FI3300
Corporate Finance

Spring Semester 2010
Dr. Isabel Tkatch
Assistant Professor of Finance

Learning objectives
- Fined the project’s CFs
- Correct accounting distortions:
  - Long term investments: fixed assets and depreciation
  - Short term investments: the Net Working Capital (NWC)
  - Eliminate the effect of financing decisions and payouts:
    - Interest (creditors) compared with dividends (equity holders)
  - Use only relevant incremental CFs:
    - Avoid arbitrarily allocated costs
    - Avoid sunk costs
    - Account for opportunity costs
  - CF type and the appropriate cost of capital:
    - The cost of equity – for dividends
    - The (after tax) cost of debt – for interest payments
    - The Weighted Average Cost of Capital (WACC) – for project’s CFs

- Use only relevant incremental CFs:
- Account for negative or positive effects on other projects
- Avoid arbitrarily allocated costs
- Avoid sunk costs
- Account for opportunity costs
- CF type and the appropriate cost of capital
- The cost of equity – for dividends
- The (after tax) cost of debt – for interest payments
- The Weighted Average Cost of Capital (WACC) – for project’s CF

Textbook example – problem 11.6

You are responsible for the firm’s capital budgeting decisions: use the following data to calculate the project’s CFs and the NPV rule to decide whether to accept / reject the project.
- The appropriate (annual) risk adjusted cost of capital is 12%
- The firm is in the 30% tax bracket

Textbook Example: Fixed Assets and Depreciation

b. If the project is undertaken, prior to construction, an amount of $100,000 would have to be spend to make the land usable for construction purposes
e. The project will require an initial outlay of $20 million for plan and machinery
h. The company uses straight-line depreciation. The project has an economic life of ten years and will have a salvage value of $3 million at the end (date t=10)

Correct accounting distortions (1): Fixed Assets and Depreciation

1a. Increasing the investment in Fixed Assets is a cash outflow
1b. Decreasing the investment in Fixed Assets is a cash outflow
2. Depreciation expense is not a cash outflow
3. Depreciation tax shield is a cash inflow
Depreciation tax shield = Depreciation-expense \times \text{tax-rate}

Textbook Example: Net Working Capital (NWC)
i. Because of the project, the company will need additional working capital of $1 million, which can be liquidated at the end of ten years
Correct accounting distortions (2): Net Working Capital (NWC)

\[ \text{NWC} = \text{Current Assets} - \text{Current Liabilities} \]

1a. Increasing the investment in NWC is a cash outflow
1b. Decreasing the investment in NWC is a cash inflow

Note: Investment in NWC ↑ if (i) CA↑ (ii) CL↓
Simplifying assumption: we invest in NWC in the beginning of the project and liquidate at the end

Textbook Example: Consider only relevant incremental CFs (1)

f. The sales from this project will be $15 million per year, of which 20% will be from lost sales of existing products
g. The variable costs of manufacturing for this level of sales will be $9 million per year
j. The project will require additional supervisory and managerial manpower that will cost $200,000 per year
k. The accounting department has allocated $350,000 as overhead cost for supervisory and managerial salaries

Consider only relevant incremental CFs (1)

1. If the project affects the CFs from other projects consider only the net contribution:
   - If the project increases the CFs of other projects adjust for cash inflow
   - If the project decreases the CFs of other projects adjust for the cash outflow
2. Allocated expenses:
   - don’t affect the project’s CF is they exist with or without the project
   - affect the project’s CF if they exist only if the it is accepted (i.e., don’t exist if the project is rejected)

Textbook Example: Consider only relevant incremental CFs (2)

c. To come up with the project concept, the company had hired a marketing research firm for $200,000
d. The firm has spent another $250,000 on R&D for this project

3. Sunk costs:
   - If a cost (or any other relevant CF) is in the future it should be taken into account
   - If a cost is in the past (sunk cost) it does not affect the project’s CFs and value
4. Opportunity cost:
   - The cost of an asset that you buy for the project is the price you paid
   - The cost of an asset that you own and allocated for the project is the highest price you could have gotten for it - opportunity cost (usually not zero)

Ignore CFs related to financing decisions: Interest expense and dividends

1. Ignore interest payments to creditors
   Interest payments are ignored even though they are considered an expense (accounting) and they constitute a cash outflow (finance)
   We account for the interest tax shield when calculating the (after tax) cost of capital
2. Ignore dividend payments to shareholders
   Dividend payout is ignored. It is not considered an expense (accounting) but dividends are a cash outflow (finance)
Calculate the initial CF (investment)

- Market value of land: $1,000,000
- Investment in land improvement: $100,000
- Investment in plant & machinery: $20,000,000
- Investment in working capital: $1,000,000

Initial CF (investment) = $22,100,000

Calculate the annual incremental CF (1)

