IE2111 ISE Principles & Practice II
Lab 4 - Risk Analysis using Monte Carlo Simulation

Objectives and Learning Outcomes

At the end of the lab session, you will be able to do the followings:

1. Perform Probabilistic Risk Analysis using Monte Carlo Simulation.
2. Interpret Risk Profiles and make final recommendations.

Problem Description

This is a continuation of the problem analyzed in Lab 3.

Risk Analysis using Monte Carlo Simulation

To better understand and assess the risk associated with each alternative, you recommended that the probabilistic behavior of the sensitive variables identify in the previous section fully studied and Monte Caro Simulation be performed on these variables to determine the risk profiles for the two alternatives.

Expert's assessments of the probability distributions of the sensitive variables are given in the table below:

	Alternative A	Distribution	Parameters
1	Annual volume	Uniform Integer	min=13,000; max=17,000
2	Unit selling price	Truncated Normal	mean=10; sd=0.5; min=9; max=11
3	Annual Maintenance cost	Uniform	min=24,000; max=26,000
4	Manpower cost/worker/hour	Truncated Normal	mean=12; sd=1.5; min=9; max=15
5	Output per hours (pieces)	Triangular	min=7.50; mode=8.00; max=8.50
6	Variable material cost per unit	Triangular	min=2.80; mode=3.00; max=3.20

	Alternative B	Distribution	Parameters
1	Annual volume	Uniform Integer	min=13,000; max=17,000
2	Unit selling price	Truncated Normal	mean=10; sd=0.5; min=9; max=11
3	Annual Maintenance cost	Uniform	min=9,000; max=11,000
4	Manpower cost/worker/hour	Truncated Normal	mean=8; sd=0.5; min=7; max=9
5	Output per hours (pieces)	Triangular	min=5.50; mode=6.00; max=6.50
6	Variable material cost per unit	Triangular	min=2.80; mode=3.00; max=3.20

Generate the Risk profiles for the *AW* and *IRR* of Alternatives A and B and answer the following questions:

1. AW Analysis

1.1 Mean and Variance Analysis

What is the Expected AW of Alternative A? _____

What is the Standard Deviation of AW of Alternative A ? _____

What is the Expected AW of Alternative B? _____

What is the Standard Deviation of AW of Alternative B? _____

Is there any Mean-Variance Dominance?   Yes / No

1.2 Downside Risk:

What is the probability that Alternative A will be infeasible? _____

What is the probability that Alternative B will be infeasible? _____

1.3 Upside Potentials:

What is the probability that Alternative A will achieve $AW \geq$ \$10,000? _____

What is the probability that Alternative A will achieve $AW \geq$ \$20,000? _____

What is the probability that Alternative A will achieve $AW \geq$ \$30,000? _____

What is the probability that Alternative B will achieve $AW \geq$ \$10,000? _____

What is the probability that Alternative B will achieve $AW \geq$ \$20,000? _____

What is the probability that Alternative B will achieve $AW \geq$ \$30,000? _____

1.4 Value-at-Risk:

What is the Alternative A equivalent annual value-at-risk at 90% confidence? _____

What is the Alternative A equivalent annual value-at-risk at 95% confidence? _____

What is the Alternative B equivalent annual value-at-risk at 90% confidence? _____

What is the Alternative B equivalent annual value-at-risk at 95% confidence? _____

1.5 Stochastic Dominance Analysis:

Is there any first order stochastic dominance?   Yes / No

2. IRR Analysis

2.1 Mean and Variance Analysis

What is the Expected *IRR* of Alternative A? _____

What is the Standard Deviation of *IRR* of Alternative A? _____

What is the Expected *IRR* of Alternative B? _____

What is the Standard Deviation of *IRR* of Alternative B? _____

Is there any Mean-Variance Dominance?   Yes / No

2.2 Downside Risk:

What is the probability that Alternative A will be infeasible? _____

What is the probability that Alternative B will be infeasible? _____

2.3 Upside Potentials:

What is the probability that Alternative A will achieve $IRR \geq 15\%$? _____

What is the probability that Alternative A will achieve $IRR \geq 20\%$? _____

What is the probability that Alternative A will achieve $IRR \geq \$25\%$? _____

What is the probability that Alternative B will achieve $IRR \geq 20\%$? _____

What is the probability that Alternative B will achieve $IRR \geq 30\%$? _____

What is the probability that Alternative B will achieve $IRR \geq 40\%$? _____

2.4 Stochastic Dominance Analysis:

Is there any first order stochastic dominance?   <u>Yes / No</u>

3. Conclusion

What is your final recommendation to the company?