

Calculating Cash Flows

Objectives

- Describe the factors affecting a firm's cash flows
- Describe the relevant cash flows for a project
- Calculate cash flows from a firm's financial statement and discount those cash flows to arrive at a present value
- Recommended Exercises:
 - 10th edition, chapter 6: 1, 9, 11, 17, 23, 29, 30-32
 - 11th edition, chapter 6: 1, 9, 11, 17, 23, 29, 30-32
 - 12th edition, chapter 6: 1, 11, 13, 21, 27, 33, 34-36

Projecting Cash Flows

- Why do we care?
- Financial managers need forecasts of cash flows to make good investment decisions like:
 - should we expand our production by building a new factory?
 - should we introduce a new product?
 - should we take over a particular company?
 - and many more
- Think of recent M&A deals
 - How did they come up with the valuations?

Projecting Cash Flows

- What do we want?
 - Financial decisions involve computation of various NPVs – we need to forecast cash flows (numerators in NPV analysis)
 - Financial statements are one of the available sources of information about firm's financial performance
 - Data presentation in financial statements has several substantial flaws from our (financial) perspective – we need to understand them if we want to successfully “dig up the real cash out of accounting data”.

Finance vs. Accounting – the Main Conflicts

- Income Statement: GAAP (or IFRS) Net Income versus true cash flows
 - Finance needs to know the true cash flows. In addition, we are interested in timing of cash flows and the risk of cash flows.
 - Cash flow does not equal GAAP net income!
 - Depreciation and other non-cash items are included in GAAP net income
 - Items are recorded on an accrual basis not when the money actually comes into the firm. Thus, timing is not recognized.
- Why can't we use the statement of cash flows?
 - GAAP doesn't define cash flow
 - Huge variation from firm to firm

A practitioner's view of cash flow

- According to Tom Copeland, formerly head of Valuation at McKinsey & Company
 - “Managers ... should use discounted cash flow analysis, not earnings per share, to make decisions. The DCF approach captures all the elements that affect the value of the company in a comprehensive yet straightforward manner.”
 - See his book “Valuation: Measuring and managing the value of companies”

Calculating Free Cash Flow

- In simple terms, free cash flow is just dollars in minus dollars out
- FCF measure how much of true, real cash a firm (or a project) produced in a given year
- **FCF = operating cash flow – net capital spending – additions to NWC**
 - where **Operating Cash Flow = EBIT – Taxes + Depreciation**
- Earnings before Interest and Taxes – good measure of firm's profitability
- Loosely speaking,
$$\text{EBIT} = \text{Revenues} - \text{Costs} - \text{Depreciation}$$

Calculating Free Cash Flows, continued

- Q: Why “before interest”?
- A: Interest is just the method of profit distribution that goes to some of the business partners (banks, bondholders) that finance company's operations.
- Q: Why is depreciation added back?
- A: Depreciation is treated as a cost in accounting. But – it is a non-cash item (why?) !! Do we give up cash when we depreciate? No!
- Q: Why do we deduct taxes?
- A: Taxes are included in operating cash flow because the taxes are paid on the revenues associated with operating activities. Taxes are real (sometimes painfully real 😊) cash outflow!!

The Income Statement: A Recap

| U.S. CORPORATION 2018 Income Statement (\$ in millions) | | |
|---|-------|----------------------|
| Net sales | | \$1,509 |
| Cost of goods sold | | 750 |
| Depreciation | | <u>65</u> |
| Earnings before interest and taxes | | \$ 694 |
| Interest paid | | <u>70</u> |
| Taxable income | | \$ 624 |
| Taxes (34%) | | <u>212</u> |
| Net income | | <u><u>\$ 412</u></u> |
| Dividends | \$103 | |
| Addition to retained earnings | 309 | |

The Income Statement: How can you get from Net Income to EBIT?

- $\text{EBIT} = \text{Net income} + \text{Taxes} + \text{Interest expense}$
- This is what some call the 'bottom up' approach to get to operating cash flow
- Review question: What else do you have to add to / subtract from EBIT to get operating cash flow?

