Discounted Cash Flow Valuation

Equity Valuation

- The value of equity is obtained by discounting expected cashflows to equity.

$$\text{Value of Equity} = \sum_{t=1}^{t=n} \frac{\text{CF to Equity}_t}{(1+k_e)^t}$$

  - where,
  - CF to Equity_t = Expected Cashflow to Equity in period t.
  - k_e = Cost of Equity.
- The dividend discount model is a specialized case of equity valuation, and the value of a stock is the present value of expected future dividends.

Discounted Cash Flow Valuation: The Steps

- Estimate the **discount rate** or rates to use in the valuation.
- Estimate the **cash flows** equity investors (CF to Equity).
- Estimate the **future earnings and cash flows** on the asset being valued, generally by estimating an expected growth rate in earnings or revenues.
- Estimate **when** the firm will reach **"stable growth"** and what characteristics (risk & cash flow) it will have when it does.
- Implement the **DCF model**.

The Key Inputs in DCF Valuation

- Discount Rate
  - Cost of Equity, in valuing equity
- Cash Flows
  - Cash Flows to Equity
- Growth (to get future cash flows)
  - Growth in Equity Earnings or Sales

I. Estimating Discount Rates

DCF Valuation

Estimating Inputs: Discount Rates

- **Critical ingredient** in discounted cashflow valuation. Errors in estimating the discount rate can lead to serious errors in valuation.
- At an intuitive level, the discount rate used should be consistent with both the **riskiness** and the **type of cashflow** being discounted.

Capital Asset Pricing Model

Model	*Expected Return*	*Inputs Needed*
CAPM	$E(R) = R_f + \beta (R_m - R_f)$	*Riskfree Rate*
		Beta relative to market portfolio
		Market Risk Premium

II. Estimating Cash Flows

DCF Valuation

Steps in Cash Flow Estimation

- Estimate the current earnings of the firm
  - If looking at cash flows to equity, look at earnings after interest expenses - i.e. net income
- Consider how much the firm invested to create future growth
  - If the investment is not expensed, it will be categorized as capital expenditures. To the extent that depreciation provides a cash flow, it will cover some of these expenditures.
  - Increasing working capital needs are also investments for future growth
- If looking at cash flows to equity, consider the cash flows from net debt issues (debt issued - debt repaid)

Earnings Checks

- When estimating cash flows, we invariably start with accounting earnings. To the extent that we start with accounting earnings in a base year, it is worth considering the following questions:
  - Are basic accounting standards being adhered to in the calculation of the earnings?
  - Are the base year earnings skewed by extraordinary items - profits or losses? (Look at earnings prior to extraordinary items)
  - Are the base year earnings affected by any accounting rule changes made during the period? (Changes in inventory or depreciation methods can have a material effect on earnings)
  - Are the base year earnings abnormally low or high? (If so, it may be necessary to normalize the earnings.)
  - How much of the accounting expenses are operating expenses and how much are really expenses to create future growth?

Dividends and Cash Flows to Equity

- In the strictest sense, the only cash flow that an investor will receive from an equity investment in a publicly traded firm is the dividend that will be paid on the stock.
- Actual dividends, however, are set by the managers of the firm and may be much lower than the potential dividends (that could have been paid out)
  - managers are conservative and try to smooth out dividends
  - managers like to hold on to cash to meet unforeseen future contingencies and investment opportunities
- When actual dividends are less than potential dividends, using a model that focuses only on dividends will under state the true value of the equity in a firm.

Measuring Potential Dividends

- Some analysts assume that the earnings of a firm represent its potential dividends. This cannot be true for several reasons:
  - Earnings are not cash flows, since there are both non-cash revenues and expenses in the earnings calculation
  - Even if earnings were cash flows, a firm that paid its earnings out as dividends would not be investing in new assets and thus could not grow
  - Valuation models, where earnings are discounted back to the present, will over estimate the value of the equity in the firm
- The potential dividends of a firm are the cash flows left over after the firm has made any "investments" it needs to make to create future growth and net debt repayments (debt repayments - new debt issues)

Measuring Investment Expenditures

- Accounting rules categorize expenses into operating and capital expenses. In theory, operating expenses are expenses that create earnings only in the current period, whereas capital expenses are those that will create earnings over future periods as well. Operating expenses are netted against revenues to arrive at operating income.
  - There are anomalies in the way that this principle is applied. Research and development expenses are treated as operating expenses, when they are in fact designed to create products in future periods.
- Capital expenditures, while not shown as operating expenses in the period in which they are made, are depreciated or amortized over their estimated life. This depreciation and amortization expense is a non-cash charge when it does occur.
- The net cash flow from capital expenditures can be then be written as:

Net Capital Expenditures = Capital Expenditures - Depreciation

The Working Capital Effect

- In accounting terms, the working capital is the difference between current assets (inventory, cash and accounts receivable) and current liabilities (accounts payables, short term debt and debt due within the next year)
- A cleaner definition of working capital from a cash flow perspective is the difference between non-cash current assets (inventory and accounts receivable) and non-debt current liabilities (accounts payable)
- Any investment in this measure of working capital ties up cash. Therefore, any increases (decreases) in working capital will reduce (increase) cash flows in that period.
- When forecasting future growth, it is important to forecast the effects of such growth on working capital needs, and build these effects into the cash flows.

