# Profitability-Analysis-using-Monte-Carlo-simulation

In this project, we determine if setting up a business would be profitable 15 years down the line, subject to 9 inputs, each associated with a fixed uncertainty. Following are the inputs which we consider and their specifications-

## Project Premises

| Variable | Distribution | Parameters |
|---|---|---|
| C_land (cost of land) | Discrete | 20% ($3.0); 50% ($5.0); 30% ($10.0) |
| C_royalties (cost of royalties) | Beta-PERT | L = ($1.5/yr); M = ($4.0/yr); U = ($5.0/yr) |
| TDC (total depreciable capital) | Normal | Ave = ($100); Stdev = $20 |
| WC (working capital) | Uniform | Min = ($20); Max = ($40) |
| C_start (startup costs) | Normal | Ave = ($12.5); Stdev = $3.0 |
| S (sales revenue) | Beta-PERT | L = $30/yr; M = $50/yr; U = $60/yr |
| C (production costs) | Triangular | L = ($5.0/yr); M = ($6.0/yr); U = ($8.0/yr) |
| Tax (annual rate) | Discrete | 30% 0.35; 70% 0.40 |
| i (annual interest rate) | Uniform | Min = 9%, Max = 15% |

*All values in $MM (millions of dollars); values in parentheses represent negative values.

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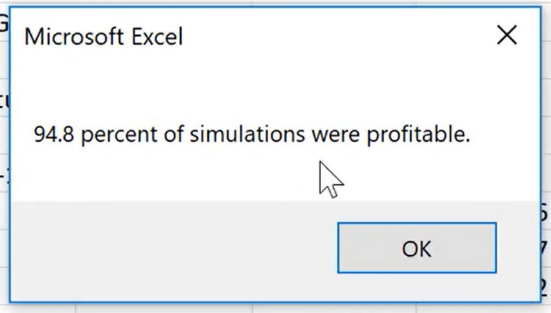
To calculate the Cash Flow (CF) for a particular year, we will use the formula-

