Key Concepts and Skills

- Understand how to determine the relevant cash flows for various types of capital investments.
- Be able to compute depreciation expense for tax purposes.
- Incorporate inflation into capital budgeting.
- Understand the various methods for computing operating cash flow.
- Apply the Equivalent Annual Cost approach.

Chapter Outline

7.1 Incremental Cash Flows
7.2 The Baldwin Company: An Example
7.3 Inflation and Capital Budgeting
7.4 Alternative Definitions of Cash Flow
7.5 Investments of Unequal Lives: The Equivalent Annual Cost Method

7.1 Incremental Cash Flows

- Cash flows matter—not accounting earnings.
- Sunk costs do not matter.
- Incremental cash flows matter.
- Opportunity costs matter.
- Side effects like cannibalism and erosion matter.
- Taxes matter: we want incremental after-tax cash flows.
- Inflation matters.

Cash Flows—Not Accounting Income

- Consider depreciation expense.
  - You never write a check made out to "depreciation."
- Much of the work in evaluating a project lies in taking accounting numbers and generating cash flows.

Incremental Cash Flows

- Sunk costs are not relevant
  - Just because "we have come this far" does not mean that we should continue to throw good money after bad.
- Opportunity costs do matter. Just because a project has a positive NPV, that does not mean that it should also have automatic acceptance. Specifically, if another project with a higher NPV would have to be passed up, then we should not proceed.
Slide 7

Incremental Cash Flows

- Side effects matter.
  - Erosion and cannibalism are both bad things. If our new product causes existing customers to demand less of current products, we need to recognize that.
  - If, however, synergies result that create increased demand of existing products, we also need to recognize that.

Slide 8

Estimating Cash Flows

- Cash Flow from Operations
  - Recall that:
    \[ \text{OCF} = \text{EBIT} - \text{Taxes} + \text{Depreciation} \]
- Net Capital Spending
  - Do not forget salvage value (after tax, of course).
- Changes in Net Working Capital
  - Recall that when the project winds down, we enjoy a return of net working capital.

Slide 9

Interest Expense

- Later chapters will deal with the impact that the amount of debt that a firm has in its capital structure has on firm value.
- For now, it is enough to assume that the firm’s level of debt (and, hence, interest expense) is independent of the project at hand.

Slide 10

7.2 The Baldwin Company

- Costs of test marketing (already spent): $250,000
- Current market value of proposed factory site (which we own): $150,000
- Cost of bowling ball machine: $100,000 (depreciated according to MACRS 5-year)
- Increase in net working capital: $10,000
- Production (in units) by year during 5-year life of the machine: 5,000, 8,000, 12,000, 10,000, 6,000

Slide 11

The Baldwin Company

- Price during first year is $20; price increases 2% per year thereafter.
- Production costs during first year are $10 per unit and increase 10% per year thereafter.
- Annual inflation rate: 5%
- Working Capital: initial $10,000 changes with sales

Slide 12

The Baldwin Company

- Price during first year is $20; price increases 2% per year thereafter.
- Production costs during first year are $10 per unit and increase 10% per year thereafter.
- Annual inflation rate: 5%
- Working Capital: initial $10,000 changes with sales
At the end of the project, the warehouse is unencumbered, so we can sell it if we want to.

Year 0 Year 1 Year 2 Year 3 Year 4 Year 5
Investments:
1. Bowling ball machine –100.00
2. Accumulated depreciation $(1) – 20.00$ $21.76^*$
3. Adjusted basis of machine after depreciation (end of year)
4. Opportunity cost –150.00
5. Net working capital 10.00
6. Change in net working capital –10.00
7. Total cash flow of investment $(1) + (4) + (6) – 260.00$ $-6.32$ $-8.65$ $3.75$ $192.98$

Income:

Year 0 Year 1 Year 2 Year 3 Year 4 Year 5
Income:
8. Sales Revenues 100.00 $163.20$ $249.72$ $212.20$ $129.90$
9. Operating costs 50.00 $88.00$ $145.20$ $133.10$ $87.84$
10. Depreciation 20.00 $32.00$ $19.20$ $11.52$ $11.52$
11. Income before taxes 30.00 $43.20$ $85.32$ $67.58$ $30.54$
12. Income after taxes 19.80 $28.51$ $56.31$ $44.80$ $20.16$

Depreciation is calculated using the Accelerated Cost Recovery System (shown at right). Year ACRS %
1 20.00% 2 32.00% 3 19.20% 4 11.52% 5 11.52% 6 11.52% Total 100.00%

Recall that production (in units) by year during the 5-year life of the machine is given by: $(5,000, 8,000, 12,000, 10,000, 6,000)$. Price during the first year is $20 and increases 2% per year thereafter. Sales revenue in year 3 $= 12,000 \times [20 \times (1.02)^2] = 12,000 \times 20.81 = 249,720$.

