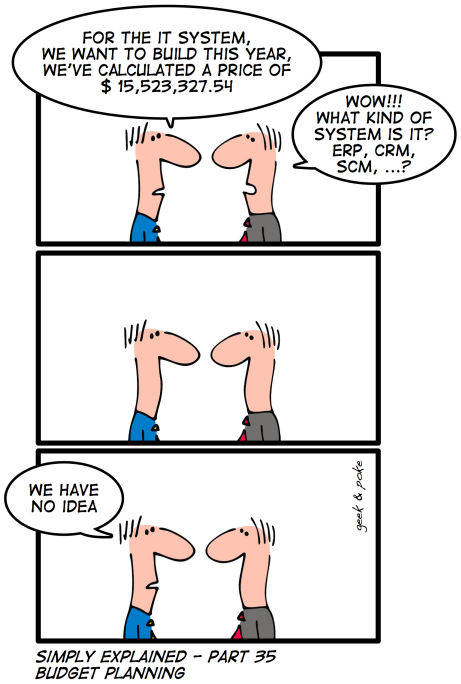
MBAS 821: Topic 2

Capital Budgeting

Ryan Riordan

How much does an investment cost?



As satirical as the comic is, the guy was doing a great job as a finance advisor, since he was able to figure out the cost of building the IT system. (Without knowing anything about it!)

Capital Budgeting

In order to calculate the NPV of a project, firm needs to know:

- Initial investment
  - Cost of machinery
  - Set up costs
  - etc.
- Future revenues and expenses
  - Wage
  - Rent
  - Machinery maintenance
  - etc.

Free Cash Flow (FCF)

Free cash flow (**FCF**) is the net cash inflow from a firm's operation less capital expenditures (CAPEX).

- FCF takes initial investment, revenue, expenses, etc. i.e. Every cash flow related to a project into account.

The NPV equation of an N-year project (based on FCF):

$$NPV = \sum_{t=0}^{N} \frac{FCF_t}{(1+r)^t}$$

How to calculate **FCF**?

Income Statement

Revenues	(1)
$-$ Cost of goods sold (COGS)	(2)
$-$ Other Costs	(3)
EBITDA	$(4) = (1) - (2) - (3)$
$-$ Depreciation (Dep)	(5)
Earnings before Interests and Taxes (EBIT)	$(6) = (4) - (5)$
$-$ Interest Expense	(7)
Earnings before Taxes (EBT)	$(8) = (6) - (7)$
$-$ Taxes	(9)
Net Income (NI)	$(10) = (8) - (9)$

EBITDA: Earnings before Interest, Taxes, Depreciation and Amortization.

Problem 1: Interest Expenses

Since we are interested in the **FCF**, which is the cash flow generated by the project to both equity and debt holders. We should exclude the interest expenses.

Instead of net income (**NI**), we calculate the *unlevered net income*, which is the net income assuming there were no debt.

$$\text{Unlevered NI} = EBIT \times (1 - T_C)$$

Where T_C is the corporate tax rate.

Another way of calculating unlevered net income is to add back the interest expense (post-tax) to the net income (NI):

$$\text{Unlevered NI} = NI + \text{Interest Expense} \times (1 - T_C)$$

Problem 2: Depreciation

Since depreciation is not a cash expense (i.e. There is no cash transactions as you write-off the depreciation expense), we need to add it to the unlevered net income. This value is the Operating Cash Flow (**OCF**):

$$OCF = \text{Unlevered NI} + Dep$$

On the other hand, we can calculate OCF by taxing on the EBITDA (i.e. assuming no debt and no depreciation). However, depreciation generates a tax shield which is a cash inflow. Summing these two items together is another way of calculating **OCF**:

$$OCF = EBITDA \times (1 - T_C) + Dep \times T_C$$

On the right-hand side of the equation, the first item is the post-tax EBITDA, the second item is the depreciation tax shield.

Problem 3: Capital Expenditure (CAPEX)

CAPEX(Sometimes written as CapEX, CAPX) is a cash outflow of purchasing assets. (e.g. land, machinery, etc.) This cash outflow is not recorded in the income statement.

Therefore, when calculating **FCF**, we need to deduct **CAPEX** from the **OCF**.

Problem 4: Change in Net Working Capital (ΔNWC)

Net working capital is the assets or capital tied up with a specific project:

- e.g. Cash, inventory, receivables and payables.

$$\begin{aligned} NWC &= \text{Current Assets} - \text{Current Liabilities} \\ &= \text{Cash} + \text{Inventory} + \text{Receivables} - \text{Payables} \end{aligned}$$

The change in net working capital is a cash item that is not recorded in the income statement, therefore we need to adjust for it by subtracting it from the OCF.

The change in net working capital (ΔNWC) is the difference of NWC between year t and t-1:

$$\Delta NWC = NWC_t - NWC_{t-1}$$

Finally, a formula for FCF

$$FCF = \text{Unlevered NI} + Dep - CAPEX - \Delta NWC$$

Wait, there is more:

$$FCF = EBIT \times (1 - T_C) + Dep - CAPEX - \Delta NWC$$

$$FCF = EBITDA \times (1 - T_C) + Dep \times T_C - CAPEX - \Delta NWC$$

$$FCF = NI + \text{Interest Expenses} \times (1 - T_C) + Dep - CAPEX - \Delta NWC$$

Use whichever formula that is the most convenient based on the information given.

Exercise: FCF

Find the FCF of year 2019:

	2018	2019
Sales	5,000	5,500
COGS	4,200	4,700
Depreciation	150	160
Interest Expense	450	550
CAPEX	250	250
Cash	200	150
Receivables	250	300
Payables	100	120
Inventories	250	300
Corporate Tax Rate	40%	

Solution

$$NWC_{2018} = 200 + 250 - 150 + 250 = 550$$

$$NWC_{2019} = 150 + 300 - 120 + 300 = 630$$

$$\Delta NWC = 630 - 550 = 80$$

$$\begin{aligned} FCF &= EBITDA \times (1 - T_C) + Dep \times T_C - CAPEX - \Delta NWC \\ &= (\text{Sales - COGS}) \times (1 - T_C) + Dep \times T_C - CAPEX - \Delta NWC \\ &= (5500 - 4700) \times (1 - 0.4) + 160 \times 0.4 - 250 - 80 \\ &= 214 \end{aligned}$$

Depreciation: Straight-line vs CCA

The depreciation

Further Considerations

- Cannibalism
  - Introduction of new product that **cannibalizes** revenue of an existing product. (Cash outflow)
- Synergies
  - Introduction of new product that **boosts** revenue of an existing product. (Cash inflow)
- Discount rates
  - Cash flows must be discounted at appropriate discount rates when calculating NPV.
- Sunk costs
  - Expenses or costs that have already been spent are sunk costs, do **NOT** consider them as cash outflows!