ELEC 481 Homework 3

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Question 1a. The net current principal of the payments are

$$P = 16500 + 16500/1.03 + 16500/1.03^2 + 28500/1.03^3 = \$74154.$$

Then we can calculate the EUAC:

$$\text{EUAC} = P(A/P, 0.03, 4) = \$19949.$$

Question 1b.

$$P = 16500(P/A, 0.03, 4) + 12000/1.03^4 = \$71994.$$

Question 1c.

$$P = 16500(P/A, 0.03, \infty) + 12000/(1.03^4 - 1) = \$645611.$$

Question 2. Total cost:

$$\text{EUAC}_A = A + P(A/P, i, n) - S(A/F, i, n) = \$2552.$$

$$\text{EUAC}_B = A + P(A/P, i, n) - S(A/F, i, n) = \$2692.$$

Since the cost of machine A is lower than machine B, the company should use machine A.

Question 3. Putting the investment into excel, we arrive at a revenue stream as described in table 1. Using the excel IRR function we see that the annual rate of return is 3.5%.

year	payment	revenues	sum
0	(14,000)		(14,000)
1	-	3,100	3,100
2	-	3,100	3,100
3	-	3,100	3,100
4	-	3,100	3,100
5	-	3,100	3,100

Figure 1: Revenue stream of question 3

Question 4. Since bonds don't compound, the revenue stream can be calculated as seen in figure 2. The yearly income was calculated simply as a percentage of the original bond's worth:

$$A = P \cdot i.$$

year	payment / withdrawal	revenues	sum	present value (PV)
0	(10,800)		(10,800)	(10,800)
1		504	504	475
2		504	504	449
3		504	504	423
4		504	504	399
5	12,000	504	12,504	9,341

Figure 2: Revenue flow for question 4.

Using the IRR function on the column labelled sum, we find that the annual effective interest rate is 6.6%.

Question 5. To find the effective annual interest rate we have to compare the current option with the alternative, which is to pay by cash. Doing this results in a revenue stream as described in table 3.

year	payment	revenues	sum
0	(25,000)	95,000	70,000
1	(21,397)	-	(21,397)
2	(21,397)	-	(21,397)
3	(21,397)	-	(21,397)
4	(21,397)	-	(21,397)

Figure 3: Revenue stream of question 5.

Note that the $95000 in revenue represents the incremental analysis of not doing the next best option, which is to buy the machine with cash. The yearly payments were calculated using the formula:

$$A = P(A/P, i, n).$$

Applying the IRR function to the last column we find that the effective annual interest rate is 8.6%.

Question 6. A plot of the EUAC of each option is shown in figure 4. These values were calculated in excel using the formula:

$$\text{EUAC} = A - P(A/P, i, n).$$

From this graph we can find the option with the lowest EUAC for each interest rate, and we can make the table seen in table 1.

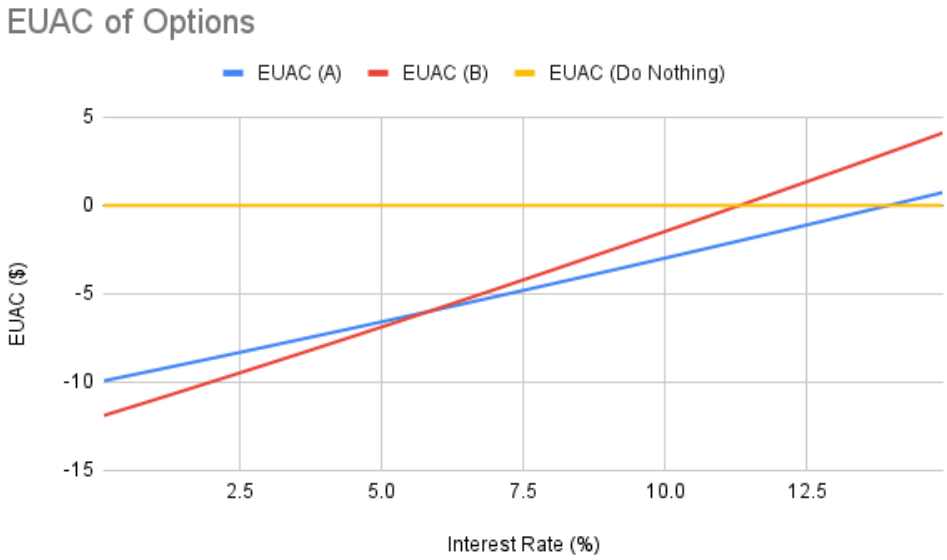

Figure 4: Graph of the EUAC for each option in question 6.

Table 1: Choice table for question 6.

Interest rate (%)	Choice
Under 5.8	B
5.8-13.95	A
Over 13.95	Do Nothing