Discounted Cashflow Valuation: Basis for Approach

where \( CF_t \) is the cash flow in period \( t \), \( r \) is the discount rate appropriate given the riskiness of the cash flow and \( t \) is the life of the asset.

Proposition 1: For an asset to have value, the expected cash flows have to be positive some time over the life of the asset.

Proposition 2: Assets that generate cash flows early in their life will be worth more than assets that generate cash flows later; the latter may, however, have greater growth and higher cash flows to compensate.

\[
\text{Value} = \sum_{t=1}^{n} \frac{CF_t}{(1 + r)^t}
\]

where \( CF_t \) is the cash flow in period \( t \), \( r \) is the discount rate appropriate for the investor.
Equity Valuation versus Firm Valuation

Value just the equity stake in the business

Value the entire business, which includes, besides equity, the other claimholders in the firm
value of equity is obtained by discounting expected cashflows to equity, i.e., the residual cashflows after meeting all expenses, tax obligations and interest and principal payments, at the cost of equity, i.e., the rate of return required by equity investors in the firm. The dividend discount model is a specialized case of equity valuation, and the value of equity is the present value of expected future dividends.

\[
K_e = \text{Cost of Equity}
\]

\[
\text{CF to Equity}_t = \text{Expected Cashflow to Equity in period } t
\]

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

The value of equity is obtained by discounting expected cashflows to equity, i.e., the residual cashflows after meeting all expenses, tax obligations and interest and principal payments, at the cost of equity, i.e., the rate of return required by equity investors in the firm.
II. Firm Valuation

The value of the firm is obtained by discounting expected cashflows to the firm, i.e., the residual cashflows after meeting all operating expenses and taxes, but prior to debt payments, at the weighted average cost of capital, which is the cost of the different components of financing used by the firm, weighted by their market value proportions.

\[
\text{Value of Firm} = \sum_{t=1}^{n} \frac{\text{CF to Firm}_t}{(1 + \text{WACC})^t}
\]

where,

\[
\text{WACC} = \text{Weighted Average Cost of Capital}
\]

\[
\text{CF to Firm}_t = \text{Expected Cashflow to Firm in period } t
\]

The value of the firm is obtained by discounting expected cashflows to the firm, i.e., the residual cashflows after meeting all operating expenses and taxes, but prior to debt payments, at the weighted average cost of capital, which is the cost of the different components of financing used by the firm, weighted by their market value proportions.
Firm Value and Equity Value

To get from firm value to equity value, which of the following would you need to do?

- Subtract out the value of all debt
  - Greater than the value you would have got in an equity valuation
  - Equal to the value you would have got in an equity valuation
  - Lesser than the value you would have got in an equity valuation

Doing so, will give you a value for the equity which is

- Greater than the value you would have got in an equity valuation
- Equal to the value you would have got in an equity valuation
- Lesser than the value you would have got in an equity valuation

To get from firm value to equity value, which of the following would you need to do?

- Subtract out the value of all non-equity claims included in the cost of capital calculation
- Subtract out the value of all non-equity claims in the firm, that are
- Subtracted out the value of all debt
- Subtracted out the value of all non-equity claims in the firm
- Subtracted out the value of all non-equity claims in the firm, that are
- You need to do?
Assume that you are analyzing a company with the following cashflows for the next five years.

<table>
<thead>
<tr>
<th>Year</th>
<th>CF to Equity</th>
<th>Int Exp</th>
<th>CF to Firm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>40</td>
<td>90</td>
</tr>
<tr>
<td>2</td>
<td>60</td>
<td>40</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>68</td>
<td>40</td>
<td>108</td>
</tr>
<tr>
<td>4</td>
<td>76.2</td>
<td>40</td>
<td>116.2</td>
</tr>
<tr>
<td>5</td>
<td>83.49</td>
<td>40</td>
<td>123.49</td>
</tr>
</tbody>
</table>

Terminal Value: $1,603.0

Assume also that the cost of equity is 13.625% and the firm can borrow long term at 10%. (The tax rate for the firm is 50%.)

The current market value of equity is $1,073 and the value of debt outstanding is $800.

The next five years:

Assume that you are analyzing a company with the following cashflows for Cash Flows and Discount Rates.
Equity versus Firm Valuation

Method 1: Discount CF to Equity at Cost of Equity to get value of equity

\[ \text{Cost of Equity} = 13.625\% \]
\[ \text{PV of Equity} = \frac{50}{1.13625} + \frac{60}{1.13625^2} + \frac{68}{1.13625^3} + \frac{76.2}{1.13625^4} + \frac{83.49+1603}{1.13625^5} = \$1073 \]

Method 2: Discount CF to Firm at Cost of Capital to get value of firm

\[ \text{WACC} = 13.625\% \times \left( \frac{1073}{1873} \right) + 5\% \times \left( \frac{800}{1873} \right) = 9.94\% \]
\[ \text{PV of Firm} = \frac{90}{1.0994} + \frac{100}{1.0994^2} + \frac{108}{1.0994^3} + \frac{116.2}{1.0994^4} + \frac{123.49+2363}{1.0994^5} = \$1873 \]

\[ \text{PV of Equity} = \text{PV of Firm} - \text{Market Value of Debt} = \$1873 - \$800 = \$1073 \]

\[ \text{Method 2: Discount CF to Firm at Cost of Capital to get value of firm} \]

\[ \text{PV of Equity} = \frac{76.2}{1.13625^4} + \frac{83.49+1603}{1.13625^5} = \$1073 \]

\[ \text{Cost of Equity} = 13.625\% \]

\[ \text{Method 1: Discount CF to Equity at Cost of Equity to get value of equity} \]

\[ \text{Cost of Equity} = 13.625\% \]
First Principle of Valuation

Never mix and match cash flows and discount rates.

