

IEGR 350: Engineering Economy

Fall 2015

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Assignment 4 Solution Key

For a project with annual compounding interest rate of 10%, the following information is provided:

\$1000 initial investment

investment of \$4,920 in year 2, decreasing by \$750 each year through year 8

withdrawal of \$2,400 annually between years 11 through 14

withdrawal of \$9,852 in year 17, decreasing by 10% annually through year 24

two equal withdrawals of \$20,670 in years 27 and 30

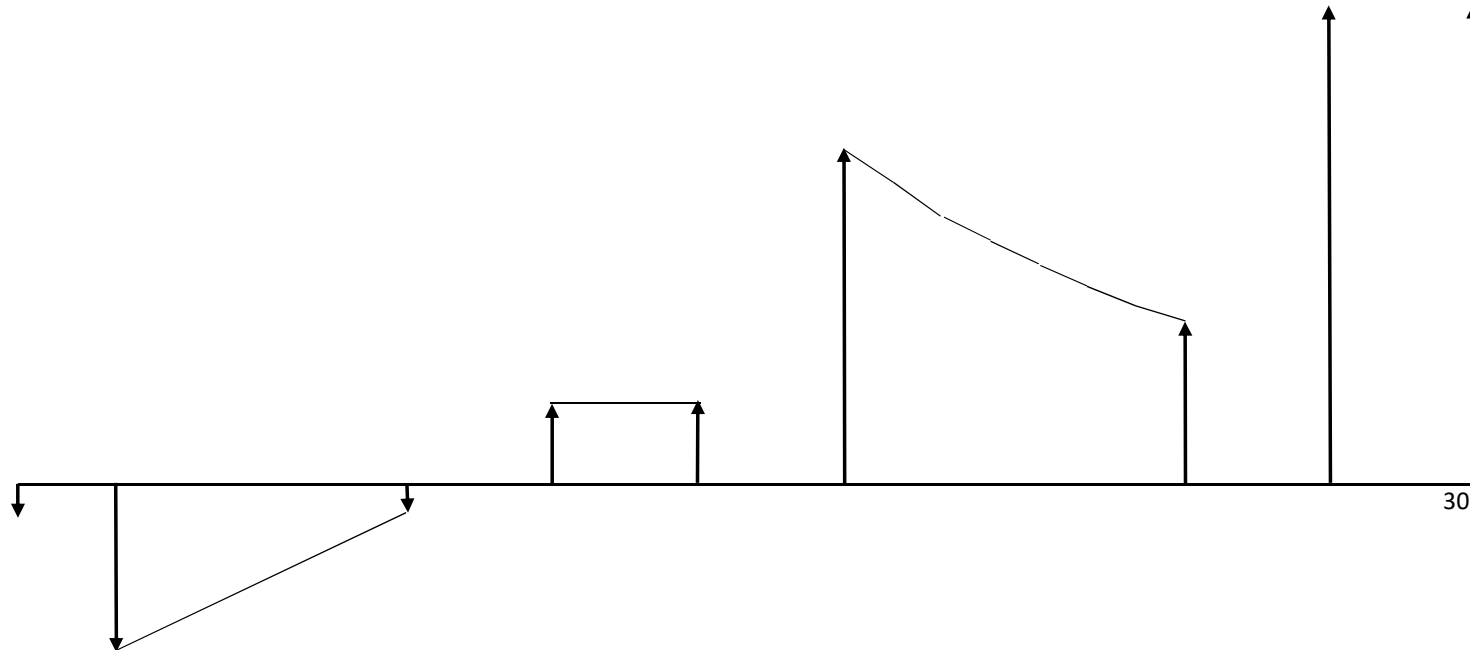
(1) use manual calculations to find out present worth of the cash flow

(2) set up an EXCEL sheet and use proper functions to find the present worth of the project and compare it with your manual calculations

(3) use proper functions to find the annual equivalent worth of the project

(4) Use proper EXCEL analysis tool to find out what annual withdrawals between years 11 and 14 should be so the present worth of investment and withdrawals is equal.

(5) Use proper EXCEL analysis tool for the original problem to find out what the rate of return should be so the present worth of investment and withdrawals is equal.