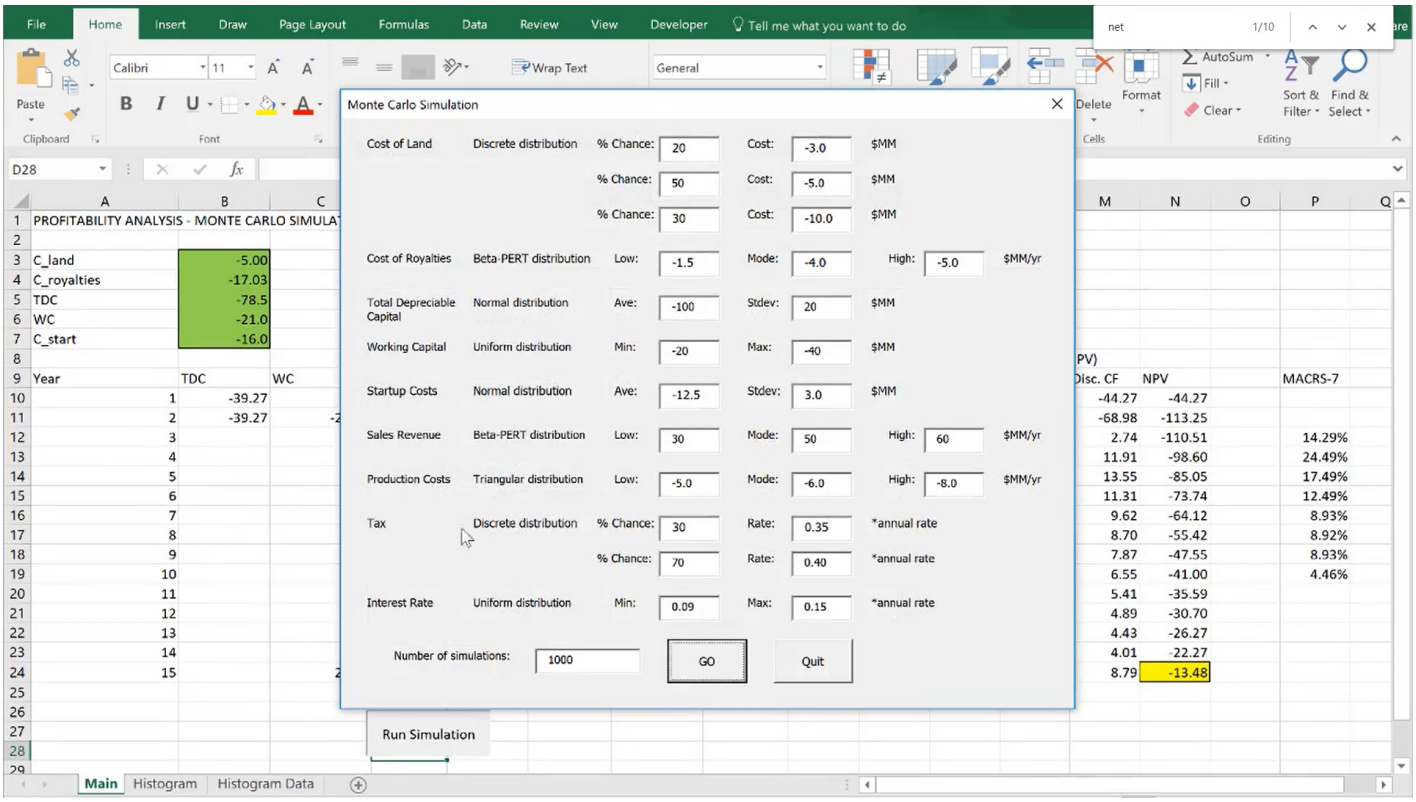
$CF= (1-t)(S-C) + D - C_{TDC} - C_{WC} - C_{land} - C_{startup} - C_{royalty} + V_{salvage} (+ C_{WC})$

Using Monte Carlo simulation, we iterate through a fixed number of scenarios, to determine what percent of scenarios result in a positive NPV (Net Present Value)-

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S | 43.7 | | C | -6.63 | | | | | |
| Tax: | 0.35 | | i | 10.5% | | | | | |
| | *IMPORTANT: DON'T CHANGE ANYTHING ON THIS SHEET ACCEPT | | | | | | | | |
| | FOR INPUTS HIGHLIG | | | | | | | | |
| C_land | C_royalty | C_start | | | | C | ATE | Cash Flow | (PV Disc |
| -3.00 | | | | | | | | -57.0916 | |
| 0 | | | | | | | | -104.596 | |
| | -4.56 | | | | | -3.31 | 6.31 | 17.21 | |
| | -4.56 | | | | | -5.30 | 8.96 | 30.89 | |
| | -4.56 | | | | | -6.63 | 20.42 | 34.79 | |
| | -4.56 | | | 13.51 | 43.72 | -6.63 | 23.94 | 32.89 | |
| | -4.56 | | | 9.66 | 43.72 | -6.63 | 26.44 | 31.54 | |
| | -4.56 | | | 9.65 | 43.72 | -6.63 | 26.45 | 31.54 | |
| | -4.56 | | | 9.66 | 43.72 | -6.63 | 26.44 | 31.54 | |
| | -4.56 | | | 4.82 | 43.72 | -6.63 | 29.59 | 29.85 | |
| | -4.56 | | | | 43.72 | -6.63 | 32.72 | 28.16 | |
| | -4.56 | | | | 43.72 | -6.63 | 32.72 | 28.16 | |
| | -4.56 | | | | 43.72 | -6.63 | 32.72 | 28.16 | |




The user can also change the parameters using the userform displayed after clicking on 'Run Simulation' on the excel sheet-




We then plot a histogram to get a 1-stop view of the distribution of the NPV as a consolidation of all the scenarios-