Incremental After Tax Cash Flows

<table>
<thead>
<tr>
<th>Year</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>$-260$</td>
<td>$39.80$</td>
<td>$54.19$</td>
<td>$59.87$</td>
<td>$224.66$</td>
</tr>
<tr>
<td>1</td>
<td>$39.80$</td>
<td>$(1.10)^2$</td>
<td>$(1.10)^3$</td>
<td>$(1.10)^4$</td>
<td>$(1.10)^5$</td>
</tr>
<tr>
<td>2</td>
<td>$34.19$</td>
<td>$(1.10)^2$</td>
<td>$(1.10)^3$</td>
<td>$(1.10)^4$</td>
<td>$(1.10)^5$</td>
</tr>
<tr>
<td>3</td>
<td>$28.58$</td>
<td>$(1.10)^2$</td>
<td>$(1.10)^3$</td>
<td>$(1.10)^4$</td>
<td>$(1.10)^5$</td>
</tr>
<tr>
<td>4</td>
<td>$24.19$</td>
<td>$(1.10)^2$</td>
<td>$(1.10)^3$</td>
<td>$(1.10)^4$</td>
<td>$(1.10)^5$</td>
</tr>
<tr>
<td>5</td>
<td>$20.16$</td>
<td>$(1.10)^2$</td>
<td>$(1.10)^3$</td>
<td>$(1.10)^4$</td>
<td>$(1.10)^5$</td>
</tr>
</tbody>
</table>

NPV = $51,588$
Inflation and Capital Budgeting

- For low rates of inflation, this is often approximated:
  \[ \text{Real Rate} \approx \text{Nominal Rate} - \text{Inflation Rate} \]
- While the nominal rate in the U.S. has fluctuated with inflation, the real rate has generally exhibited far less variance than the nominal rate.
- In capital budgeting, one must compare real cash flows discounted at real rates or nominal cash flows discounted at nominal rates.

7.4 Other Methods for Computing OCF

- Bottom-Up Approach
  - Works only when there is no interest expense
  - \( \text{OCF} = \text{NI} + \text{depreciation} \)
- Top-Down Approach
  - \( \text{OCF} = \text{Sales} - \text{Costs} - \text{Taxes} \)
  - Do not subtract non-cash deductions
- Tax Shield Approach
  - \( \text{OCF} = (\text{Sales} - \text{Costs})(1 - T) + \text{Depreciation}^*T \)

7.5 Investments of Unequal Lives

- There are times when application of the NPV rule can lead to the wrong decision. Consider a factory that must have an air cleaner that is mandated by law. There are two choices:
  - The "Cadillac cleaner" costs $4,000 today, has annual operating costs of $100, and lasts 10 years.
  - The "Cheapskate cleaner" costs $1,000 today, has annual operating costs of $500, and lasts 5 years.
- Assuming a 10% discount rate, which one should we choose?

At first glance, the Cheapskate cleaner has a higher NPV.
Investments of Unequal Lives

- This overlooks the fact that the Cadillac cleaner lasts twice as long.
- When we incorporate the difference in lives, the Cadillac cleaner is actually cheaper (i.e., has a higher NPV).

Replacement Chain Approach

- The Cadillac cleaner time line of cash flows:
  \[
  \begin{array}{cccccccccc}
  \text{CF0} & \text{CF1} & \text{CF2} & \text{CF3} & \text{CF4} & \text{CF5} & \text{CF6} & \text{CF7} & \text{CF8} & \text{CF9} & \text{CF10} \\
  -4,000 & -100 & -100 & -100 & -100 & -100 & -100 & -100 & -100 & -100 & -100 \\
  \end{array}
  \]

- The Cheapskate cleaner time line of cash flows:
  \[
  \begin{array}{cccccccccc}
  \text{CF0} & \text{CF1} & \text{CF2} & \text{CF3} & \text{CF4} & \text{CF5} & \text{CF6} & \text{CF7} & \text{CF8} & \text{CF9} & \text{CF10} \\
  \end{array}
  \]

Equivalent Annual Cost (EAC)

- Applicable to a much more robust set of circumstances than the replacement chain.
- The EAC is the value of the level payment annuity that has the same PV as our original set of cash flows.
  - For example, the EAC for the Cadillac air cleaner is $750.98.
  - The EAC for the Cheapskate air cleaner is $763.80, which confirms our earlier decision to reject it.

Cadillac EAC with a Calculator

- \( CF0 = -4,000 \)
- \( CF1 = -100 \)
- \( I/Y = 10 \)
- \( PV = -4,614.46 \)
- \( PMT = 750.98 \)
- \( FV = \)
Cheapskate EAC with a Calculator

<table>
<thead>
<tr>
<th>CF0</th>
<th>-1,000</th>
<th>N</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>CF1</td>
<td>-500</td>
<td>IY</td>
<td>10</td>
</tr>
<tr>
<td>FV</td>
<td>5</td>
<td>PV</td>
<td>-2,895.39</td>
</tr>
<tr>
<td>PMT</td>
<td>10</td>
<td>FV</td>
<td>763.80</td>
</tr>
<tr>
<td>NPV</td>
<td>-2,895.39</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Quick Quiz

• How do we determine if cash flows are relevant to the capital budgeting decision?
• What are the different methods for computing operating cash flow, and when are they important?
• How should cash flows and discount rates be matched when inflation is present?
• What is equivalent annual cost, and when should it be used?

Contact Information

• Office: RCOB 18, U of West Georgia
• Office Phone and Voicemail: (770)301-8648 (cell) or (678)839-4816 (office)
• Class Webpage: Ulearn/WEBCT Vista
• E-mail: Ulearn/WEBCT Vista (pref.) or chodges@westga.edu (alt.)
• MSN Instant Messenger: mba8622@hotmail.com