Session 4.1
Project Evaluation Criteria

Introductory Course on Economic Analysis of Investment Projects
8 May 2008
Cost Benefit Analysis

Ex-Ante vs. Ex-Post Analysis

- Identification and quantification of costs and benefits
- Discounting
- Comparison of benefits and costs – economic efficiency
  - NPV
  - IRR
  - B/C ratio
- Sensitivity Analysis
- Distribution Analysis
Net Present Value

\[ NPV^0 = \sum_{t=0}^{n} \frac{B_t - C_t}{(1 + r)^t} \]

Decision Rules

- Do not accept projects with negative NPV
- Mutually exclusive projects, no cost constraint – select the project with largest NPV
- Above rules are applicable for any time profile of net cash flow
- NPV is sensitive to discount rate
Internal Rate of Return

Discount rate at which NPV is zero

Decision Rules:
- Do not accept if IRR < cut off point
- May provide incorrect results in ranking

Problems:
- Multiple IRR or no IRR
- IRR is not additive
- Generally favors projects with shorter lifespan
- IRR is independent of the starting time
- Incorrect results for irregular cash flows
Time Profiles of the Incremental Net Cash Flows for Various Types of Projects

Incremental Net Cash Flow

Incremental Net Cash Flow

Incremental Net Cash Flow

Time

- +

Time

- +

Time

- +
Benefit Cost Ratio

\[
BCR = \frac{\text{PV of Economic Benefits}}{\text{PV of Economic Costs}}
\]

Decision Rules:
- Reject the project if BCR < 1
- Selection of mutually exclusive projects may provide incorrect results

Example:

<table>
<thead>
<tr>
<th></th>
<th>PV of Capital Costs</th>
<th>PV of Net Cash Flows</th>
<th>NPV of Project</th>
<th>BCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project X</td>
<td>1,000</td>
<td>1,300</td>
<td>300</td>
<td>1.3</td>
</tr>
<tr>
<td>Project Y</td>
<td>8,000</td>
<td>9,400</td>
<td>1,400</td>
<td>1.175</td>
</tr>
<tr>
<td>Project Z</td>
<td>1,500</td>
<td>2,100</td>
<td>600</td>
<td>1.4</td>
</tr>
</tbody>
</table>
Pay Back Period

- Number of years it takes to repay investments
- More applicable to private sector operations
  - political risks

Problems:
- Quick yielding projects are not necessarily superior

\[ B_t - C_t \]

\[ B^a \]

\[ B^b \]

\[ C^a = C^b \]

Payout period for project a

Payout period for project b
Debt Service Capacity Ratio (DSCR)

- DSCR determines the ability of the project to pay operating expenses and debt servicing obligations.

\[
ADSCR = \frac{\text{ANCF}^t_{\text{real}}}{(\text{Annual Debt Repayment}^t)^{\text{real}}}
\]

\[
DSCR = \frac{\text{PV (ANCF end year of debt)}}{\text{PV (Annual debt repayment end year of debt)}}
\]
## Calculation of Debt Service Capacity

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
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</thead>
<tbody>
<tr>
<td>Net Cashflow</td>
<td>0</td>
<td>320,000</td>
<td>320,000</td>
<td>360,000</td>
<td>440,000</td>
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<td>100,000</td>
<td>200,000</td>
<td>480,000</td>
<td>540,000</td>
<td>640,000</td>
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<tr>
<td>Debt Repayment</td>
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<td>298,316</td>
<td>298,316</td>
<td>298,316</td>
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<td>298,316</td>
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</tr>
<tr>
<td>ADSCR</td>
<td>1.07</td>
<td>1.07</td>
<td>1.21</td>
<td>1.47</td>
<td>1.27</td>
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</table>
Thank you