E355 Engineering Economics Spring 2022
Classroom Assignment #5

"I pledge my honor that I have abided by the Stevens Honor System"

By: Alexander Gaskins, Daniel Goldberg, and Samuel Gavrilov

1. Given the following information: Two year loan, loan proceeds of $4,800, interest on the loan is 8%. Calculate the interest and principle replacement payments. If answers end up being wrong, you must have shown the math to get any partial credit. [3 points]

Year	Beginning Balance	Annual Payment	Interest	Principle Repayment	Ending Balance
1	$4,800	$2,691.84	$384	$2,307.84	$2,492.16
2	$2,492.16	$2,691.84	$199.37	$2,492.46	-0.30
Total		$5,383.68	$583.37	$4,800.30	

$A = 4800(\frac{A}{P}, 8\%, 2) = 2691.84$

Year 1:
$Interest = (4800)(0.08) = 384$
$Principle\ Repayment = 2691.84 - 384 = 2307.84$

Year 2:
$Interest = (2492.16)(0.08) = 199.37$
$Principle\ Repayment = 2691.84 - 199.37 = 2492.46$

$Rounding\ Error = 2492.16 - 2492.46 = \sim 0.30$

2. Given the following information: Two year loan, depreciable capital at year 0 is $3,500, depreciation rates of 0.55 and 0.45 and assume that the working capital is returned in year two. Calculate the depreciation expense and the accumulated depreciation expense: If answers end up being wrong, you must have shown the math to get any partial credit. [2 points]

Year	Initial Costs	Depr. Rate	Depr. Expenses	Accumulated depreciation	Ending BV
0	$3,500	-	-	-	-
1		55%	$1,925	$1,925	$1,575
2		45%	$1,575	$3,500	$0
Total		100%	$3500		

1:
$3500(0.55) = 1925$
$3500 - 1925 = 1575$

2:
$3500(0.45) = 1575$
$3500 - 3500 = 0$

3. Calculate the taxes on the Non-depreciable capital, given the following. Non-depreciable capital at year zero is $1,100. Non-depreciable capital at the end of the project life is $2,500 and the yearly tax rate is 20%. [1 point]

$Tax\ Rate\ (TR) = 20\% = 0.2$
$End\ of\ life\ (FMV) = 2500$
$Year\ 0\ (IC) = 1100$

$Tax = (FMV - IC)(TR) = (2500 - 1100)(0.2)$
$Tax = \$280$

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1. The following data represents a defender. Given this data, what is the correct replacement analysis technique to compare this asset against a challenger? How do we know? [1 point]

Year	BTCF (Marginal Cost)
1	$3,800.00
2	$2,700.00
3	$2,200.00
4	$4,100.00

We are given a four year lifetime summarization with the defender's marginal cost data for each year. As per the Replacement Method Decision Map, we see that the annual marginal cost is not **strictly** increasing. Thus, in order to compare the defender against a challenger, we need to use technique 2, where we find the lowest EUAC for the Defender, and compare it to the Challenger's minimum EUAC. If the Defender's minimum EUAC is lower than the Challenger's minimum EUAC, it should be kept for at least the minimum cost life.

2. The first cost of a machine is $60,000. The machine's end of year salvage value over the next five years are $53k, $45k, $38k, $32k, and $24k. The interest rate is 10%. Fill in the table and state the machine's economic life. [5 points]

Year	Cost	Loss in Market Value	Interest (10%)	Total Marginal Cost
0	$60,000.00	-	-	-
1	$53,000.00	60000-53000 = **$7,000**	$6,000	7000+6000 = **$13,000**
2	$45,000.00	53000-45000 = **$8,000**	$5,300	8000+5300 = **$13,300**
3	$38,000.00	45000-38000 = **$7,000**	$4,500	7000+4500 = **$11,500**
4	$32,000.00	38000-32000 = **$6,000**	$3,800	6000+3800 = **$9,800**
5	$24,000.00	32000-24000 = **$8,000**	$3,200	8000+3200 = **$11,200**

The economic life of the machine is at the end of 4 years, at the inflection point of the total marginal cost.

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Classroom Assignment #7

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1) A financial expert has predicted 5% inflation during the next 4 years. How much will an item that currently costs $100, cost in 4 years. [2 points]

$$FV = P(1 + i)^N = 100(1 + 0.05)^4 = \$121.55$$

2) An annuity currently costs $25,000. It promises to pay $3,000 each year for the next 15 years. You want a real rate of return of 8% and inflation is estimated to average 3% per year. Should you buy the annuity? [4 points]

$$i = rate\ of\ return + rate\ of\ inflation = 8\% + 3\% = 11\%$$

$$PW_{Annuity} = A[\frac{1-(1+i)^{-N}}{i}] = 3000[\frac{1-(1+0.11)^{-15}}{0.11}] = \$21,572.61$$

The annuity should not be bought, as there is a loss on purchasing it. ($\$21,572.61 < \$25,000$)

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Classroom Assignment #8

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1) A company wants to purchase a machine that has the following probable cash flows. It is expected to have a useful life of 10 years and a MARR of 5%. Determine the expected value of the NPW of the machine. The first cost is $32,000 [3 points]

	p = 60%	p = 40%
Annual Costs	$2,000	$3,000
Salvage Value	$15,000	$10,000

$Annual\ Cost = (2000 \times 0.6) + (3000 \times 0.4) = \$2,400$
$Salvage\ Value = (15000 \times 0.6) + (10000 \times 0.4) = \$13,000$

$NPW = -P - A(\frac{P}{A}, i, N) + F(\frac{P}{F}, i, N) = -32000 - 2400(\frac{P}{A}, 5\%, 10) + 13000(\frac{P}{F}, 5\%, 10)$
$NPW = -32000 - 2400(7.722) + 13000(0.6139)$
$NPW = -\$42,552.10$

2) The following matrix represents the annual benefits of a potential project in thousands. [3 points]

Probability	A1	A2	A3	A4
20%	$4	$4	$4	$5
30%	$3	$2	$2	$4
10%	$2	$3	$3	$4
40%	$3	$3	$2	$4

a) Do any alternatives dominate any others and/or all others? And if so, which one(s)?

A4 dominates the other alternatives, as it offers the highest benefits for each probability section.

b) Calculate the range for each alternative? Which alternative has the best range? Why?

$A1 = 4 - 2 = 2$
$A2 = 4 - 2 = 2$
$A3 = 4 - 2 = 2$
$A4 = 5 - 4 = 1$←Lowest, most desirable

c) What is the most probable future worth? Why?

A4 is the most probable, as it has the highest benefit for each probability, and the lowest range of the Alternatives.