Comparing Mutually Exclusive Alternatives

Lecture No. 16
Professor C. S. Park
Fundamentals of Engineering Economics
Copyright © 2005

Comparing Mutually Exclusive Projects

- Mutually Exclusive Projects
- Alternative vs. Project
- Do-Nothing Alternative
- **Revenue Projects**
  Projects whose revenues depend on the choice of alternatives

- **Service Projects**
  Projects whose revenues do not depend on the choice of alternative

- **Analysis Period**
  The time span over which the economic effects of an investment will be evaluated (study period or planning horizon).

- **Required Service Period**
  The time span over which the service of an equipment (or investment) will be needed.
Comparing Mutually Exclusive Projects

- **Principle**: Projects must be compared over an equal time span.

- **Rule of Thumb**: If the required service period is given, the analysis period should be the same as the required service period.

Case 1: Analysis Period Equals Project Lives

Compute the PW for each project over its life

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>$1,000</td>
<td>$4,000</td>
</tr>
<tr>
<td>1</td>
<td>$450</td>
<td>$600</td>
</tr>
<tr>
<td>2</td>
<td>$500</td>
<td>$1,400</td>
</tr>
<tr>
<td>3</td>
<td>$2,075</td>
<td>$2,110</td>
</tr>
<tr>
<td>PW (10%)&lt;sub&gt;A&lt;/sub&gt; = $283</td>
<td>PW (10%)&lt;sub&gt;B&lt;/sub&gt; = $579</td>
<td></td>
</tr>
</tbody>
</table>
Comparing projects requiring different levels of investment – Assume that the unused funds will be invested at MARR.

Case 2: Analysis Period Shorter than Project Lives

- Estimate the salvage value at the end of the required service period.
- Compute the PW for each project over the required service period.
Example 5.6 - Comparison of unequal-lived service projects when the required service period is shorter than the individual project life.

Required Service Period = 2 years

PW(15%)A = -$362,000  PW(15%)B = -$364,000
Case 3: Analysis Period Longer than Project Lives

- Come up with replacement projects that match or exceed the required service period.
- Compute the PW for each project over the required service period.

Example 5.7 - Comparison for Service Projects with Unequal Lives when the required service period is longer than the individual project life
Lease Model A to serve the remaining service life

- **Model A**
  - Years: 0, 1, 2, 3, 4, 5
  - Cash Flows: $2,000, $5,000, $5,500, $6,000, $6,500, $5,000
  - Present Worth (PW) at 15%: -$35,929

- **Model B**
  - Years: 0, 1, 2, 3, 4, 5
  - Cash Flows: $1,500, $4,000, $4,500, $5,000, $5,500, $5,000
  - Present Worth (PW) at 15%: -$33,173

**Summary**

- **Present worth** is an equivalence method of analysis in which a project’s cash flows are discounted to a lump sum amount at present time.
- The **MARR** or minimum attractive rate of return is the interest rate at which a firm can always earn or borrow money.
- MARR is generally dictated by management and is the rate at which NPW analysis should be conducted.
- Two measures of investment, the **net future worth** and the **capitalized equivalent worth**, are variations to the NPW criterion.
The term **mutually exclusive** means that, when one of several alternatives that meet the same need is selected, the others will be rejected.

- **Revenue projects** are those for which the income generated depends on the choice of project.

- **Service projects** are those for which income remains the same, regardless of which project is selected.

- The **analysis period** (study period) is the time span over which the economic effects of an investment will be evaluated.

- The **required service period** is the time span over which the service of an equipment (or investment) will be needed.

---

- The **analysis period** should be chosen to cover the **required service period**.

- When not specified by management or company policy, the **analysis period** to use in a comparison of mutually exclusive projects may be chosen by an individual analyst.