Free cash flow calculation in detail, starting from Revenue ('top down')

| Explanation | Calculation | Formula |
|---|---|------------------|
| The change in the firm's cash income, excluding interest expense, resulting from the project. | Revenue | Revenue |
| | – Cash operating expenses | – Op Ex |
| | Earnings before interest, taxes, depreciation, and amortization | EBITDA |
| | – Depreciation and amortization | – D&A |
| | Operating profit | EBIT |
| | $\times (1 - \text{Firm's marginal tax rate})$ | $\times (1 - t)$ |
| Adjustments for the impact of depreciation and amortization and investments on FCF. | Net operating profit after tax | NOPAT |
| | + Depreciation and amortization | + D&A |
| | Cash flow from operations | CF Opns |
| | – Capital expenditures | – Cap Exp |
| | – Additions to working capital | – Add WC |
| | Free cash flow | FCF |

Note on Depreciation

- Depreciation is a non-cash accounting adjustment that has no direct relation to future market values - we add back the *full* value of depreciation when computing OCF.
- However, depreciation has important cash flow consequences because it affects the tax bill:
$$\text{Taxes} = T * \text{EBIT} = T * (\text{Sales} - \text{Costs} - \text{Depreciation})$$
- Side note: For taxes, we ignore interest payments
 - We implicitly assume an all-equity financed firm/project
- The way depreciation is computed for tax purposes is a relevant factor for capital investment decisions.

Depreciation Methods

- 1) **Straight line:** A fixed percentage of the original asset book value, i.e., we depreciate the same amount of money every year:

$$\text{Depreciation} = \text{Original Book Value} / \text{Number of Years}$$

- 2) **Modified Accelerated Cost Recovery System (MACRS):** 1986 Tax Reform Act allows firm to “front-load” depreciation charges.

- 3-year class of assets: equipment used in research
- 5-year class of assets: autos, computers
- 7-year class of assets: most industrial equipment, etc.

Depreciation Methods: MACRS

| Property Class | | | |
|----------------|------------|-----------|------------|
| Year | Three-Year | Five-Year | Seven-Year |
| 1 | 33.33% | 20.00% | 14.29% |
| 2 | 44.45 | 32.00 | 24.49 |
| 3 | 14.81 | 19.20 | 17.49 |
| 4 | 7.41 | 11.52 | 12.49 |
| 5 | | 11.52 | 8.93 |
| 6 | | 5.76 | 8.92 |
| 7 | | | 8.93 |
| 8 | | | 4.46 |

Capital Budgeting Problem: Fairways Driving Range

- Two friends are considering opening a driving range for golfers. Because of the popularity of golf in Georgia, they estimate that they could rent 20,000 buckets at \$3 a bucket in the first year, and that rentals will grow by 750 buckets a year thereafter. The price will remain at \$3 per bucket.
- Equipment (Ball Dispensing Machine \$2,000, Tractor \$8,000, Ball Pickup Machine \$8,000) is 5-year ACRS and is expected to have a salvage value of 10% of cost after 6 years. Expenditures for balls and buckets \$3,000 initially. The cost of replacing balls and buckets will grow at 5% per year. Net working capital needs are \$3,000 to start. Thereafter, NWC grows at 5% per year.
- Relevant tax rate 15%, required rate of return 12%
- Evaluate the project for 6 years. Should your friends proceed with the project?

Fairways Driving Range: Operating Costs per Year

| Item | Cost (\$) |
|-------------------|------------------|
| Land Lease | 12,000.00 |
| Water | 1,500.00 |
| Electricity | 3,000.00 |
| Seed & Fertilizer | 2,000.00 |
| Labor (Salaried) | 30,000.00 |
| Gasoline | 1,500.00 |
| Maintenance | 1,000.00 |
| Insurance | 1,000.00 |
| Miscellaneous | 1,000.00 |
| Total | 53,000.00 |

Step 1: Revenue Forecast

Forecasted 20,000 buckets at \$3 a bucket in the first year, and that rentals will grow at 750 buckets a year thereafter. The price will remain at \$3 per bucket.

| Year | Buckets | Revenues |
|------|---------|----------|
| 1 | 20,000 | \$60,000 |
| 2 | 20,750 | 62,250 |
| 3 | 21,500 | 64,500 |
| 4 | 22,250 | 66,750 |
| 5 | 23,000 | 69,000 |
| 6 | 23,750 | 71,250 |

