years monthly compounding
- between years 6 to 8 from now, weekly compunding

you invested $3,000 from 12 to 9 years ago, received a single payment (its absolute value matching Y=(X/5)3 equation where X is the year and Y is in $1000) eight years ago to be followed another investment 7 years from now (using same equation), followed by yearly reception of fund that their values follw an arithmatic series beginning 8 years from now with $4000 and ending in year 12 with $2000.





Payment 8 years ago: $\$1000(8/5)^3 = \$4,096.00$

Payment in year 7: $\$1000(7/5)^3 = \$2,740.00$.

Effective Interest rate calculation:

Nominal: 16%, continuous compounding (CC)

$r = e^{i} - 1 = (2.718)^{016} - 1 = 1.1735 - 1 = 0.1735$

or 17.35%

Effective Interest rate calculation:

Nominal: 16%, ,momthly compounding (MC)

$r = (1 + i/n)^{n} - 1 = (1+0.16/12)^{12} - 1 =$

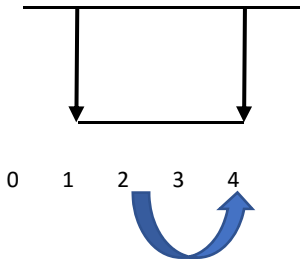
$1.1722 - 1 = 0.1722$ or 17.22%

Effective Interest rate calculation:

Nominal: 16%, ,weekly compounding (WC)

$r = (1 + i/n)^{n} - 1 = (1+0.16/52)^{016} - 1 =$

$1.1732 - 1 = 0.1732$ or 17.32%

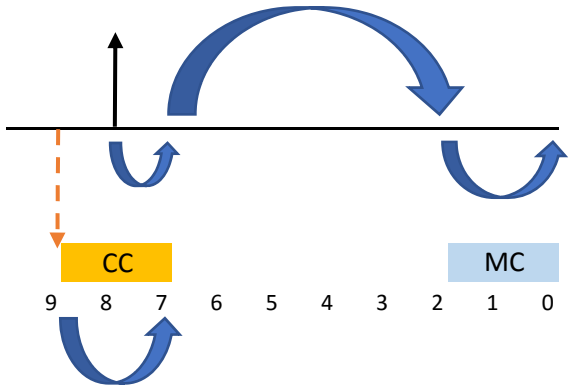


First we will find the future value of the annual payments at 9 years ago:

-$3000 (F/A, 16%, 4) = -$3,000 (5.066)

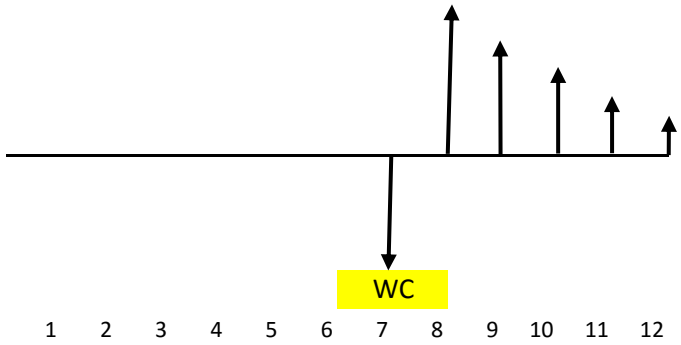
= -$15,198

Next we find the future value of the single payments at the end of contiuous compounding periods
-$15,198 (F/p, 17.35%. 2) + $4,096 (F/P, 17.35%, 1) =
-$15,198 (1.377) + $4,096 (1.1735) = -$16,120.99

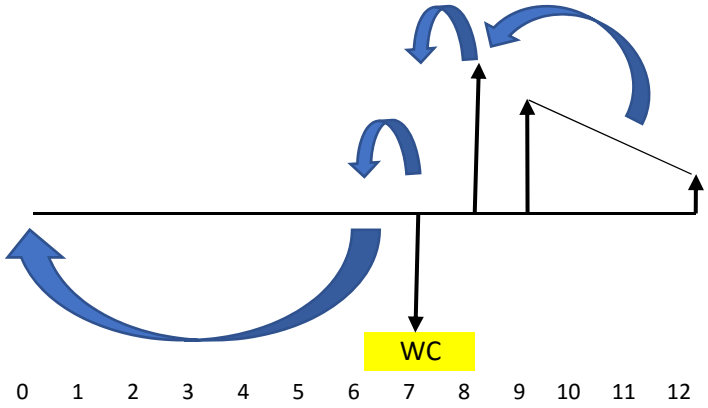


We then find the future value of -$16,120.99 at the end of year before monthly compounding periods.
-$16,120.99 (F/p, 16%, 5) = -$16,120.99 (2.100)
= -$33,854.07

Finally, we then find the future value of -$33,854 at the end of year before monthly compounding periods.
-$33,854 (F/p, 17.22%, 2) = -$33,854 (1.374)
= -$46,515.40



For years 0-12 we have an arithmetic series and a single payment. Since interest rate between years 7-8 is compounding differently, the first payment of the series must be considered separately as a single payment (compare it with the standard form of arithmetic series)



For years 0-12 we have an arithmetic series and a single payment. Since interest rate between years 7-8 is compounding differently, the first payment of the series must be considered separately as a single payment (compare it with the standard form of arithmetic series)

Begin with arithmatic series and find its present worth value at year 8.
$3500 (P/A, 16%, 4) - $500 (P/G, 16%, 4) = $7953.00
Add that to the single payment of $4,000 at year 8
$7953 + $4,000 = $11,953

Using a compounding rate of 17.32% find the value of $11,953 at year 7
$11,953 (P/F, 17.32%, 1) = $11,953 (0.8524) = $10188.74
then combine the results with the payment at year 7 and find their valu at year 6.
($10,188.74 - $2,740) (P/F, 17.32%, 1) = $7,448 (0.8524) = $6,348.675

Now find the present value at time 0 and add it to the value obtaind from left side of the cash flow diagram.
PW = $6,348.675 (P/F, 16%, 6) -$46,515.40 =
PW = $6,348.675 (0.4104) -$46,515.40 = - 43,909.90