

Simulation & Risk Analytics: Term Project Part 2

Monte Carlo Simulation for Oil and Gas Exploration

Due Date: Tuesday, October 22

The assignment is due by 5:00pm. Feel free to hand it to me or email it to my NCSU address.

General Instructions

For this assignment, you are expected to provide a written business report.

The objective of assignments 2 and 3 is to build a Monte Carlo simulation to analyze the following:

- Net Present value of the expected returns from an oil exploration/production project
- Risk assessment of the project for horizons of 1, 3, 5, 10 and 15 years ahead
- Identify which of all factors (Price per Barrel of Oil, Reservoir, Drilling costs, Decline Rate, etc.) have the highest impact on the simulation result. Are the results the same across different horizons? Are the same factors driving the Expected NPV, VaR and CVaR?
- This project has a life of 15 years. Unless the drilling turns out to be a “dry-hole” you have to continue the operation for a total of 15 years. Suppose that a financial institution is willing to give you the option to abandon the investment at the end of Year 7, without incurring any costs or penalties. What would be the highest price you would be willing to pay for such an option?

Objective of assignment 3

In assignment 2 you identified any distributions that were not already given (drilling cost and oil prices) and you also build the flow chart of your analysis. In this assignment, you put all these information in RSP to run your simulation.

The suggested section of this business report are the following (the order is just a suggestion; feel free to use any order that fits best to the flow of your analysis).

- Describe the results of your simulation (Simulation analysis should be based on 10,000 draws):
 - Present the descriptive statistics and the empirical distribution for the key variables (NPV of years 1, 3, 5, 10 and 15).
- Risk Assessment
 - Calculate VaR and CVaR at the 99% level for the key variables (NPV of years 1, 3, 5, 10 and 15). Provide confidence intervals for both estimates.

- Sensitivity: Identify which risk factors have the highest impact on the simulation result. Are the results the same across different horizons? Are the same factors driving the Expected NPVs, VaR and CVaR?
- Guarantee evaluation: This project has a life of 15 years. Unless the drilling turns out to be a “dry-hole” you have to continue the operation for a total of 15 years. This is required, even if your net revenues are below the minimum amount you require.
 Suppose that a financial institution is offering you the following guarantee: For any of the years 8-15 you are guaranteed to have discounted net revenues (as of the end of year 7) of at least \$150,000. In other words, if your discounted revenues drop below \$150,000, the guarantor will pay you the difference. To give you an example, suppose that your net revenues on year 12 are \$210,000. Discounting these to year 7 will become $\$210,000 / (1+0.1)^5 = \$130,393$. The guarantor will cover the difference by giving you an addition \$19,607 so that you reach the minimum of \$150,000 discounted revenues. From the other side, if your discounted revenues were \$160,000, the guarantor would not give you anything. What would be the highest price you are willing to pay for such an guarantee?
- The final section must summarize the results and conclusions that you have derived from your analysis. You should contrast the simulation results with the single point estimates and make recommendations about the factors that affect the final results the most. Do you have any policy suggestions?