HW5 INVESTMENT ANALYSIS

You are still in the consulting business. This time you are hired by a soft drink producing company. They want you to create a profitability analysis model – a **TOOL** that (i) will allow you to thoroughly analyze the investment opportunity under question (a new drink producing plant), and (ii) will be further used by the company managers for valuation of future projects.

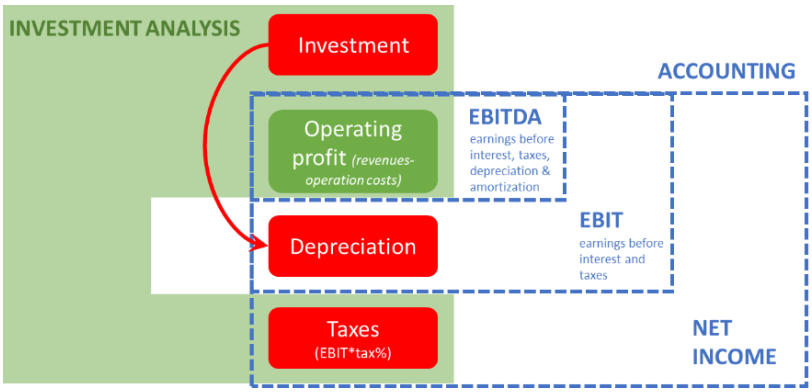
1. CASE

The big soft drink producing company that hired you is thinking about opening a new plant to produce a new kind of soft drink. Their expectations are that the project is no riskier than the existing soft drink business that they are presently involved in. The present running operations have been discounted at a 10% nominal rate and you have come to the conclusion that it is a good rate of discount for our new project as well. Company's expert engineers have calculated the construction costs of the plant to be 10 million dollars and that the construction will take 2 years, the costs will be evenly divided to both years (years 0 and 1). When finished, the plant will immediately start producing soft drinks. The sales experts have estimated that the sales of the soft drink would be at first one million bottles per year for three years, but after that, when the soft drink has become more popular, the sales will rise to 1,5 million bottles – and will remain there. These calculations have been made with the best-estimate price of one bottle at 2 dollars. The production costs of the soft drink are 0,50 dollars per bottle. The plant can produce the soft drink for 12 years, and at the end of the last year, the machines can be sold as scrap at the fair price of its remaining value after it depreciated during years of operation. Depreciation of the initial investment is assumed in a straight line in 13 years, starting from the beginning of the operation of the plant. The government has a corporate tax rate at 20%. Estimated annual inflation is 4%. The working capital investments are estimated at 50 000 dollars each year from the beginning of the operation of the plant for five years. The last five years of the operation, when plenty of cash is available, the working capital investment is released back from the project profits (evenly distributed among the last five years).

2. INVESTMENT ANALYSIS TOOL

Start by building the cash flow model based on the case information.

➥ *carefully distinguish accounting and actual cash flows. To calculate taxes you don't need investment cost (capital expenditures), instead, they are converted into depreciation that diminishes the tax base in a more distributed manner. Check e.g.* EBITDA & EBIT. *But depreciation is nothing more than 'imaginary' cash flows used for taxation purposes, therefore it should NOT be in the cash flow calculation for investment profitability, check* FCF (Free Cash Flow). *See also a simplified scheme to visually assist you in this issue.*



➥ *working capital investment is practically liquidity budgeting, previously we had assumed that the owner of an enterprise simply provided extra money, now we in advance account for that deducting needed working capital from the profits and then later returning it back to properly calculate for investment profitability. The*

overall sum of working capital cash flows in investment analysis should be equal to zero. Working capital investment does not affect the tax base.

➥ *remember to keep the whole calculation in either real or nominal terms.*

➥ *start organizing your model in accordance with the 'best practices' from the very beginning.*

Calculate the following profitability indicators: Net Present Value (NPV), Internal Rate of Return (IRR), Profitability Index (PI), and Discounted Payback Period (DPP).

➥ *make sure DPP calculation is automated. You might need some extra research to make it happen.*

Build graphics that would display important to the project profitability cash flows and resulting NPV.

Design and organize the output part of the model. Include also insights from the next section. Make a printable report (might be separate from the output part if it is placed near the inputs) with a button that saves it to the pdf on the desktop.

➥ *use best practices for your model.*

(a) Is the investment profitable with these base-case assumptions? What does each profitability indicator tell?

3. ANALYSIS

BREAKEVEN ANALYSIS

Perform breakeven analysis to see what are the critical values of different input variables (at least three) that zero out NPV. Choose variables, that can be to some extent managed, e.g. investment cost can be lowered by choosing a cheaper construction contractor.

Create a macro that would refresh the breakeven even analysis of all three variables and return the original inputs values with a single button. The macro will become handy for checking breakeven values in different scenarios.

