```
==== Problem 1 ====
    year  Revenue  Expenses  D_16_SL  D_10_MACR  AT NP (SL)  AT NP (MACR)  AT CF (SL)  AT CF (MACR)
0      6 2.18e+09  1.10e+09 3.56e+08   5.70e+08    5.10e+08      3.60e+08    8.66e+08      9.30e+08
1      7 2.18e+09  1.10e+09 3.56e+08   1.03e+09    5.10e+08      4.13e+07    8.66e+08      1.07e+09
2      8 2.18e+09  1.10e+09 3.56e+08   8.21e+08    5.10e+08      1.85e+08    8.66e+08      1.01e+09
3      9 2.18e+09  1.10e+09 3.56e+08   6.57e+08    5.10e+08      3.00e+08    8.66e+08      9.56e+08
4     10 2.18e+09  1.10e+09 3.56e+08   5.26e+08    5.10e+08      3.92e+08    8.66e+08      9.17e+08
5     11 2.18e+09  1.10e+09 3.56e+08   4.20e+08    5.10e+08      4.65e+08    8.66e+08      8.86e+08
6     12 2.18e+09  1.10e+09 3.56e+08   3.73e+08    5.10e+08      4.98e+08    8.66e+08      8.72e+08
7     13 2.18e+09  1.10e+09 3.56e+08   3.73e+08    5.10e+08      4.98e+08    8.66e+08      8.72e+08
8     14 2.18e+09  1.10e+09 3.56e+08   3.74e+08    5.10e+08      4.98e+08    8.66e+08      8.72e+08
9     15 2.18e+09  1.10e+09 3.56e+08   3.73e+08    5.10e+08      4.98e+08    8.66e+08      8.72e+08
10    16 2.18e+09  1.10e+09 3.56e+08   0.00e+00    5.10e+08      7.60e+08    8.66e+08      7.60e+08
11    17 2.18e+09  1.10e+09 3.56e+08   0.00e+00    5.10e+08      7.60e+08    8.66e+08      7.60e+08
12    18 2.18e+09  1.10e+09 3.56e+08   0.00e+00    5.10e+08      7.60e+08    8.66e+08      7.60e+08
13    19 2.18e+09  1.10e+09 3.56e+08   0.00e+00    5.10e+08      7.60e+08    8.66e+08      7.60e+08
14    20 2.18e+09  1.10e+09 3.56e+08   0.00e+00    5.10e+08      7.60e+08    8.66e+08      7.60e+08
15    21 2.18e+09  1.10e+09 3.56e+08   0.00e+00    5.10e+08      1.11e+09    8.66e+08      1.11e+09
16    22 2.18e+09  1.10e+09 3.56e+08   0.00e+00    5.10e+08      7.60e+08    8.66e+08      7.60e+08
=== Straight line non-discount profitability metrics ===
PBP: 6.58
CCP (billions): 14.73
CCR: 2.58
ROI: 0.15
=== MACR non-discount profitability metrics ===
PBP: 6.5
CCP (billions): 14.92
CCR: 2.62
ROI: 0.15
    year   Revenue  Expenses  D_16_SL  D_10_MACR  AT NP (SL)  AT NP (MACR)  AT CF (SL)  AT CF (MACR)
0      1 -1.71e+09  0.00e+00 3.56e+08   0.00e+00   -1.45e+09     -1.20e+09   -9.73e+08     -1.07e+09
1      2 -1.14e+09  0.00e+00 3.56e+08   0.00e+00   -1.05e+09     -7.98e+08   -5.51e+08     -6.36e+08
2      3 -1.14e+09  0.00e+00 3.56e+08   0.00e+00   -1.05e+09     -7.98e+08   -4.92e+08     -5.68e+08
3      4 -1.14e+09  0.00e+00 3.56e+08   0.00e+00   -1.05e+09     -7.98e+08   -4.39e+08     -5.07e+08
4      5 -6.00e+08  0.00e+00 3.56e+08   0.00e+00   -6.69e+08     -4.20e+08   -1.78e+08     -2.38e+08
5      6  2.18e+09  1.10e+09 3.56e+08   5.70e+08    5.10e+08      3.60e+08    4.39e+08      4.71e+08
6      7  2.18e+09  1.10e+09 3.56e+08   1.03e+09    5.10e+08      4.13e+07    3.92e+08      4.83e+08
7      8  2.18e+09  1.10e+09 3.56e+08   8.21e+08    5.10e+08      1.85e+08    3.50e+08      4.06e+08
8      9  2.18e+09  1.10e+09 3.56e+08   6.57e+08    5.10e+08      3.00e+08    3.12e+08      3.45e+08
9     10  2.18e+09  1.10e+09 3.56e+08   5.26e+08    5.10e+08      3.92e+08    2.79e+08      2.95e+08
10    11  2.18e+09  1.10e+09 3.56e+08   4.20e+08    5.10e+08      4.65e+08    2.49e+08      2.55e+08
11    12  2.18e+09  1.10e+09 3.56e+08   3.73e+08    5.10e+08      4.98e+08    2.22e+08      2.24e+08
12    13  2.18e+09  1.10e+09 3.56e+08   3.73e+08    5.10e+08      4.98e+08    1.99e+08      2.00e+08
13    14  2.18e+09  1.10e+09 3.56e+08   3.74e+08    5.10e+08      4.98e+08    1.77e+08      1.78e+08
14    15  2.18e+09  1.10e+09 3.56e+08   3.73e+08    5.10e+08      4.98e+08    1.58e+08      1.59e+08
15    16  2.18e+09  1.10e+09 3.56e+08   1.87e+08    5.10e+08      6.29e+08    1.41e+08      1.33e+08
16    17  2.18e+09  1.10e+09 3.56e+08   0.00e+00    5.10e+08      7.60e+08    1.26e+08      1.11e+08
17    18  2.18e+09  1.10e+09 3.56e+08   0.00e+00    5.10e+08      7.60e+08    1.13e+08      9.88e+07
18    19  2.18e+09  1.10e+09 3.56e+08   0.00e+00    5.10e+08      7.60e+08    1.01e+08      8.82e+07
