Monte Carlo Simulation Problems

Nick DeRobertis

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Capital Budgeting Probabilities with Monte Carlo Simulation

Problem Definition

You are a financial analyst for an aircraft manufacturer. Your company is trying to decide how large its next line of planes should be. Developing a line of planes takes a one-time research cost, then each plane has a cost to manufacture afterwards. The larger the plane, the higher the research and manufacture costs, but also the more revenue per plane. The larger planes are more risky because if the economy goes poorly, not many airlines will want to invest in such a large plane, but if the economy goes well, airlines will be rushing to the larger planes to fit rising demand.

The research cost will be paid at $t = 0$. For simplicity, assume that all planes are manufactured at $t = 1$ and sold at $t = 2$. The interest rate is given in the below table.

Find the expected NPV and standard deviation of NPV for each plane. Which plane has the lowest chance of a negative NPV? Which has the highest chance of a positive NPV? Visualize the range of possible NPVs for each plane, as well as the probability of acheiving different NPV levels (probability table). For the mid-size plane, which has a larger impact on the NPV, an additional plane sold or a decrease in the interest rate by 1%? In your opinion, which plane should the manufacturer create?

Possible Planes

Plane	Research Cost	Manufacture Cost	Sale Price	Expected Unit Sales	Stdev Unit Sales
Super Size	$100,000,000	$10,000,000	$11,500,000	200	120
Large	$50,000,000	$5,000,000	$5,600,000	400	50
Mid-size	$25,000,000	$3,000,000	$3,350,000	500	20

Other Inputs

Input	Default Value	Default Stdev
Interest Rate	7%	4%