Lecture 16

Review

Exam Topics

Incremental Rate of Return

- If you are going to pick only one alternative from several,
  - Need to compare them against each other!
    - (based on differences in cost)
  - Not only against the base rate of return i*
- Need to evaluate each incremental investment to see if it is worthwhile

Incremental Rate of Return

- **Possible mistakes:**
  - **Highest IRR is not necessarily best**
    - **Another project with a *larger investment* might yield a larger total benefit!**
  - **Project with largest initial investment is also not necessarily best**
- **But we know that options with IRR < i* will *never* be chosen!**

Incremental Rate of Return

- If i* < IRR of (B - A), then:
  - Option B is better
- If IRR of (B - A) < i* < IRR of A:
  - Option A is better
- (Assuming that i* < IRR of A)

Benefit/Cost Analysis

- How to calculate conventional and modified benefit/cost ratios
- Know when a project is desirable:
  - Benefit/cost ratio greater than 1
- Option with highest benefit/cost ratio is not always best:
  - Need to do incremental benefit/cost analysis to choose the best option

Payback Period

- How to calculate crude payback
- Why it should not be used for choosing projects
- How it can be used

Breakeven Analysis

- Find the value of a variable at which an alternative breaks even:
  - So that its benefits equal its costs
- Find the value of a variable at which two alternatives are equal

Depreciation

- Straight-line depreciation
- Declining-balance depreciation:
  - Especially double declining balance
- MACRS depreciation:
  - Using a lookup table!

Retirement and Replacement

- Know how to determine the economic service life:
  - Annual equivalent cost is minimized
- Know when to replace equipment if the annual equivalent cost of the replacement is:
  - Higher
  - Lower

  than cost of the current equipment

Retirement and Replacement

- Remember to treat the current market value of the defender as:
  - An opportunity cost of keeping it
  - Not a benefit of selling it!

Example with Different Lifetimes

- Use annual equivalent
- Annual equivalent of current pump:
  - Annual expenses $2,000/year
  - $700 (A/P, 18%, 10) = $156/year
    - This is a ***cost*** of keeping the current pump
    - We don't get it unless we sell!
  - Total = **$2,156/year**

Different Lifetimes (continued)

- Annual equivalent of replacement:
  - Annual expenses $1,100/year
  - $3,400 (A/P, 18%, 20) = $635/year
  - Total = $1,635/year
- Is it better to replace the pump?
- If we considered the $700 as a benefit of the new pump:
  - It would be annualized over 20 years
  - *Even though it lasts for only 10 years!*

Example

- Equipment is 2 years old
  - Purchased for $25,000
- Assume i* = 15% (before tax)
- Resale value = $13,000 today
  - $10,000 in 1 year
  - $7,500 in 2 years
  - $5,500 in 3 or more years

Example

- Based on the ***outsider viewpoint***
  - (opportunity cost, ***not cash flow!***),

  keeping the equipment is the same as buying it used for $13,000
- Assuming operating costs are the same as for new equipment:
  - Can safely ignore in comparison!

Example

- Compare alternative lifetimes
- Cost of keeping for 1 year:
  - $13,000 (A/P, 15%, 1) = $14,950
    - This is a ***cost*** of keeping the equipment
    - You don't get it unless you sell!
  - Year 1 salvage value = -$10,000
  - Total = $4,950
    - (in year 1 dollars!)

Example

- Cost of keeping for 2 years (given that I am keeping it for 1 year):
  - $10,000 (A/P, 15%, 1) = $11,500
  - Year 2 salvage value = -$7,500
  - Total = $4,000
    - (in year 2 dollars!)

Example

- Cost of keeping for 3 years (given that I am keeping it for 2 years):
  - $7,500 (A/P, 15%, 1) = $8,625
  - Year 3 salvage value = -$5,500
  - Total = $3,125
    - (in year 3 dollars!)

Example

	Year	"Cash flow"	Discounted	Discount rate
	1	4950	4304	0.15
	2	4000	3025	
	3	3125	2055	
Present	Year 1		4304	
worth	Years 1 and 2		7329	
	Years 1, 2, 3		9384	
Annual	(already in year 1 dollars)		4950	
equivalent	7329	(A/P, 15%, 2)=	4508	
	9384	(A/P, 15%, 3)=	4110	

- **What is the best option?**
  - **Keeping for 3 years has *lowest cost***