19    20  2.18e+09  1.10e+09 3.56e+08   0.00e+00    5.10e+08      7.60e+08    8.98e+07      7.87e+07
20    21  2.18e+09  1.10e+09 3.56e+08   0.00e+00    5.10e+08      1.11e+09    8.02e+07      1.03e+08
=== Straight line discounted profitability metrics ===
DPBP: 26.6
NPV (billions): 0.8
PVR: 0.6
IRR: 0.01
=== MACR discounted profitability metrics ===
DPBP: 25.14
NPV (billions): 0.61
PVR: 0.64
IRR: 0.01
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=== Profitability discussion ===
The project is profitable with an ROI of 15% when the cash flow is not discounted
However when the cash flow is discounted, the payback period is longer than project life
Present value ratio is < 1 and the interal rate of return is 1%
Due to the problems of profitability to justify risk, it is not feasible in current state
=== Estimation vary over time ===
Estimates are based off supply and demand and with changes in either can also lead to
significant changes in predicted values. Changes in global economy can also have significant
impact on the project from changes in interest rates for lending, price of raw materials, energy cost, etc
=== Comparison of ROI/IRR of depreciation options ===
There was no effect on the overall ROI/IRR from the depreciation method used
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==== Problem 2 ====
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===== Electric Car, i=0.04, n=10 =====
Price of car: 23100.0, annual fuel cost: 276.25, annual maintenance: 203
Net present value: -26987.15
Capitalized cost: 23100.0
Equivalent capitalized cost: 83181.77
Equivalent annual operating cost: 3327.27
===== Gas Car, i=0.04, n=10 =====
Price of car: 21000.0, annual fuel cost: 541.67, annual maintenance: 368
Net present value: -28378.24
Capitalized cost: 21000.0
Equivalent capitalized cost: 87469.5
Equivalent annual operating cost: 3498.78
====================
===== Electric Car, i=0.1, n=10 =====
Price of car: 23100.0, annual fuel cost: 276.25, annual maintenance: 203
Net present value: -26044.78
Capitalized cost: 23100.0
Equivalent capitalized cost: 42386.69
Equivalent annual operating cost: 4238.67
===== Gas Car, i=0.1, n=10 =====
Price of car: 21000.0, annual fuel cost: 541.67, annual maintenance: 368
Net present value: -26589.53
Capitalized cost: 21000.0
Equivalent capitalized cost: 43273.23
Equivalent annual operating cost: 4327.32
====================
===== Electric Car, i=0.04, n=15 =====
Price of car: 23100.0, annual fuel cost: 276.25, annual maintenance: 203
Net present value: -28428.49
Capitalized cost: 23100.0
Equivalent capitalized cost: 63922.24
Equivalent annual operating cost: 2556.89
===== Gas Car, i=0.04, n=15 =====
Price of car: 21000.0, annual fuel cost: 541.67, annual maintenance: 368
Net present value: -31114.06
Capitalized cost: 21000.0
Equivalent capitalized cost: 69960.83
Equivalent annual operating cost: 2798.43
====================
===== Electric Car, i=0.04, n=10 =====
Price of car: 27600.0, annual fuel cost: 276.25, annual maintenance: 203
Net present value: -31487.15
Capitalized cost: 27600.0
Equivalent capitalized cost: 97052.0
Equivalent annual operating cost: 3882.08
===== Gas Car, i=0.04, n=10 =====
Price of car: 21000.0, annual fuel cost: 541.67, annual maintenance: 368
Net present value: -28378.24
Capitalized cost: 21000.0
Equivalent capitalized cost: 87469.5
Equivalent annual operating cost: 3498.78
==================== Which option would you recommend ===
The EAOC for the electric car is lower, therefore it is the better option
=== Interest rate of 10% ===
The EAOC for the gas car is lower, therefore the better option
=== Lifetime of 15 years ===
With 15 years of ownership, the electric car has the lower EAOC, making it the better option
=== Expiration of tax credit ===
If the federal tax credit expired, the gas car would have the lower EAOC, making it the better option
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==== Problem 3 ====
Years: 8.0
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