- Calculate incremental sales:
  Incremental sales = 0.8 x 15,000,000 = $12,000,000

- Calculate the depreciation expense and tax shield:
  Investment in fixed assets = $20M
  Liquidation value of fixed assets = $3M
  Straight line depreciation, 10 years
  Depreciation expense = (20,000,000 - 3,000,000)/10 = $1,700,000
  Corporate tax rate = 0.3
  Depreciation tax shield = $1,700,000 x 0.3 = $510,000

Calculate the annual incremental CF (2)

  + Incremental sales + $12,000,000
  - Incremental variable cost - $9,000,000
  - Incremental managerial salaries - $200,000
  - Incremental depreciation - $1,700,000
  = Incremental taxable income - $1,100,000
  - Incremental tax @30% - $330,000
  = Incremental net income - $770,000
  + Add back depreciation + $1,700,000
  = Incremental cash flow = $2,470,000

Calculate the annual incremental CF (3)

  + Incremental sales + $12,000,000
  - Incremental variable cost - $9,000,000
  - Incremental managerial salaries - $200,000
  = EBITDA = $2,800,000
  - Incremental tax @30% - $840,000
  = EBITDA x (1-tc) = $2,160,000
  + Incremental depreciation tax shield + $510,000
  = Incremental cash flow = $2,670,000

End of project’s life: liquidation / residual value

- Receive $3M salvage value of fixed assets
- Recover $1M working capital

Liquidation (residual) cash flow = $3,000,000 + $1,000,000 = $4,000,000

Summarize all CFs: the timeline

- Initial investment:
  $CF_0 = -$22,100,000
- Incremental after-tax cash flow (t=1…10):
  $CF_1, …, CF_{10} = +$2,470,000
- Liquidation / residual cash flow (t=10):
  $CF_{10} = +$4,000,000

Note:
Total $CF_{10} = 2,470,000 + 4,000,000 = +$6,470,000

NPV(r=12%) = ___________ Accept / Reject
### Item | Date | t = 0 | t = 1,..., 9 | t = 10
---|---|---|---|---
- Incremental sales and inflows | + | +12,000,000 | +12,000,000 |
- Incremental costs and outflows (considered expenses for tax purposes) | -9,200,000 | -9,200,000 |
- EBITDA Earning Before Interest Tax Dep. & Am. | +2,800,000 | +2,800,000 |
- Incremental tax @30% | -840,000 | -840,000 |
- EBITDA x (1-tc) | +1,960,000 | +1,960,000 |
- Incremental depreciation tax shield | +510,000 | +510,000 |
- Incremental operational cash flow | +2,470,000 | +2,470,000 |
- Opportunity Costs | -1,000,000 |
- Investment in Fixed Assets | -20,100,000 | +3,000,000 |
- Investment in NWC | -100,000 | +1,000,000 |
+ Incremental cash flow | -$22,100,000 | +$2,470,000 | +$6,470,000 |

#### CF calculation check list

- Correct accounting distortions:
  - Long term investments: fixed assets and depreciation
  - Short term investments: the Net Working Capital (NWC)
- Eliminate the effect of financing decisions and payouts:
  - Interest (creditors) and dividends (equity holders)
- Use only relevant incremental CFs:
  - Account for negative or positive effects on other projects
  - Avoid arbitrarily allocated costs
  - Avoid sunk costs
  - Account for opportunity cost

### The Cost of Capital

- Dividends and capital gains - CFs paid to shareholders:
  - Dividends are not an expense for tax purposes: If the firm pays $1 the shareholder gets $1.
  - Use the cost of equity \( r_E \) to discount CFs to equity holders.
- Interest - CF paid to creditors:
  - Interest is an expense for tax purposes: the firm pays only $1x(1-tc) and the creditor gets $1.
  - Use the after-tax cost of debt \( (1-tc) \times r_D \) to discount CFs to creditors.

### The Cost of Capital

- The after-tax project's Cash Flow (or the firm) is paid to both, creditors and shareholders:
  - Use the Weighted Average Cost of Capital (WACC) to discount the after-tax project's Cash Flow:
  \[
  \text{WACC} = w_D \times (1-tc) \times r_D + w_E \times r_E
  \]
  \[
  w_D = \frac{D}{E+D}
  \]
  \[
  w_E = \frac{E}{E+D}
  \]
  \[
  tc = \text{corporate tax rate}
  \]

### Another example

(Based on Spring 2001 Final Exam)

ABC Corp. manufactures television sets and computer monitors. The company is considering introducing a new 40" flat screen television/monitor. The company's CFO collected the following information about the proposed product.
3) If the company goes ahead with the proposed product, it will have to increase inventory by $280,000 and accounts payable by $80,000. At t = 5, the net working capital will be recovered after the project is completed.

