Chapter 11
Cash Flow Estimation and Other Issues in Capital Budgeting (thru page 435)

Overview
- Cash Flow Estimation
  - New or Expansion Project
  - Other Cash Flow Estimation Issues
  - Replacement Project

Capital Budgeting Steps
- For a potential project:
  1. **Forecast the project cash flows.**
  2. Estimate the cost of capital
  3. Discount the future cash flows at the cost of capital.
  4. Find NPV of project = PV of future cash flows – required investment, and accept if NPV > 0.
Cash Flow Estimation

- Need to estimate **incremental after tax cash flows** that the project is expected to generate.
- General form: \( \text{Cash Flow} = \text{Incremental Net Income} + \text{Depreciation} \)
- Other “special” cash flows
  - Initial costs
  - Extra ending or terminal cash flows at the end of the project’s expected useful life.

**Incremental Cash Flows**

**IMPORTANT**

Ask yourself this question

Would the cash flow still exist if the project does not exist?

- If yes, do not include it in your analysis.
- If no, include it.

Karsten Ping Golf: New Project CF Analysis

- As an analyst at MAD Inc., you have been asked to work with a client seeking capital budgeting advice, Ping Golf. Ping is considering making a new line of over-sized irons aimed at mid to high handicap golfers (known as mere mortal golfers or most of the people who play golf). These new irons would be called the Ping Kings, and would have a 3-year product life. Ping has already researched and designed these new golf clubs. Ping has given MAD Inc. the following information in order for you to estimate the project's cash flows.
Ping cash flow information

- Ping has already spent $500,000 to research and design the Ping Kings.
- Ping will need to buy $4,000,000 in new manufacturing equipment plus $500,000 in shipping and installation costs, which would be depreciated using 3-year MACRS depreciation.
- At the end of the project’s 3-year life, Ping estimates they can sell this equipment for $800,000.

Ping cash flow information (cont)

- Ping will also need $700,000 in additional net operating working capital at the beginning of the project.
- Ping estimates they can sell 10,000 sets of Ping Kings in year 1, 15,000 sets in year 2, and 9,000 in year 3. They also estimate they can sell the Ping Kings for $640 a set in years 1 & 2, but they will only be able to sell them for $540 a set in year 3. Variable costs will be $350 a set for all three years and Ping also expects to have $300,000 in fixed manufacturing costs annually for this project.

Ping cash flow information (cont)

- Ping’s marginal tax rate is 40%.
- Ping’s required rate of return is 18%.
- What are the incremental cash flows for this Ping King project?
- Should Ping go ahead with the Ping Kings?
Estimate Cash Flows

a) Initial Outlay: What is the cash flow at “time 0?”

**General Steps**

(Purchase price of the asset) + (shipping and installation costs) + (Depreciable asset) + (Investment in working capital)

Net Initial Outlay

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Investment in Net Operating Working Capital

- (Net) Working Capital = Current Assets – Current Liabilities
- Most new projects require additional short-term (current) assets and often additional current liabilities, such as:
  - Additional receivables from increased credit sales.
  - Additional inventory (raw materials) necessary to produce additional new products.
  - Additional trade credit (accounts payables) and taxes and wages payable.
- Any needed increase in net operating working capital is an outflow of cash, but these outflows are recovered by the end of the project.

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Initial Outlay for Ping Kings
Estimating Cash Flows

- Annual Operating Cash Flows: What incremental cash flows occur over the life of the project?

For Each Year, Calculate:

- Incremental revenue
- Incremental costs
- Depreciation increase on project
- Tax on incremental EBT
- Incremental earnings after taxes
- Depreciation increase

Annual Operating Cash Flow

Ping King Annual Depreciation

- Depreciable Asset (cost) = $4,500,000
- 3-year MACRS depreciation.

<table>
<thead>
<tr>
<th>Year</th>
<th>MACRS%</th>
<th>Cost</th>
<th>Depreciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>33%</td>
<td>4,500,000</td>
<td>1,485,000</td>
</tr>
<tr>
<td>2</td>
<td>45%</td>
<td>4,500,000</td>
<td>2,025,000</td>
</tr>
<tr>
<td>3</td>
<td>15%</td>
<td>4,500,000</td>
<td>675,000</td>
</tr>
<tr>
<td>4</td>
<td>7%</td>
<td>4,500,000</td>
<td>315,000 - BV3</td>
</tr>
</tbody>
</table>
Annual Operating CFs ($000) for Ping Kings

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit Sales</td>
<td>10,000</td>
<td>15,000</td>
<td>9,000</td>
</tr>
<tr>
<td>$/Unit</td>
<td>$640</td>
<td>$640</td>
<td>$540</td>
</tr>
<tr>
<td>VC/Unit</td>
<td>$350</td>
<td>$350</td>
<td>$350</td>
</tr>
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</table>

Estimating Terminal, End of Project Cash Flows

c) **Terminal Cash Flow**: What is the cash flow at the end of the project’s life?

