

IE2111 ISE Principles & Practice II

Assignment #4

Date Due: 11 March 2025, 5 pm

Instructions

You may use Excel or any computing tools to calculate your final answers, but you must explain or show the relevant formulas or equations in your solutions. Submit your completed assignment into the Drop Box outside the ISEM Department Office at E1A-06-25, or to the professor at the end of the lecture.

(Total Marks: 20)

Two mutually exclusive investment projects are being considered by a company. Data for the two alternatives under based-value scenarios are given in the table below:

	Project A	Project B
Initial Investment Cost	\$300,000	\$180,000
Annual Benefits	\$100,000	\$60,000
Salvage Value	\$12,000	\$6,000
Useful Life	4 years	4 years

$MARR = 8\%$. Study period = 4 years.

Base-Value Scenario Analysis

- (a) Using the PW method, determine which alternative should be selected based on the projects' base values. (2 marks)
- (b) By how much must the base-value of annual benefits of Project B for a decision reversal between Project A and Project B in part (a)? (2 mark)

Risk Analysis for Project A

- (c) The initial cost and salvage value for Project A are fixed. The annual benefits of Project A for Year 1 to Year 4 are uncertain, mutually independent and identically distributed (IDD) with the Normal Distribution with mean = \$100,000 and standard deviation = \$22,000.
- i. What is the Expected PW of Project A? (2 marks)
- ii. What is the Expected Standard Deviation of PW of Project A? (3 marks)

Risk Analysis for Project B

- (d) The Initial investment cost for Project B is uncertain and it follows the probability distribution:

Initial Investment Cost of Project B	Probability
\$155,000	0.25
\$180,000	0.50
\$205,000	0.25

- i. Determine and plot the Risk Profile (CDF) for Project B's PW (4 marks)
- ii. What is the Expected PW of Project B? (2 mark)
- iii. What is the Standard Deviation of PW of Project B? (2 mark)
- iv. What is the downside risk for Project B? (1 mark)
- v. What is the probability that Project B will have a PW of at least \$40,000? (1 mark)

Comparison of Project A and Project B

- (e) Is there any mean-variance dominance between the PW of Project A and PW of Project B? Explain your answer. (1 mark)

Optional Exercise

- (f) Perform Monte Carlo simulation using @Risk to generate the Risk Profiles for the PW of Project A and Project B, and compare the simulation results with those you have obtained analytically above. Is there any stochastic dominance between the PW of Project A and PW of Project B?