4) The screen is expected to generate sales revenue of $2,000,000 the first year; $4,500,000 the second through fourth years and $3,000,000 in the fifth year. Each year the operating costs (excluding depreciation) are expected to equal 50% of sales revenue.

5) The company's interest expense each year will be $350,000.

6) The new screens are expected to reduce the sales of the company's large screen TV's by $500,000 per year.

7) The company's (annual) cost of capital is 12%.

8) The company's tax rate is 30%.

Questions

1. Calculate the project's initial investment
2. What is the 3rd year expected incremental operating cash flow?
3. What is the 5th year expected incremental non-operating cash flow (i.e. liquidation / residual CF)?

Q1: initial investment

To find the initial investment we need points 2 & 3:

Investment in FA (machine) = 4,000,000
Incremental Investment in NWC = (ΔCA - ΔCL) = (280,000 - 80,000) = 200,000
Initial investment = $4,200,000

Q2: 3rd incremental operating cash flow

To answer Q2, we need points 2, 4, 6, 8.

1) Incremental sales = 4,500,000 - 500,000 = 4,000,000
2) Annual depreciation = (4,000,000)/5 = 800,000
   (Depreciation tax-shield = 0.3 x 800,000 = 240,000)
3) Incremental operating cost for 3rd year = 0.5 x 4,500,000 = 2,250,000

Now draw up the incremental income statement:

<table>
<thead>
<tr>
<th>Incremental sales</th>
<th>4,000,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incremental operating cost</td>
<td>-2,250,000</td>
</tr>
<tr>
<td>Incremental depreciation</td>
<td>-800,000</td>
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<tr>
<td>Incremental taxable income</td>
<td>950,000</td>
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<tr>
<td>Incremental tax @ 30%</td>
<td>-285,000</td>
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<tr>
<td>Incremental net income</td>
<td>665,000</td>
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<tr>
<td>Add back depreciation</td>
<td>+800,000</td>
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<tr>
<td>Incremental cash flow</td>
<td>$1,465,000</td>
</tr>
</tbody>
</table>
To calculate the operating cash flow use the same approach as Q2. The only incremental non-operating cash flow is the cash flow from liquidating the investment in net working capital:

5th year expected incremental non-operating cash flow = $200,000

<table>
<thead>
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<th>Item</th>
<th>Date</th>
<th>t = 0</th>
<th>t = 1</th>
<th>t = 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incremental sales and inflows</td>
<td>1,500,000</td>
<td>4,000,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incremental costs and outflows (considered expenses for tax purposes)</td>
<td>-1,000,000</td>
<td>-2,250,000</td>
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</tr>
<tr>
<td>EBITDA</td>
<td>+500,000</td>
<td>+1,750,000</td>
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<td></td>
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<tr>
<td>Incremental tax @ 30%</td>
<td>-150,000</td>
<td>-525,000</td>
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<tr>
<td>EBITDA x (1 – tc)</td>
<td>+350,000</td>
<td>+1,225,000</td>
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<tr>
<td>Incremental depreciation tax shield</td>
<td>+240,000</td>
<td>+240,000</td>
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<tr>
<td>Incremental operational cash flow</td>
<td>+590,000</td>
<td>+1,465,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Item                      | Date | t = 3        | t = 4        | t = 5        |
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<tbody>
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<td>Incremental sales and inflows</td>
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<td>4,000,000</td>
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<td>Incremental costs and outflows (considered expenses for tax purposes)</td>
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<tr>
<td>EBITDA</td>
<td>+1,750,000</td>
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<td>+1,000,000</td>
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<tr>
<td>Incremental tax @ 30%</td>
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<td>-300,000</td>
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</tr>
<tr>
<td>EBITDA x (1 – tc)</td>
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<td>+700,000</td>
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<td>Incremental depreciation tax shield</td>
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<tr>
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<td>+1,465,000</td>
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<td>+940,000</td>
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<tr>
<td>Opportunity Costs</td>
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<td>( \Delta ) Investment in Fixed Assets</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>( \Delta ) Investment in NWC</td>
<td>-200,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incremental cash flow</td>
<td>-4,200,000</td>
<td>+590,000</td>
<td>+1,465,000</td>
<td>+1,465,000</td>
</tr>
</tbody>
</table>

Summarize all CFs: the time line

Initial investment:
\( CF_0 = -4,200,000 \)
Incremental after-tax operational CF (t=1, ..., 5):
\( CF_1 = +$ 590,000 \)
\( CF_2, ..., CF_4 = +$1,465,000 \)
\( CF_5 = +$ 940,000 \)
Liquidation / residual / non-operational CF (t=5):
\( CF_5 = +$ 200,000 \)
Note: Total \( CF_5 = +$1,140,000 \)
\( NPV(r=12\%) = \text{Accept / Reject} \)