E355 Engineering Economics Spring 2022
Homework #7

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

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7.1 You are an investor and want a real rate of return of 8% per year. If the expected annual inflation rate for the next years is 3.5%:

a) [2 point] What interest rate should be used in project analysis calculations? Calculate the interest rate

$$i = [(1 + r) \times (1 + a)] - 1 = [(1 + 0.08) \times (1 + 0.035)] - 1 = 0.1178 = 11.78\%$$

b) [2 point] If you invests $150,000 now, what is the amount that he should receive for the investment after 5 years?

$$FW = P(1 + i)^n = 150000(1 + 0.1178)^5 = \$261,765.13$$

7.2 [2 point] Apollo loaned his friend Demetrios $25,000 at 7% interest, compounded annually. The loan will be paid in 5 equal end-of-year payments. Apollo expects the inflation rate to be 3%. After taking inflation into account, what real rate of return is Apollo receiving on the loan? Compute your answer to the nearest 0.1%.

$i = nominal\ interest\ rate$
$r = real\ interest\ rate$
$a = inflation\ rate$

$(i + 1) = (1 + r) \times (1 + a)$
$i = [(1 + r) \times (1 + a)] - 1$
$r = \frac{(1+i)}{(1+a)} - 1 = \frac{(1+0.07)}{(1+0.03)} - 1 = 0.0388 = 3.9\%$

7.3 The Anthony's Spirits has opened a new shop in Jersey City. The initial investment cost of the shop was $200,000. It will produce $140,000 (in constant dollars) of revenue annually for 5 years. The real interest rate is 12% and there will be 3% inflation annually.

a) [4 points] Determine the current cash flows taking into account the inflation rate.

EOY	Constant Dollar Cash Flow	Inflation Factor	Current Dollar Cash Flow
0	-$200,000	$1/(1.03^{0}) = 1.0000$	$-200000 \times 1 =$ -$200,000
1	$140,000	$1/(1.03^{1}) = 0.9709$	$140000 \times 0.9709 =$ $135,926
2	$140,000	$1/(1.03^{2}) = 0.9426$	$140000 \times 0.9426 =$ $131,964
3	$140,000	$1/(1.03^{3}) = 0.9151$	$140000 \times 0.9151 =$ $128,114
4	$140,000	$1/(1.03^{4}) = 0.8885$	$140000 \times 0.8885 =$ $124,390
5	$140,000	$1/(1.03^{5}) = 0.8626$	$140000 \times 0.8626 =$ $120,764

b) [6 points] Find the PW for the investment (using acutal dollar cash flow values). Hint: Find the market interest rate first.

$$i = [(1 + r) \times (1 + a)] - 1 = [(1 + 0.12) \times (1 + 0.03)] - 1 = 0.1536 = 15.36\%$$

$$PW_0 = PVIF \times -200000 = \left(\left[\frac{1}{(1.1536^{0})}\right] \times -200000 = -\$200,000\right.$$

$$PW_1 = PVIF \times 135926 = \left(\left[\frac{1}{(1.1536^{1})}\right] \times 135926 = \$117,827.67\right.$$

$$PW_2 = PVIF \times 131964 = \left(\left[\frac{1}{(1.1536^{2})}\right] \times 131964 = \$99,161.93\right.$$

$$PW_3 = PVIF \times 128114 = \left(\left[\frac{1}{(1.1536^{3})}\right] \times 128114 = \$83,450.86\right.$$

$$PW_4 = PVIF \times 124390 = \left(\left[\frac{1}{(1.1536^{4})}\right] \times 124390 = \$70,236.76\right.$$

$$PW_5 = PVIF \times 120764 = \left(\left[\frac{1}{(1.1536^{5})}\right] \times 120764 = \$59,110.03\right.$$

$$PW_{investment} = \sum_{i=0}^{5} PW_i = 117827.67 + 99161.93 + 83450.86 + 70236.76 + 59110.03 - 200000$$

$$PW_{investment} = \$229,787.25$$

c) [2 point] Was the investment worth undertaking? Why?

The investment is worth undertaking, as the PW is positive.