Example

Consider a firm with two projects, A and B, each with the following cash flows and a 10 percent cost of capital:

<table>
<thead>
<tr>
<th>Year</th>
<th>Project A Cash Flows</th>
<th>Project B Cash Flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-$100</td>
<td>-$150</td>
</tr>
<tr>
<td>1</td>
<td>$70</td>
<td>$100</td>
</tr>
<tr>
<td>2</td>
<td>$70</td>
<td>$100</td>
</tr>
</tbody>
</table>
Net Present Value (NPV)

- **What is it?**
  - Measure of ________________ from project

- **How do I do it?**
  - PV of future CFs – Initial Cost

- **The Investment Rule:**
  - Accept projects with ________________ and accept highest NPV first
Net Present Value (NPV)

- **Pros:**
  - Uses all ____________________
  - Incorporates ___________________________
  - Directly related to EVA

- **Cons:**
  - Need appropriate discount rate
  - Relatively more difficult to explain

Internal Rate of Return (IRR)

- **What is it?**
  - Discount rate that makes ______________________

- **How do I do it?**
  - Set NPV = 0 and solve for _____________________

- **The Investment Rule:**
  - Accept if IRR is greater than______________
    ___________ and accept highest IRR first
Pros:
- Closely related to NPV, leads to same decision MOST of the time
- Relatively more easy to explain

Cons:
- May result in __________________________
- May result in __________________________
What is an NPV profile?

Nonnormal Cash Flows

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-$252</td>
</tr>
<tr>
<td>1</td>
<td>$1,431</td>
</tr>
<tr>
<td>2</td>
<td>-$3,035</td>
</tr>
<tr>
<td>3</td>
<td>$2,850</td>
</tr>
<tr>
<td>4</td>
<td>-$1,000</td>
</tr>
</tbody>
</table>

NPV Profiles

NPV Profile

<table>
<thead>
<tr>
<th>Rate</th>
<th>NPV Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>-$0.02</td>
</tr>
<tr>
<td>20%</td>
<td>$0.04</td>
</tr>
<tr>
<td>40%</td>
<td>$0.06</td>
</tr>
<tr>
<td>60%</td>
<td>$0.08</td>
</tr>
<tr>
<td>80%</td>
<td>$0.10</td>
</tr>
<tr>
<td>25.00%</td>
<td>33.33%</td>
</tr>
<tr>
<td>42.68%</td>
<td>66.67%</td>
</tr>
</tbody>
</table>
Mutually Exclusive Projects

What is it?
- Discount rate that makes ________________ of outflows equal to ________________ of inflows

How do I do it?
- Take present value of outflows and future value of inflows and solve for breakeven rate

The Investment Rule:
- Accept if the MIRR is greater than the __________ ______________ and accept highest MIRR first.
<table>
<thead>
<tr>
<th>Year</th>
<th>Cash Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
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</tr>
</tbody>
</table>
Modified Internal Rate of Return (MIRR)

- **Pros:**
  - Assumes all cash flows are reinvested at ____________
    ____________________________
  - Closely related to NPV, leading to the same decision more than the IRR
  - No longer possible to get __________________________

- **Cons:**
  - Can still lead to ____________________ when size/scale differences and mutually exclusive projects

Profitability Index

- **What is it?**
  - Benefit-cost ratio

- **How do I do it?**
  - ____________________ of future cash inflows divided by initial cost

- **The Investment Rule:**
  - Accept if PI greater than ____ and accept highest PI first.
Profitability Index

- **Pros:**
  - Closely related to NPV, leading to same decision MOST of the time
  - May be useful when available funds are limited

- **Cons:**
  - May result in ___________________________
Payback Period

- **What is it?**
  - _________ to recover initial investment

- **How do I do it?**
  - Add up cash flows to determine time

- **The Investment Rule:**
  - Accept if payback period is _____ than cutoff and accept shortest payback first
Payback Period

**Pros:**
- Simple, no need for discount rate
- Biased toward projects with higher __________

**Cons:**
- Ignores _________________________
- Can accept ________________ projects
- Ignores cash flows beyond cutoff
- Can reject ________________ projects
- Arbitrary cutoff
- Biased against ________________ projects (e.g., R&D)

Discounted Payback Period

**What is it?**
- ______ for present value of cash flows to recover initial investment

**How do I do it?**
- Add up present value of cash flows to determine time

**The Investment Rule:**
- Accept if discounted payback period is ___ than cutoff and accept shortest discounted payback first
Pros:
- Incorporates ______________________________
- Does not accept ____________________ projects
- Biased toward ________________

Cons:
- Ignores cash flows beyond the cutoff
- Can reject ________________ projects
- Arbitrary cutoff
- Biased against ________________ projects (e.g., R&D)
Your firm is considering which pollution reduction system to purchase and implement to meet required EPA standards. Option 1 involves an initial $30,000 investment and subsequent annual costs of $10,000, and must be replaced again after 3 years. Option 2 requires an initial investment of $55,000 and has a 6 year life, requiring subsequent annual costs of $4,000, $6,000, $8,000, $12,000, $14,000, and $16,000, respectively. The appropriate discount rate for this project is 12 percent. Which option do you recommend?
Projects with Unequal Lives: An Example

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>$(30,000)</td>
<td>$(10,000)</td>
<td>$(10,000)</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>$(55,000)</td>
<td>$(4,000)</td>
<td>$(6,000)</td>
<td>$(8,000)</td>
<td>$(12,000)</td>
<td>$(14,000)</td>
<td>$(16,000)</td>
</tr>
</tbody>
</table>

Chapter 12 Suggested Problems

- **Questions:**
  - 12-3 through 12-5

- **Problems:**
  - 12-1 through 12-9, 12-13, 12-16, 12-18, 12-20, and 12-22