Salvage value

-/+ Tax effects of new capital gain/loss on salvage value

+ Recovery of all increase in net operating working capital

= **Terminal Cash Flow**

Ping King Terminal CF (end of yr 3)

- Salvage Value = $800,000 BV = 315,000
Coronate Ping Kings?

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash Flow</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td>($5,200,000)</td>
</tr>
<tr>
<td>1</td>
<td>$2,154,000</td>
</tr>
<tr>
<td>2</td>
<td>$3,240,000</td>
</tr>
<tr>
<td>3</td>
<td>1,116k+1,306k = $2,422,000</td>
</tr>
</tbody>
</table>

- NPV at 18% = $426,445
- IRR = 22.9%
- MIRR = 21.1%

Other Incremental Cash Flow Issues

- Sunk costs = exclude. Ask yourself if rejecting the project affects this cost.
- Financing costs, such as interest expense = EXCLUDE. Already included in WACC.
- Opportunity Costs = INCLUDE. Generally revenues forgone from using land or building for another purpose other than the project.

Other Incremental Cash Flow Issues (continued)

- Externalities = effects of a project on cash flows in other part of the firm. Can be positive or negative and should be INCLUDED as part of the project’s incremental cash flows.
- Cannibalization = INCLUDE. A negative externality, occurs when the introduction of a new product diminishes the sales of existing products.
Replacement Project CF Analysis

- Assume old project is sold today and replaced by the new one.
- Receive inflow from the sale of old project today, but give up any future expected inflows (opportunity costs).
- General form: Increase in Net Income + (Depreciation on New - Depreciation on Old)

Imperial Defense Co. Death Star Replacement Project

- Six years ago in a galaxy far, far away, the Imperial Defense Co. (IDC) built the original Death Star at a cost of $100 billion. This original project is being depreciated on a straight-line basis over a 10-year period to zero.
- IDC is considering building a new and improved Death Star at a cost of $200 billion. The old death star can be sold for scrap today for $20 billion.

IDC Death Star Replacement Project Info(cont.)

- The new Death Star is estimated to have a 4-year useful life and falls into the 3-yr MACRS depreciation class. The new Death Star is expected to increase “protection” revenues by $60 billion in year 1 and by $90 billion in years 2 thru 4. Rebel defense expenses are expected to increase by $10, $20, $30 and $40 billion in years 1 thru 4 respectively.
- The new Death Star has an estimated salvage value of $30 billion at the end of its 5-yr useful life and the original Death Star has a $6 billion salvage value at the end of its useful life.
Death Star Replacement Project

Tasks

- Estimate the cash flows of the replacement project assuming a marginal tax rate of 40%.
- Should the old Death Star be replaced if Imperial Defense Co.’s cost of capital is 10%.

Death Star Replacement Project’s initial Cash Flow($billion)

- Sell old for $20 (original cost $100), buy new for $200
- Book Value of old = $100 - ($100/10 x 6) = $40
- Buy New
- Sale of Old
- Taxes on Sale of Old
- Total

Death Star Replacement Project Depreciation

- Annual Depreciation on Old = 100/10 = $10

<table>
<thead>
<tr>
<th>Year</th>
<th>Dep%</th>
<th>Base</th>
<th>New Dep</th>
<th>Old Dep</th>
<th>Diff.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>33%</td>
<td>200</td>
<td>66</td>
<td>10</td>
<td>56</td>
</tr>
<tr>
<td>2</td>
<td>45%</td>
<td>200</td>
<td>90</td>
<td>10</td>
<td>80</td>
</tr>
<tr>
<td>3</td>
<td>15%</td>
<td>200</td>
<td>30</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>7%</td>
<td>200</td>
<td>14</td>
<td>10</td>
<td>4</td>
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### Death Star Replacement Project
#### Operating Cash Flows

<table>
<thead>
<tr>
<th>Year</th>
<th>Rev</th>
<th>-Exp</th>
<th>-DepDiff</th>
<th>EBT</th>
<th>-Tax(40%)</th>
<th>Net Income</th>
<th>+DepDiff</th>
<th>Cash Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td>56</td>
<td>80</td>
<td>20</td>
<td>4</td>
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#### Death Star Replacement Terminal Cash Flows

- at t=4, New Salvage Value = $30, New Book Value = 0
- Old Salvage Value = $6, Old Book Value = 0

New Salvage Value:
- Taxes on New SV = .5(30-0)

Old Salvage Value:
- Taxes on Old SV = .5(6-0)

Total Terminal CF (t = 4)

#### Death Star Replacement Project Decision Time

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1</td>
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<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

- NPV at 10% =