Estimating Cash Flows: FCFE

- Cash flows to Equity for a Levered Firm

  Net Income
  + Depreciation & Amortization
  = Cash flows from Operations to Equity Investors
  - Preferred Dividends
  - Capital Expenditures
  - Working Capital Needs (Changes in Non-cash Working Capital)
  - Principal Repayments
  + Proceeds from New Debt Issues
  = Free Cash flow to Equity

III. Estimating Growth

DCF Valuation

Ways of Estimating Growth in Earnings

- To forecast future cash flows - which form the basis of our valuation we must forecast the financial statements of the firm.
  - An alternative approach would be to just focus on earnings - but this ignores many other issues such as capital expenditures, debt levels and working capital needs. These are very important for firms that are not in stable growth periods.
- Look at the past
  - The historical growth in revenues and earnings.
  - Analysts estimate growth in earnings per share for many firms. It is useful to know what their estimates are.
- Look at fundamentals
  - Ultimately, all growth in earnings can be traced to two fundamentals - how much the firm is investing in new projects, and what returns these projects are making for the firm.

Analyst Forecasts of Growth

- While the job of an analyst is to find under and over valued stocks in the sectors that they follow, a significant proportion of an analyst's time (outside of selling) is spent forecasting earnings per share.
  - Most of this time, in turn, is spent forecasting earnings per share in the next earnings report
  - While many analysts forecast expected growth in earnings per share over the next 5 years, the analysis and information (generally) that goes into this estimate is far more limited.
- Analyst forecasts of earnings per share and expected growth are widely disseminated by services such as Zacks and IBES, at least for U.S companies.

How good are analysts at forecasting growth?

The advantage that analysts have over time series models
- tends to decrease with the forecast period (next quarter versus 5 years)
- tends to be greater for larger firms than for smaller firms
- tends to be greater at the industry level than at the company level

- Forecasts of growth (and revisions thereof) tend to be highly correlated across analysts.

Expected Growth in EBIT And Fundamentals

- When looking at growth in operating income, the definitions are
  Reinvestment Rate = (Net Capital Expenditures + Change in WC)/EBIT(1-t)
  Return on Investment = ROC = EBIT(1-t)/(BV of Debt + BV of Equity)
- Reinvestment Rate and Return on Capital
  g_{EBIT} = (Net Capital Expenditures + Change in WC)/EBIT(1-t) * ROC
  = Reinvestment Rate * ROC
- No firm can expect its operating income to grow over time without reinvesting some of the operating income in net capital expenditures and/or working capital.
- The net capital expenditure needs of a firm, for a given growth rate, should be inversely proportional to the quality of its investments.

Estimating Growth in EBIT: Disney

- Reinvestment Rate = 50%
- Return on Capital =18.69%
- Expected Growth in EBIT =.5(18.69%) = 9.35%

IV. Growth Patterns

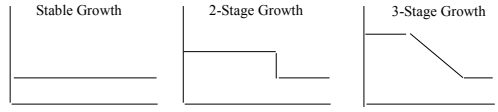
Discounted Cashflow Valuation

Stable Growth and Terminal Value

- When a firm's cash flows grow at a "constant" rate forever, the present value of those cash flows can be written as:
  Value = Expected Cash Flow Next Period / (r - g)
  where,
  r = Discount rate (Cost of Equity or Cost of Capital)
  g = Expected growth rate
- This "constant" growth rate is called a stable growth rate and cannot be higher than the growth rate of the economy in which the firm operates.
- While companies can maintain high growth rates for extended periods, they will all approach "stable growth" at some point in time.
- When they do approach stable growth, the valuation formula above can be used to estimate the "terminal value" of all cash flows beyond.

Growth Patterns

- A key assumption in all discounted cash flow models is the period of high growth, and the pattern of growth during that period. In general, we can make one of three assumptions:
  - there is no high growth, in which case the firm is already in stable growth
  - there will be high growth for a period, at the end of which the growth rate will drop to the stable growth rate (2-stage)
  - there will be high growth for a period, at the end of which the growth rate will decline gradually to a stable growth rate(3-stage)



Determinants of Growth Patterns

- Size of the firm
  - Success usually makes a firm larger. As firms become larger, it becomes much more difficult for them to maintain high growth rates
- Current growth rate
  - While past growth is not always a reliable indicator of future growth, there is a correlation between current growth and future growth. Thus, a firm growing at 30% currently probably has higher growth and a longer expected growth period than one growing 10% a year now.
- Barriers to entry and differential advantages
  - Ultimately, high growth comes from high project returns, which, in turn, comes from barriers to entry and differential advantages.
  - The question of how long growth will last and how high it will be can therefore be framed as a question about what the barriers to entry are, how long they will stay up and how strong they will remain.

Given cash flows to equity, should I discount dividends or FCFE?

- Use the Dividend Discount Model
  - (a) For firms which pay dividends (and repurchase stock) which are close to the Free Cash Flow to Equity (over a extended period)
  - (b)For firms where FCFE are difficult to estimate (Example: Banks and Financial Service companies)
- Use the FCFE Model
  - (a) For firms which pay dividends which are significantly higher or lower than the Free Cash Flow to Equity. (What is significant? ... As a rule of thumb, if dividends are less than 80% of FCFE or dividends are greater than 110% of FCFE over a 5-year period, use the FCFE model)
  - (b) For firms where dividends are not available (Example: Private Companies, IPOs)

Which Growth Pattern Should I use?

- If your firm is
  - large and already growing at a rate close to or lower than the overall growth rate of the economy, *or*
  - constrained by regulation from growing at rate faster than the economy
  - has the characteristics of a stable firm (average risk & reinvestment rates)

  Use a Stable Growth Model
- If your firm
  - is large & growing at a moderate rate (Overall growth rate + 10%) *or*
  - has a single product & barriers to entry with a finite life (e.g. patents)

  Use a 2-Stage Growth Model
- If your firm
  - is small and growing at a very high rate (> Overall growth rate + 10%) or
  - has significant barriers to entry into the business
  - has firm characteristics that are very different from the norm

  Use a 3-Stage Model