Lecture 8: Cash Flows

Outline

0. Motivation

1. Estimating Cash Flows

0. Motivation

Suppose you are forced to choose between 2 projects (as CEO of a toy company).

The first project is a new line of miniature cars designed for toddlers. The project is expected to generate revenues of $5 million per year over the next ten years, with up-front R&D expenses of $2 million this year. The labor required to produce these goods is likely to be unionized and earn above-market wages, while the materials required to create the cars will cost at most 50% of the revenues generated each year.

The second project is an improvement of an existing line of toy trucks for children. The trucks currently generate pre-tax profits of $2 million per year, and the improvements are expected to increase these profits by 5% each year. This project also requires up-front R&D, however, you are unsure of the maximum that you'd be willing to spend on this expense.

Which project is better, and why? What information would you need to make a decision?

0. Motivation

1. What's the Question?

2. Who cares?

3. Why don't we already know the answer?

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1. What's the Question?

If I want to use the NPV or IRR framework, how do I estimate cash flows in practice?

Examples:

0. Motivation

1. *What's the Question?*
2. *Who cares?*
3. *Why don't we already know the answer?*

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2. *Who cares?*

Anyone who wants to use the NPV framework to evaluate an investment decision.

0. Motivation

1. What's the Question?

2. Who cares?

3. Why don't we already know the answer?

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3. Why don't we already know the answer?

One needs to know the set of rules "agreed upon" by everyone, in order for people (investors, analysts, managers) to speak the same language and maximize efficiency.

Once the investment framework is chosen, the "spirit" of the rules that need to be followed is to properly capture the amount and the timing of the cash flows that are incurred as a result of investing in the project.

- Example 2-1: The Pierpont Company is thinking of building a plant to make trumpets. The plant and equipment costs $1 million. It lasts for five years and has no salvage value at the end of that time. The costs of running the plant are expected to be $100,000 per year. The revenues from selling the trumpets are expected to be $375,000 per year. All cash flows occur at the end of the year. IRS rules prescribe straight-line depreciation for the plant and equipment over five years. The firm faces a corporate tax rate of 35%. The opportunity cost of capital for this type of project is 10%. The projected income statement for the project is as follows:

Revenues	$375,000/year
Operating costs	-$100,000/year
EBITDA	$275,000/year
Depreciation	-$200,000/year
EBIT	$75,000/year
Taxes	-$26,250/year
Net income	$48,750/year

Should the Pierpont Company build the plant?

1. Cash flows

The broad idea:

- Construct P&L and balance sheet forecasts for horizon period.
  - How many years to forecast in the future?
  - What should we do afterwards?

- Count all cash flows
  - Incremental to the project
  - After tax (the rest goes to tax authorities)
  - Allowing for inflation

- Be consistent: discount nominal cash flows at nominal discount rates

Useful Terminology

	Accounting Flows
	Revenues
-	Costs
=	EBITDA
-	Depreciation & Amortization
=	EBIT (Operating Profit)
-	Interest Expenses
=	Pre-tax income
-	Taxes
=	Net Income
-	Dividends
=	Addition to Retained Earnings

After-tax Cash Flows

FCF =

$EBIT^*(1-\tau_C) - CAPEX - \Delta(NWC) + Depreciation$

Cash flows to equity =

$FCF - Interest^*(1-\tau_C) + \Delta(Debt)$

- **Goal**: Use accounting information to extract actual flows.
- FCF is total amount of money available to all stakeholders.
- Cash Flows to Equity are funds available to equity holders

Intuition: Free Cash-Flows

- FCF = EBIT*(1-τ_C) – CAPEX + Depreciation - Δ(NWC)

- Operating FCF is computed AS IF the firm is all-equity financed.
  - Cash-flows are after taxes and CAPEX, but before interest.
  - Tax calculated ignoring interest deductions.

- FCF ignores the effects of debt, i.e., interest payments and tax-shields.

- Operating FCFs are only affected by business risk.
  - Idea is to split the value of operations from financing.

- This ``unlevered'' CF is used by WACC and APV methods.
  - How to adjust for the effects of debt?

1. Earnings before Interest, Taxes, Depreciation and Amortization (EBITDA)

- To compute EBITDA, need to compute Net Revenues and Costs.

- Net Revenues (or Net Sales) are often found in the income statement or can be calculated from corporate economic data. Intuitively, the measure aims to quantify the money you receive from selling goods/services, minus allowances for returns, discounts, etc.

- Costs typically stem from 4 sources:

  -- Production Costs, of which there are fixed and variable quantities. Variable quantities are often called COGS (cost of goods sold) for companies that sell products, and you will often incorporate labor costs tied to production as well.

  -- Selling, General, and Administrative Expenses (SG&A) typically refer to costs that do not vary with production, such as overhead, phone bills, etc.

  -- Research and Development (R&D) Expenses are also cash outflows.

2. Depreciation

- Depreciation itself is not a cash flow but the tax savings due to the tax deductibility of depreciation are effective “tax shields.”

- In the U.S., the current rules for tax depreciation were set by the Tax Reform Act of 1986, which established the Modified Accelerated Cost Recovery System (MACRS). In the U.K. and many other countries, depreciation for the purposes of cash flow computation/valuation is essentially the same (even though accounting standards vary across countries).

- Depreciation can also be “straight-line”, depending on the situation.