Step 2: Forecasting the cost of balls and buckets

Expenditures for balls and buckets are \$3,000 initially. The cost of replacing balls and buckets will grow at 5% per year.

| Year | Balls & Buckets |
|------|-----------------|
| 1 | \$3,000 |
| 2 | 3,150 |
| 3 | 3,308 |
| 4 | 3,473 |
| 5 | 3,647 |
| 6 | 3,829 |

Step 3: Depreciation

Depreciation of \$18,000 of 5-year equipment using MACRS

| Year | ACRS% | Depreciation | Book Value |
|-------|-------|--------------|------------|
| 1 | 20.00 | \$3,600 | \$14,400 |
| 2 | 32.00 | 5,760 | 8,640 |
| 3 | 19.20 | 3,456 | 5,184 |
| 4 | 11.52 | 2,074 | 3,110 |
| 5 | 11.52 | 2,074 | 1,036 |
| 6 | 5.76 | 1,036 | 0 |
| Total | | \$18,000 | |

Salvage value of equipment equals 10% of cost = \$1,800.00. The firm will have to pay taxes on this income when the equipment is sold.

Step 4: Pro-forma Income Statement

| | Year 1 | Year2 | Year3 | Year 4 | Year 5 | Year 6 |
|---------------------|--------------|--------------|--------------|--------------|---------------|---------------|
| Revenues | \$60,000 | 62,250 | 64,500 | 66750 | 69,000 | 71,250 |
| Variable Costs | 3,000 | 3,150 | 3,308 | 3,473 | 3,647 | 3,829 |
| Fixed Costs | 53,000 | 53,000 | 53,000 | 53,000 | 53,000 | 53,000 |
| Depreciation | 3,600 | 5,760 | 3,456 | 2,074 | 2,074 | 1,036 |
| EBIT | 400 | 340 | 4,736 | 8,203 | 10,279 | 13,385 |
| Taxes | 60 | 51 | 710 | 1,230 | 1,542 | 2,008 |
| EBIT*(1-t) | 340 | 289 | 4,026 | 6,973 | 8,737 | 11,377 |

Step 5: Forecasting Operating Cash Flows

| Year | EBIT | + Depreciation | - Taxes | = Operating Cash Flow |
|------|--------|----------------|---------|-----------------------|
| 0 | \$0.00 | \$0.00 | \$0.00 | \$0.00 |
| 1 | 400 | 3,600 | 60 | 3,940 |
| 2 | 340 | 5,760 | 51 | 6,049 |
| 3 | 4,736 | 3,456 | 710 | 7,482 |
| 4 | 8,203 | 2,074 | 1,230 | 9,047 |
| 5 | 10,279 | 2,074 | 1,542 | 10,811 |
| 6 | 13,385 | 1,036 | 2,008 | 12,413 |

Project Capital Spending

- During the project's life, additional assets sometimes need to be bought, and/or some assets need to be replaced. This cash cannot be consumed by investors – we need to deduct *capital spending* from Free Cash Flows!
- In every year of project's expected life, we will compute capital spending as:
 - + purchase price of the new asset bought
 - - selling price of the asset sold
 - +/- increase (decrease) in tax liability due to the sale of an old asset at other than book value
- When the *finite-life* project ends, we will *liquidate* all assets used.
 - How? We will sell them if they still have some **salvage value**, which is the market value of an asset at the project's end

Project Capital Spending – Tax Adjustment

We will compare the selling price of the asset (S) and the book value of the asset at the time of the sale (B). Our adjustment to the capital spending will be:

- 1) If $S > B$, then we add $T^*(S-B)$ to capital spending (i.e. deduct from FCF)
- 2) If $B > S$ then we deduct $T^*(B-S)$ from capital spending (i.e. add to FCF)

Why?