0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
-1000	0	-4920	-4170	-3420	-2670	-1920	-1170	-420	0	0	2400	2400	2400	2400	0	0	9852	8866.8	7980.1	7182.1	6463.9	5817.5	5235.8	4712.2	0	0	20670	0	0	20670

$PW_0 = -1000$
 $PW_1 = - [4920(P/A, 10\%, 7) - 750(P/G, 10\%, 7)] (P/F, 10\%, 1)$
 $PW_1 = - [4920 (4.8684) - 750 (12.7631)] (0.9091) = -13073.04$
 $PW_2 = 2400 (P/A, 10\%, 4) (P/F, 10\%, 10) = 2400 (3.1699) (0.3855) = 2932.79$
 $PW_3 = A_1 (P/A_1, g, i, n) (P/F, 10\%, 16) = \{A_1 [1 - ((1 + g)/(1 + i))^n] / (i - g)\} (P/F, 10\%, 16)$
(Note that the series is decreasing so, $g = -10\%$)
 $PW_3 = 9852 \{[1 - (0.9/1.10)^8] / (0.10 - (-0.10))\} (0.2176) = 8566.43$
 $PW_4 = 20670 [(P/F, 10\%, 27) + (P/F, 10\%, 30)] = 20670 (0.0763 + 0.0573) = 2671.52$
 $PW = -1000 -13073.04 + 2932.79 + 8566.43 + 2671.52 = \97.70

Difference is due to the use of full decimals

0.1
\$188.91

0.1

Year	Cash flow \$
0	\$ (1,000.00)
1	\$ -
2	\$ (4,920.00)
3	\$ (4,170.00)
4	\$ (3,420.00)
5	\$ (2,670.00)
6	\$ (1,920.00)
7	\$ (1,170.00)
8	\$ (420.00)
9	\$ -
10	\$ -
11	\$ 2,400.00
12	\$ 2,400.00
13	\$ 2,400.00
14	\$ 2,400.00
15	\$ -
16	\$ -
17	\$ 9,852.00
18	\$ 8,866.80
19	\$ 7,980.12
20	\$ 7,182.11
21	\$ 6,463.90
22	\$ 5,817.51
23	\$ 5,235.76
24	\$ 4,712.18
25	\$ -
26	\$ -
27	\$ 20,670.00
28	\$ -
29	\$ -
30	\$ 20,670.00

\$188.91

ORIGINAL
 NPV(A1,C4:C33)+C3
 A1: interest rate (0.10)
 C4-C33: range excluding year 0
 C3: year 0 value

(\$20.04)

ORIGINAL
 PMT(A1,30,C35)
 A1: interest rate (0.10)
 30: periods
 C35: present worth from NPV

0.1

Year	Cash flow \$
0	\$ (1,000.00)
1	\$ -
2	\$ (4,920.00)
3	\$ (4,170.00)
4	\$ (3,420.00)
5	\$ (2,670.00)
6	\$ (1,920.00)
7	\$ (1,170.00)
8	\$ (420.00)
9	\$ -
10	\$ -
11	\$ 2,245.42
12	\$ 2,245.42
13	\$ 2,245.42
14	\$ 2,245.42
15	\$ -
16	\$ -
17	\$ 9,852.00
18	\$ 8,866.80
19	\$ 7,980.12
20	\$ 7,182.11
21	\$ 6,463.90
22	\$ 5,817.51
23	\$ 5,235.76
24	\$ 4,712.18
25	\$ -
26	\$ -
27	\$ 20,670.00
28	\$ -
29	\$ -
30	\$ 20,670.00

(\$0.00)

Using GOAL SEEK
 to find values for
 years 11-14

0.100898

Year	Cash flow \$
0	\$ (1,000.00)
1	\$ -
2	\$ (4,920.00)
3	\$ (4,170.00)
4	\$ (3,420.00)
5	\$ (2,670.00)
6	\$ (1,920.00)
7	\$ (1,170.00)
8	\$ (420.00)
9	\$ -
10	\$ -
11	\$ 2,400.00
12	\$ 2,400.00
13	\$ 2,400.00
14	\$ 2,400.00
15	\$ -
16	\$ -
17	\$ 9,852.00
18	\$ 8,866.80
19	\$ 7,980.12
20	\$ 7,182.11
21	\$ 6,463.90
22	\$ 5,817.51
23	\$ 5,235.76
24	\$ 4,712.18
25	\$ -
26	\$ -
27	\$ 20,670.00
28	\$ -
29	\$ -
30	\$ 20,670.00

\$0.00

Using GOAL SEEK
 to find values for
 interest rate
 here cell K1 has int rate

