PET685 - Assignment 2

Solve the following and upload your solutions to Canvas. Make sure to include any Excel or Python files/code you have used. For the problems where it has been specified that you should use Python, you must use Python. Note that your Python answers must be in a single Jupyter Notebook file. Use your surname (as registered by UiS) as the name of the zipped filed.

Problem 1 – The local newspaper, Stavanger Aftenblad, ran an article on September 4th, 2020, about one of the long-time top managers in Equinor, Margareth Øvrum, who was about to retire at age 62. When she was 32, Øvrum became the first female platform manager in Statoil. Since then, she held a number of top management jobs in the company and since 2004 she was a member of the company's executive management team reporting directly to the managing director. Her last job with Equinor was as managing director of Equinor Brazil.

According to the newspaper, the present value at the end of 2019 of Øvrum's lifetime retirement pension was NOK 69 million. According to NAV[1], life expectancy for a woman born in 1958 is about 88 years.

The Norwegian State's Pension Fund use an annual discount rate of 4%[2] to calculate the value of the pension fund (assume annual compounding).

a) Given the information above, what was the size of Øvrum's monthly pension when she began her retirement in January 2021 (assume the present value of her pension was NOK 69 million in January 2021)?
b) Use Python to do a sensitivity analysis to evaluate what her monthly pension will be for discount rates between 0 and 5%. Graph your results.

Problem 2 - A company is considering in acquiring a local Waste-to-Energy plant which produces electricity for the energy market by burning wastes collected from the community. The investment will cost the company an initial cost of $16 million which will be funded by taking a 5-year bank loan at an interest rate of 8% per year. The loan will be repaid with 5 equal end-of-year payments. Annual profits from the sales of electricity generated by the plant to the power grid are estimated to be $2 million in years 1 to 10, and $3 million in years 11 to 20. All cash flows are assumed to occur at the end of each year. The plant has a useful life of 20 years with a salvage value of $500,000. The company MARR is 10%.

a) What is the annual repayment amount for the bank loan?
b) What is the Present Worth of the project? Is the project economically feasible?
c) What is the IRR of the project?
d) What is the MIRR of the project if the financing rate is 8% and the reinvestment rate is 10%?
e) What is the discounted pay-back period of the project?

[1] https://www.nav.no/no/person/pensjon/alderspensjon/uttak-regulering-og-levealdersjustering/levealdersjustering-av-alderspensjon
[2] https://www.regjeringen.no/en/dokumenter/nou-2012-16/id700821/?ch=6

Problem 3 - The average price of gasoline in 2005 was $2.31 per gallon. In 1993, the average price was $1.07.

a) What was the average annual rate of increase in the price of gasoline over this 12-year period?
b) If we assume that the price of gasoline will continue to inflate at this rate, how long will it be before we are paying $5.00 per gallon?

Problem 4 – Your company is operating an oil field which is in its late life and is producing significant water with the oil. Separators have been bought and installed topside on the platform, but they require continuous maintenance. The expected maintenance amounts are $100,000 for the first year, $200,000 for the second year, $500,000 for the third year, and $400,000 for each year from the fourth through the eighth. Find

a. the present equivalent expenditure, P_0;
b. the future equivalent expenditure, F_8;
c. the annual equivalent expenditure, A

of these cash flows if the annual interest rate is 20%. Solve by hand and by using Python.

Problem 5 - The prospective exploration for oil in the outer continental shelf by a small, independent drilling company has produced a strange pattern of cash flows, as follows:

End of Year	Net Cash Flow
0	−$520,000
1–10	+200,000
10	−1,500,000

The $1,500,000 expense at EOY 10 will be incurred by the company in dismantling the drilling rig.

a) Over the 10-year period, use Python to plot PW versus the interest rate (*i*) in an attempt to discover whether multiple rates of return exist.
b) Based on the projected net cash flows and results in Part (a), what would you recommend regarding the pursuit of this project? Customarily, the company expects to earn at least 20% per year on invested capital before taxes. Use the IRR method.

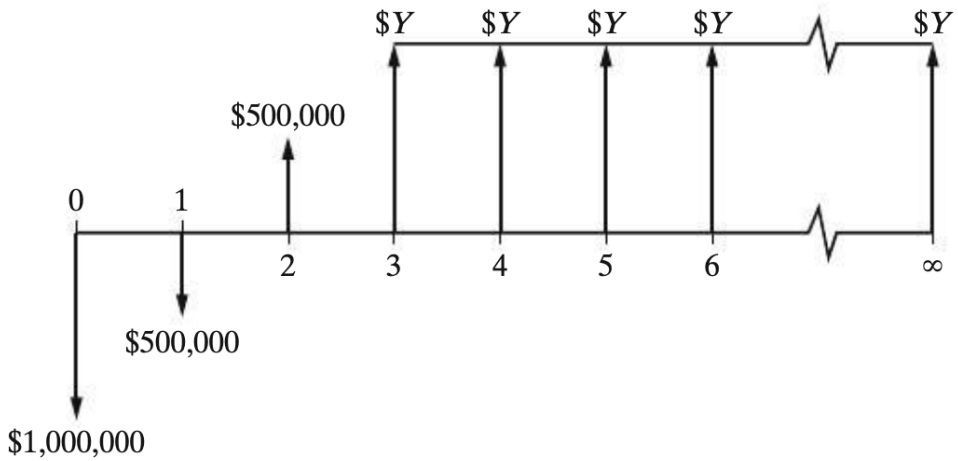
Problem 6 - Consider the cash flow of a certain project given in the table below. If the project's IRR is 12%:

a) Find the value of X.

b) Is this project acceptable at MARR = 14%

Year	NCF
0	-$34,400
1	$14,200
2	$16,600
3	X

Problem 7 - The cash flow diagram below has an internal rate of return of 35%. What is the value of Y if perpetual service is assumed?



Problem 8 - Anderson County has 35 older-model school buses that will be salvaged for $5,000 each. These buses cost $144,000 per year for fuel and maintenance. Now the county will purchase 35 new school buses for $40,000 each. They will travel an average of 2,000 miles per day for a total of 360,000 miles per year. These new buses will save $10,000 per year in fuel (compared with the older buses) for the entire group of 35 buses. If the new buses will be driven for 15 years and the county's MARR is 6% per year, what is the equivalent uniform annual cost of the new buses if they have negligible market value after 15 years?

Problem 9 – A small start-up biotech firm anticipates that it will have cash outflows of $200,000 per year at the end of the next 3 years. Then the firm expects a positive cash flow of $50,000 at the EOY 4 and positive cash flows of $250,000 at the EOY 5–9. Based on these estimates, would you invest money in this company if your MARR is 15% per year?