➥ *do not hard-code the values (e.g. typing in the code C1=10000), because the company will later use this model for different investment cases with different input values. The macro here should return the values that were in the input area just before the breakeven analysis.*

Include the results of the break-even analysis into the report. Copy a refresh button there as well, so that the user can refresh everything without a need to leave the report sheet.

➥ *make sure the refresh button on the report works properly too.*

(b) What does the breakeven analysis tell about investment profitability?

SENSITIVITY ANALYSIS

Adopt a sensitivity analysis macro (given) to your model. Conduct sensitivity analysis of any two profitability indicators to any five input variables. Include the resulting graphics into the report and copy the refresh button there too.

(c) What are the most crucial factors for project profitability? Which factors can potentially boost profitability and which deteriorate? Are they the same?

SCENARIO ANALYSIS

What might be an alternative future worth checking? Create a scenario analysis tool, check scenarios that would make sense and be appreciated by the managers of the company we are working for. What comes to mind is forecasting different market development with the scenario tool, e.g. combination of price, tax, and inflation, and when such a tool is ready, a manager can check the critical breakeven values of manageable parameters in different scenarios. This will enable the model to provide actionable information about the investment project. However, you can pursue the design of scenario analysis that makes sense to you.

but note that in order to enable the flexibility of checking breakeven values in different scenarios, one cannot use the rigid scenario manager tool.

Include the insight from scenario analysis into the report.

(d) Why your scenario tool is useful in this particular investment case? What insight does it bring?

MONTE CARLO SIMULATION

Build a Monte Carlo simulation for the investment model. Make assumptions of uncertainty (min and max) in chosen (by you) five input variables. Enable the user to change those assumptions and to define the number of simulation runs. Assume the uniform distribution of values.

The output of the simulation should be:

i. A table with descriptive statistics (include the probability-weighted mean = expected NPV, min and max NPV, its standard deviation, the share of negative NPVs = risk, and positive NPVs = potential);
ii. The probability distribution of NPVs.

Include this information into the report.

in the report create links to corresponding model parts (Monte Carlo, sensitivity analysis, scenario analysis, etc.).

if your model has become very slow, check the "10 tips to SPEED-UP your Excel"

To advance the Monte Carlo simulation tool implement the following:

i. Color-code negative and positive NPVs on the probability distribution (not manually, it should change accordingly if inputs are changed and simulation is run again);
ii. An indicator of the progress of the simulation would be useful for bigger = longer simulations (it can be displayed in a cell OR on the StatusBar);
iii. Enable the user to choose the number of bins for the graph and introduce a button to update the graph accordingly. Make sure that the X-axis scale gets properly updated with small and big # of bins.

these last three things might require a lot of effort and creativity. Would you dare to try?

Don't get upset if that's too hard for you, just skip it, you will be able to get enough points without this.

(e) What conclusion can be drawn from the Monte Carlo simulation?

PLEASE DO NOT PROTECT THE SHEETS OR RANGES TO ENABLE CHECKING YOUR HOMEWORK. *But do use it for modeling in the future*

BEFORE SUBMITTING RETURN THE INPUTS INTO ORIGINAL STATE

Grading and self-check	**Total points: 15**
The model structure is in accordance with 'best practices', has separate input, processing, and output parts. The input part has a user-friendly design, the processing parts do not contain any other inputs or fixed numbers except the separate input part for the Monte Carlo simulation.	1
The logic of the cash flow calculation is correct. All revenues are with a plus sign in final cash flows, all expenses with a minus. Depreciation is not included (or added back) to the final cash flows. The working capital sign makes sense and altogether sums up to zero.	1
Both rates and cash flows are either in nominal or real terms.	1
NPV, IRR, and PI are calculated and make sense.	1
Discounted Payback Period (DPP) calculation is automated. If inputs change, it changes too.	1
A chart displaying project cash flows and NPV is built and make sense.	1
Break-even analysis is done to 3 or more variables, automated with a macro, the macro updates all values at once and returns original inputs to the input area, the button is copied into the report and works there too, a short comment is left about the results.	1
Sensitivity analysis of 2 outputs to 5 input variables is implemented with the given macro, the graphics are included into the report, the button is copied there and works, a short comment is left about the results.	1
Scenario analysis is implemented and the insight from it is included in the report.	1
Monte Carlo simulation is attempted (even if does not work properly).	1
Monte Carlo simulation is working. It includes 5 uncertain variables, summary statistics, and the probability distribution of NPVs.	1
The probability distribution is color-coded (positive and negative NPVs are of different colors on the graph). It works properly with updated inputs (change several input parameters and run the simulation again and check if color-coding is updated properly).	1
The simulation progress is implemented. E.g. a cell that shows from 0 to 100% during the simulation run.	1
The user can change the number of bins and update the distribution with a button. The X-axis scale should stay adequate with a low and high number of bins (try e.g. 5 and 100).	1
The report is well organized, contains all the required information, printable and has a button that saves it to pdf.	1