Step 6: Project Capital Spending

Project capital spending is \$18,000. Salvage value of equipment equals 10% of cost = \$1,800.00. The firm will have to pay taxes on this income when the equipment is sold, because the book value at the time of sale (year 6) will be \$0.

| Year | Project Capital Spending | Addition to FCF |
|------|---|---|
| 0 | \$18,000 | -\$18,000 |
| 1 | 0 | 0 |
| 2 | 0 | 0 |
| 3 | 0 | 0 |
| 4 | 0 | 0 |
| 5 | 0 | 0 |
| 6 | $-\$1,800 + 0.15 \times \$1,800 = -\$1,530$ | $+\$1,800 - 0.15 \times \$1,800 = +\$1,530$ |

Addition to Net Working Capital (NWC)

- Additions to Net working capital (NWC)
= (ending NWC – beginning NWC)
- Q: What is 'Net Working Capital'?
 - A: $NWC = \text{Current Assets} - \text{Current Liabilities}$
 - current = in accounting terms 'payable within one year'
- Why do we want to deduct this term?
 - Adjusts for sales and purchases made on credit
 - Cash flows would be misrepresented otherwise
 - Adjust for Inventory purchases
 - Inventory purchases are cash outflows

The Balance Sheet: A Recap

| U.S. CORPORATION 2017 and 2018 Balance Sheets (\$ in millions) | | | | | |
|--|----------------|----------------|--------------------------------------|----------------|----------------|
| Assets | | | Liabilities and Owners' Equity | | |
| | 2017 | 2018 | | 2017 | 2018 |
| Current assets | | | Current liabilities | | |
| Cash | \$ 104 | \$ 160 | Accounts payable | \$ 232 | \$ 266 |
| Accounts receivable | 455 | 688 | Notes payable | <u>196</u> | <u>123</u> |
| Inventory | <u>553</u> | <u>555</u> | Total | <u>\$ 428</u> | <u>\$ 389</u> |
| Total | <u>\$1,112</u> | <u>\$1,403</u> | | | |
| Fixed assets | | | | | |
| Net plant and equipment | <u>\$1,644</u> | <u>\$1,709</u> | Long-term debt | \$ 408 | \$ 454 |
| | | | Owners' equity | | |
| | | | Common stock and paid-in surplus | 600 | 640 |
| | | | Retained earnings | <u>1,320</u> | <u>1,629</u> |
| | | | Total | <u>\$1,920</u> | <u>\$2,269</u> |
| Total assets | <u>\$2,756</u> | <u>\$3,112</u> | Total liabilities and owners' equity | <u>\$2,756</u> | <u>\$3,112</u> |

Net working capital (simple example)

- Consider the following hypothetical data on NWC
- In this case, what is the addition in NWC? Is it a cash inflow or outflow to the firm?

| Account | End of Year | Beginning of Year |
|----------------------------|-------------|-------------------|
| | | |
| <i>Current Assets</i> | | |
| Inventories | 150 | 110 |
| Accounts receivable | 110 | 100 |
| | | |
| <i>Current Liabilities</i> | | |
| Accounts Payable | 180 | 70 |
| NWC | 80 | 140 |

Net working capital (simple example)

- Some of the firm sales are on credit – they are entered in sales, but the cash is not received. Instead, the value of the sale is entered in “accounts receivable” – we need to deduct the value representing the amount of money *accrued* but not received.

How much is it in our case?

- Some of the firm purchases are on credit – they are entered in costs, but the cash is not paid out. Instead, the value of the purchase is entered in “accounts payable” – we need to add back the value representing the amount of money *expensed* but not paid out.

How much?

- When a firm increases its inventories, it spends cash to do it. We need to deduct the value representing the amount spent on the additions to inventories.

How much?

Working Capital “Issues”

- Current Assets contain Cash Reserves. Only cash *needed to support company's operations* should be included when computing working capital. *Excess cash* should be excluded and the value of it should ultimately be added to the final company value. Rule of thumb solutions:
 - Typically, cash needed for operations varies between 0.5% and 2% of net sales
 - Often, analysts exclude Cash Reserves from the definition of Working Capital altogether
- Current Liabilities included in Working Capital should *exclude all interest-bearing current liabilities* (such as short-term debt). Interest-bearing current liabilities are typically included in the definition of company's total capital.

