Session 4.1
Project Evaluation Criteria

Introductory Course on Economic Analysis of Investment Projects
2 July 2009
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
Benefit Cost Ratio

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

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

Time
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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<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>
<td>380,000</td>
<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>
<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