Project Comparison and Evaluation Techniques

Module 02-1: Project Comparison

Modified: January 27, 2003

Purpose:

- Review the need for financial measures in the alternative selection process.
- Go over some of the problem areas.

Learning Objectives:

- Students should be able to compare simple project cashflow situations and make a choice between projects based upon B/C ratio, NPV, AE, Cap Value, IRR and ERR.

Overview

- There are a number of ways to compare alternative problem solutions; that is, which alternative is the most desirable? We can compare:
  - Emotionally
  - Physical Feasibility
  - Political Acceptability
  - Financially

A Problem for Engineers

- Engineers Use both Physical and Financial Evaluations and tend to ignore the Political and Emotional considerations.
- Why is this a problem? Get some comments from the class!

Physical Feasibility

- Actually possible to build – anti-gravity devices?
- Won't cause more Harm than Good – Environmental Issues (maybe political)

Financial Techniques:

- Net Present Value – non equal periods problem
- Net Annual Equivalent – may obscure total value
- B/C (Benefit / Cost) Ratio – legally required in some cases; the two forms may yield different results.

Cont'd.

- IRR – Lenders prefer but may yield non-sense results
- ERR – Yields better results but not understood by lenders
- Cap Rate method – Too easy to manipulate to your advantage
- Pay Back Period – Doesn't work with extreme interest rates
- Incremental Analysis using all of the above – You have to know what you are doing.

Projects with Unequal Time Periods

- When comparing projects with unequal time periods the NPV (the most popular) technique may yield incorrect results. For example (i=0%):

Yrs	Initial Cost	Yrly Exp	**NPV**	
2	100	50	200	**<< Lowest**
4	200	25	250	

Yrs	Initial Cost	Yrly Exp	**AE**	
2	100	50	100	
4	200	25	75	**<< Lowest**

B/C Ratio

- Very Important for Public Works Projects. Because:
- "The Benefits, to whom so ever they may accrue, must exceed the Costs to the government."
- Became a piece of 1930's Bureau of Reclamation legislation and it got applied to everyone.

Two Forms of the Relationship

- Conventional Form

$$B/C = \frac{\sum \text{Annual User Benefits}}{\sum \text{Annual Government Costs}}$$

- Modified Form

$$B/C = \frac{\sum \text{Benefits} - \sum \text{O \& M Costs}}{\sum \text{Capital Recovery Costs}}$$

Class Pair\Team Problem

- Use the B/C Ratio evaluator with i=0% to select the best of the following:

	A	B	C
Benefits	1,000	1,000	2,000
O&M	100	250	500
Cost	10,000	15,000	15,000
Years	10	20	15

The Answers Are:

- C is the best.

	A	B	C
Mod	0.90	1.00	1.50
Conv	0.91	1.00	1.33

Evaluation Procedure

1. Define the Objective – What are you trying to prove?
2. Define the Evaluation Criteria
   a. Politically
   b. Physically
   c. Financially
3. Define Mutually Exclusive Alternatives to be Evaluated

Cont'd.

4. Estimate Net Cash Stream for each mutually exclusive alternative
5. Apply the appropriate evaluation technique to get: NPV, B/C, etc.
6. Rank Order by … …
7. Select the "best" alternative or the "best" sequence using Other Criteria to break ties.

Pair Exercise.

Three artificial turfs are available for covering the playing field in a college stadium. The costs are a follows and use i=15%. Find the best using Annual Equivalent (AE).

	Turf King	Turf Ease	Turf Magic
Cost New($)	**540,000**	**608,000**	**467,000**
Annual Maintenance Cost ($)	**2,300**	**1,600**	**2,500**
Expected Life (years)	**12**	**15**	**10**
Salvage Value ($)	**54,000**	**57,000**	**40,000**

The answer is Magic.

	IC	Maint.	SV	Total
King	-99,630	-2,300	1,860	-$100,070
Ease	-103,970	-1,600	1,200	-$104,370
Magic	-93,070	-2,500	1,970	-$93,600

Summary

- Selection of the "Best" alternative is a rational process.
- You can use an engineering process, a political process, or an emotional process.
- Which ever one you use, follow the steps.

Class Assessment

- Take a minute to write 1 sentence on the "muddiest topic" in this module.