Recovering NWC at the End of the Project

- Because the projects (usually) have finite lives, we will always recover all the investment into NWC at the project's end (we will sell all our inventories, we will receive all the accounts receivable).
 - DON'T LEAVE ANY MONEY ON THE TABLE!!
- An important rule for the additions to NWC computation:
 - The sum of additions to NWC over all years must be equal to 0
 - Because we eventually recover *all* investment into NWC

Step 7: Forecasting Additions to NWC

Net working capital needs are \$3,000 to start. Thereafter, NWC grows by 5% per year.

| Year | Net Working Capital | Increase in NWC | Adjustment To FCF |
|------|---------------------|------------------------|-------------------|
| 0 | 3,000 | 3,000 | -3,000 |
| 1 | 3,150 | 150 | -150 |
| 2 | 3,308 | 158 | -158 |
| 3 | 3,473 | 165 | -165 |
| 4 | 3,647 | 174 | -174 |
| 5 | 3,829 | 182 | -182 |
| 6 | 4,020 | $191 - 4,020 = -3,829$ | +3,829 |

Putting Everything Together

- After we compute OCF, capital spending, and additions to NWC for each year of the project's life, we will be able to compute the project's cash flows in every year as:
- $\text{Project Cash Flow} = \text{OCF} - \text{Capital spending} - \text{Additions to NWC}$
- Note: capital spending and additions to NWC are cash *outflows*!
- Once we estimate project cash flows for every year, we can finally use some of the *investment criteria* (NPV, IRR, payback) to evaluate the project.

Step 8: Forecasting Project FCF

| Year | Operating Cash Flow | -Additions to Working Capital | - Capital Spending | = Total Cash Flow |
|-------------|----------------------------|--------------------------------------|---------------------------|--------------------------|
| 0 | \$0.00 | -\$3,000 | -\$18,000 | - \$21,000 |
| 1 | 3,940 | -150 | 0 | 3,790 |
| 2 | 6,049 | -158 | 0 | 5,891 |
| 3 | 7,482 | -165 | 0 | 7,317 |
| 4 | 9,047 | -174 | 0 | 8,873 |
| 5 | 10,811 | -182 | 0 | 10,629 |
| 6 | 12,413 | +3,829 | +1,530 | 17,772 |

Step 9: Making Decisions

- What is the NPV of this project?
- $\text{NPV} = +\$33,962 - \$21,000 = \$12,962$
- What is the project's IRR?
- $\text{IRR} = 27.12\%$
- Should the project be undertaken?

YES!

Free cash flow calculation (repetition)

| Explanation | Calculation | Formula |
|---|---|--|
| The change in the firm's cash income, excluding interest expense, resulting from the project. | $ \begin{array}{l} \text{Revenue} \\ \hline - \text{Cash operating expenses} \\ \hline \text{Earnings before interest, taxes, depreciation, and amortization} \\ \hline - \text{Depreciation and amortization} \\ \hline \text{Operating profit} \\ \times (1 - \text{Firm's marginal tax rate}) \\ \hline \text{Net operating profit after tax} \end{array} $ | $ \begin{array}{l} \text{Revenue} \\ \hline - \text{Op Ex} \\ \hline \text{EBITDA} \\ \hline - \text{D\&A} \\ \hline \text{EBIT} \\ \times (1 - t) \\ \hline \text{NOPAT} \end{array} $ |
| Adjustments for the impact of depreciation and amortization and investments on FCF. | $ \begin{array}{l} \hline + \text{Depreciation and amortization} \\ \hline \text{Cash flow from operations} \\ \hline - \text{Capital expenditures} \\ \hline - \text{Additions to working capital} \\ \hline \text{Free cash flow} \end{array} $ | $ \begin{array}{l} \hline + \text{D\&A} \\ \hline \text{CF Opns} \\ \hline - \text{Cap Exp} \\ \hline - \text{Add WC} \\ \hline \text{FCF} \end{array} $ |

Sample problem #1

- The Campbell Company is evaluating the proposed acquisition of a new milling machine. The machine's base price is \$108,000 and it would cost another \$12,500 to modify for special use. The machine will be depreciated straight-line to zero over the three-year life of the project. It could be sold after 3 years for \$65,000. The machine would require an increase in NWC of \$5,500. The milling machine would have no effect on revenues, but it is expected to save the firm \$44,000 per year in before-tax operating costs, mainly labor. Campbell's tax rate is 35%. Should this machine be purchased? Assume a discount rate of 12%.

Sample Problem #2

- The Clayton Manufacturing Co. is considering an investment in a new automated inventory system for its warehouse that will provide a cash savings to the firm over the next five years. The firm's CFO anticipates additional EBITDA from cost savings equal to \$200,000 for the first year of operation of the center and over the next four years, the firm estimates that this amount will grow at a rate of 5% per year. The system will require an initial investment of \$800,000 that will be depreciated over a five-year period using straight-line depreciation of \$160,000 per year. Assume a 35% tax rate. What is the NPV of this project if the discount rate is 12%? Assume a zero salvage value at the end of the fifth year.

