

IE2111 ISE Principles & Practice II

Lab 2 - Financial Analysis on Multiple Projects

Objectives

In this lab exercise, you will learn how to do financial analysis and make decision on multiple mutually exclusive projects.

Learning Outcomes

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

1. Develop cash flow models based for the base case scenario using Excel financial functions.
2. Compute relevant measures of effectiveness for each alternative and make appropriate recommendation under different operating scenarios and assumptions.

Problem Statement

Land transportation across the Songhua River plays a major role in economic development of the Songbei District of Harbin in Heilongjiang, China. To cope with future economic development, an additional bridge across the river has been proposed, and two alternative bridge designs are under consideration.

Design A has a useful life of 40 years and Design B has a useful life of 20 years. Each design requires a one-time initial construction cost for land acquisition, site preparation work and bridge construction. The life of each bridge may be extended for another life cycle if certain critical structures are replaced at the end of its useful life, at a cost significantly less than initial one-time construction costs. Each bridge must be resurfaced periodically at regular intervals except in the final year of its useful life or in its final year of usage. The bridges will also not incur any maintenance cost at the end of its useful life or in its final year of usage.

Data

The annual benefits of each design differ on the basis of disruption to normal traffic flow along the two sides of the river. Relevant information and data for the two bridge designs are given in the table below:

	Bridge Design	
	A	B
Initial one-time construction cost	\$20,000,000	\$15,000,000
Annual maintenance cost*	12,500	17,500
Resurface (every five years) *	-	50,000
Resurface (every eight years) *	40,000	-
Bridge replacement cost at end of every useful life	3,500,000	2,500,000
Annual benefit	2,750,000	2,000,000
Useful life of bridge (years)**	40	20

* Cost not incurred in last year of bridge's useful life.

** Applies to roadbed only; structural option of bridge has **indefinite useful life**.

$MARR = 10\%$.

All designs have negligible salvage value at any time during their useful life time.

Lab Exercises

Question 1

Determine which bridge design should be selected based on the PW method when the study period is 20 years.

- (a) PW of Design A over 20-year study period = _____
- (b) PW of Design B over 20-year study period = _____
- (c) Decision: Select Design _____

Question 2

Determine which bridge design should be selected based on the PW method when the study period of 40 years.

- (a) PW of Design A over 40-year study period = _____
- (b) PW of Design B over 40-year study period = _____
- (c) **Decision:** Select Design _____

Question 3

Determine which bridge design should be selected based on the PW method when the study period is infinity.

- (a) PW of Design A over infinite study period = _____
- (b) PW of Design B over infinite study period = _____
- (c) Decision: Select Design _____

Remember to fill up the Answers Worksheet in the Excel File before uploading.