  For example: Depreciation Amount = (Purchase price – Market Value at end of “Taxable Life”) / (# of years of “Taxable Life”)

- Example of Cash flows with and without Depreciation Expense of 20:

	No Depreciation	Depreciation
Revenue	100	100
- Costs	60	60
- Depreciation		
EBIT		
- Taxes (35%)		
(1-T) × EBIT		
+ Depreciation		
Cash Flow		

3. Taxes

- Taxes are a cash outflow when your project generates positive earnings. Use the firm's marginal corporate tax rate, which is the tax rate that the company pays on an *incremental* dollar of pre-tax income.

- If your project has negative earnings, then these earnings will create an effective tax credit, assuming that the firm makes sufficient earnings elsewhere to offset the negative project cash flows.

4. Net Working Capital (NWC)

If you finance your project with net working capital, then you need to account for cash flows associated with *changes* in NWC in your valuation.

NWC = Current Assets – Current Liabilities
= Cash + Inventory + Accts Receivables – Accts Payable

Remember that increases (decreases) in the levels of NWC from year t to year t+1 are decreases (increases) in cash flows for year t+1.

- What about cash ?

Cash should only be considered as part of working capital if in the safe or in checking accounts receiving no interest, or if for some reason a project requires holding a certain amount of cash.

Otherwise it's "negative debt" ("excess cash") and part of the firm's financial and payout policies

5. Salvage Value

- Salvage value is the cash flow that is realized upon the sale of assets associated with a project. The cash flow should take into account any tax considerations (namely, any book profits or losses).

- The book value of an asset (plant, machine, etc.) is equal to the initial investment cost minus the cumulative depreciation. For example, if you buy a machine for $600 and IRS rules prescribe straight-line depreciation over three years, the book value in one, two and three years from now is 400, 200 and zero, respectively.

- If you sell an asset and the book value equals the sales price, there are no tax consequences. If you sell an asset and the sales price is above the book value, the difference constitutes a taxable book gain. Finally, if you sell an asset and the sales price is below the book value, the difference constitutes a book loss, which gives rise to a tax credit.

- Suppose you sell an asset at price P and the book value of the asset is B. The corporate tax rate is T.
  - P = B : cash flow is P.
  - P > B (book gain): cash flow from sale is P minus taxes on book gain of T × (P – B). (Note: taxes accrue at end of year, while the sale itself may or may not be at end of year.)
  - P < B (book loss): cash flow from sale is P plus tax credit on book loss equal to T × (B – P). (Note: tax credit accrues at end of year, while the sale itself may or may not be at end of year.)

6. Terminal Value

- Cash-flows can only be reasonably estimated for a few periods (no more than 5-10 years).
- After T periods, we need to compute terminal value TV_T.
- Usual assumption is that it is based on a multiple or a perpetuity:

$$TV_T = \frac{(1+g)CF_T}{r-g}$$

  - CF_T: Final period cash-flow.
  - g: Terminal growth rate after period T
  - r: Discount rate depending on type of CF. (R_E, WACC or R_A)
- Firms usually go through a fast-growth stage and then become more stable.
- g for stable phase. Usually set to expected economic growth.

7. Indirect costs

- Sunk Costs: Do not include costs related to expenses that are incurred prior to the investment decision.

- Opportunity Costs: If investing in a particular project causes other projects to have lower cash flows, you must include these incremental cash flows in your project valuation. For example, if you build a plant, and therefore forsake the rental income you could have generated by renting out the land on which the plant is built, then you must include the lost rental income in your cash flow analysis.

8. Investments / Capital Expenditures

- A reorganized balance sheet:

Net working capital (NWC)	Net Debt
Net physical assets (NPA)	Equity
Other	Other
Net assets (NA)	**Capital**

- Investment is equal to a change in NA

This explains the formula:

$$FCF = EBIT(1-t) - \Delta NA$$
$$= EBIT(1-t) - \Delta NWC - \Delta NPA$$

Where $\Delta NPA = CAPEX - Depreciation$

Note: Use net assets net of excess cash

9. “Other” liabilities

- “Other” liabilities (e.g. deferred compensation, pension obligations, deferred taxes, etc.) must not be ignored in valuation exercises.

- Should they be seen as part of the capital or are they expenses (to be treated as cash outflows?) Conceptually, it’s a difficult question;

- In practice, it’s important to be consistent:
  - If other liabilities are really operational, they should be netted from assets just as current liabilities.
  - If such liabilities are treated as capital, the definition of leverage must include them, which will affect the calculation of discount rates.

- Example 2-2: The Olympics Corporation is considering whether to build a new bakery to make cherry pies. The current date is 12/31/03. The new bakery will be built over two years and will be ready to start production on 12/31/05 and will cease production on 12/31/07. The investment for the bakery requires an outlay of $2.5 million to be paid today. IRS rules prescribe that this expenditure is depreciated using straight-line depreciation over the two years the bakery is producing. The total salvage value of the plant and equipment on 12/31/07 is expected to be $1 million. The land the bakery will be built on could be rented out for $0.2 million per year for the four years while the bakery is being built and is in production. The bakery will produce 1.2 million cherry pies a year.

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- The cherry pies can be sold at $7 per pie. Raw material costs are $1.20 per pie and total labor costs are $0.42 million per year. These revenues and costs are expected to be the same for the two years the bakery is producing. The working capital required on 12/31/05 to allow inventories to be financed during the first year of production is $0.3 million (assume that net working capital prior to this date is 0). Working capital needs for the second year will be 10% higher. When the bakery ceases production all the working capital will be recovered (so the level of net working capital is 0).
- The firm has a corporate tax rate of 35% and other profitable ongoing operations. All cash flows occur at the end of a year. The discount rate is 12%.

  Should the Olympics Corporation build the bakery?