Sample Problem #3

- The Gap is considering buying cash register software from Microsoft so that it can more effectively deal with its retail sales. The software package costs \$750,000 and will be depreciated down to zero using the straight-line method over its five-year economic life. The marketing department predicts that sales will be \$600,000 per year for the next three years, after which the market will cease to exist. Cost of goods sold and operating expenses are predicted to be 25 percent of sales. After three years the software can be sold for \$40,000. The Gap also needs to add net working capital of \$25,000 immediately. The additional net working capital will be recovered in full at the end of the project life. The corporate tax rate for the Gap is 35 percent and the required rate of return relevant to the project is 17 percent. What is the NPV of the new software?

Concluding Notes on Projecting FCF

- We're interested in **incremental cash flows**: Changes in firm's future cash flows that are direct consequence of taking project
 - How to avoid common mistakes in identifying incr. cash flows?
- 1. **Sunk Costs**: A cash flow already paid or already promised to be paid (e.g., consulting fees).
 - Relevant or irrelevant?
- 2. **Opportunity Costs**: Any cash flow lost or foregone by taking one course of action rather than another. These apply to any assets or resources that have value if sold rather than used.
 - Relevant or irrelevant?
 - Example: You want to build a new factory. First, you need to buy a piece of land for \$1 million. What are your costs associated with buying the land? Suppose that you own the land. What are your costs now?

Concluding Notes on Projecting FCF

3. **Side Effects:** With multi-line firms, projects often affect one another – sometimes helping, sometimes hurting.
 - Relevant or irrelevant?
 - **Erosion:** Revenues gained by a new project at the expense of the firm's other products or services.
4. **Financing Costs:** Interest, principal on debt and dividends
 - These costs will be (for now) **irrelevant** for us. They represent the division of cash flows from the project between the providers of capital – stockholders and bondholders. We want to know how good the project is without respect to who gets the cash flows from it.

Quiz about incremental cash flows

- Starbucks is considering opening another coffee shop. Should they take into account any negative revenue effects of the new coffee shop on existing locations?
- Your company already owns an old rustic cotton mill you bought years ago for \$100,000. Assume the current market value is still \$100,000. You are thinking about converting it into upmarket condominiums. When you evaluate this investment project, should you include the initial purchase price of \$100,000?
- General Milk Company hires a financial consultant to help evaluate whether a line of chocolate milk should be launched. When the consultant turns in the report, General Milk objects to the analysis because the consultant did not include the hefty consulting fee as a cost of the chocolate milk project. Should this fee be included in the analysis?

“Real World” and FCF Projections

- In practice, analysts typically don't perform just one FCF projection. Typically, they perform **robustness analysis** (studying the impact of changes in parameters - growth rates, etc. - on the final NPV):
 - best vs. worst scenario
 - **sensitivity analysis** (impact of changes in a particular parameter on NPV)
- In addition, analysts sometimes consider the additional value of **managerial options**:
 - option to expand
 - option to abandon
 - option to wait, etc.

Calculate the Free Cash Flow of Apple for the most recent fiscal year

- For EBIT, use: Income Statement, 'Operating income'
 - You could also use 'Income before provision for income taxes', but it's not clear if that includes interest expenses
- Taxes: Income Statement, 'Provision for income taxes'
 - If we knew Apple's eff. tax rate, we would multiply that with EBIT
- Depreciation: Cash flow statement, 'Depreciation and Amortization'
 - Sometimes you find this in the Income Statement
- Changes in Net Working Capital (NWC)
 - Balance Sheet: $NWC = \text{Current Assets} - \text{Current Liabilities}$
 - If you want to be precise, exclude cash and debt
- Capital spending
 - Cash flow statement, combine the following:
 - Payments made in connection with business acquisitions
 - Payments for acquisition of PPE

What was Apple's Free Cash Flow over the most recent fiscal year?

- **FCF = operating cash flow – CAPX – additions to NWC**
- **Operating Cash Flow = EBIT – Taxes + Depreciation**