The key error to avoid is mismatching cashflows and discount rates.

Since discounting cashflows to equity at the weighted average cost of capital will lead to an upwardly biased estimate of the value of equity, while discounting cashflows to the firm at the cost of equity will yield a downward biased estimate of the value of the firm.

Never mix and match cash flows and discount rates.
The Effects of Mismatching Cash Flows and Discount Rates

Error 1: Discount CF to Equity at Cost of Capital to get equity value

\[
\text{Value of Equity} = \frac{50}{1.0994} + \frac{60}{1.0994^2} + \frac{68}{1.0994^3} + \frac{76.2}{1.0994^4} + \frac{83.49 + 1603}{1.0994^5} = 1248
\]

Value of Equity is overstated by $175.

Error 2: Discount CF to Firm at Cost of Equity to get firm value

\[
\begin{align*}
\text{PV of Firm} &= \frac{90}{1.13625} + \frac{100}{1.13625^2} + \frac{108}{1.13625^3} + \frac{116.2}{1.13625^4} + \frac{123.49 + 2363}{1.13625^5} \\
&= 1613
\end{align*}
\]

\[
\text{PV of Equity} = 1612.86 - 800 = 813
\]

Value of Equity is understated by $260.

Error 3: Discount CF to Firm at Cost of Equity, forget to subtract out debt, and get too high a value for equity

\[
\begin{align*}
\text{PV of Firm} &= 90/1.13625 + 100/1.13625^2 + 108/1.13625^3 + 116.2/1.13625^4 + 123.49 + 2363/1.13625^5 \\
&= 1613
\end{align*}
\]

\[
\text{PV of Equity} = 1613 - 800 = 813
\]

Value of Equity is overstated by $540.
Discounted Cash Flow Valuation: The Steps

Choose the right DCF model for this asset and value it.

- Characteristics (risk & cash flow) it will have when it does.
- Estimate when the firm will reach "stable growth" and what

valued, generally by estimating an expected growth rate in earnings.

- Estimate the current earnings and cash flows on the firm being
equity investors (CF to Equity) or to all claimholders (CF to Firm)

- Estimate the current earnings and cash flows on the asset, to either

- Discount rate can vary across time.

- Whether the cash flows are nominal or real
  Discount rate can be in nominal terms or real terms, depending upon
  cost of capital (if valuing the Firm)
  Discount rate can be either a cost of equity (if doing equity valuation) or a

- Estimate the discount rate or rates to use in the valuation
Aswath Damodaran

EQUITY VALUATION WITH DIVIDENDS

- Risk of Equity
- Expected Growth
- Return on Equity
- Beta
- Type of Business

Firm is in stable growth:
- Grows at constant rate
- Terminal Value = Dividend = Net Income * Payout Ratio

Terminal Value = Dividend = Net Income * Payout Ratio

Riskfree Rate:
- No default risk
- No reinvestment risk
- No default risk
- In same currency and same terms (real or nominal as cash flows)

Discount at Cost of Equity:
- Dividend 1
- Dividend 2
- Dividend 3
- Dividend 4
- Dividend 5

Cost of Equity

Expected Growth

- Base Equity
- Premium
- Risk
- Investment risk
- Premium for average
- Risk Premium
Expected Growth = Retention Ratio * Return on Equity

Terminal Value = FCFE_{n+1} / (ke - gn)

Cost of Equity = Risk Free Rate + Beta * Market Risk Premium

Discount at Cost of Equity = Value of Equity

Terminal Value = FCFE_{n+1} / (ke - gn)

Expected Growth = Projected Growth - Realization Premium - Financial Leverage

Cashflow to Equity = Net Income - (Cap Ex - Dep) - (1 - DR) - Net Income

Firm is in stable growth: Grows at constant rate forever

Financing Weights = DR

Risk Free Rate:
- No default risk
- No reinvestment risk
- In same currency and
- Nominal as cash flows in some terms (real or nominal)

Beta
- Measures market risk

Risk Premium:
- Premium for average risk investment

Type of Business
- Operating Leverage
- Financial Leverage

Risk Premium
- Country Risk
- Base Equity
- Premium

Risk Investment Risk
- Premium for average
risk

Equity Valuation with FCFE
VALUING A FIRM

Aswath Damodaran

Expected Growth
Reinvestment Rate
Return on Capital

Discount at WACC = Cost of Equity (Equity/(Debt + Equity)) + Cost of Debt (Debt/(Debt + Equity))

Value of Operating Assets + Cash & Non-op Assets = Value of Firm - Value of Debt

Risk Premium:
- Measures market risk

Risk Free Rate:
- No default risk
- No reinvestment risk
- No real risk

Beta:
- Premium for average risk investment

Type of Business
Operating Leverage
Financial Leverage
Country Risk

Terminal Value = FCFF_{n+1}/(r-g_n)

Firm is in stable growth:
Grows at constant rate forever

Cost of Equity + Cost of Debt

Weights
Based on Market Value

Expected Growth

Cashflow to Firm
EBIT (1-t) - (Cap Ex - Dep) - Change in WC = FCFF

Expected Growth - Return on Capital - Reinvestment Rate

Firm is in stable growth:
Grows at constant rate

Cost of Equity

Expected Growth

Return on Capital

Reinvestment Rate

Terminal Value = FCFF_{n+1}/(r-g_n)

Firm is in stable growth:
Grows at constant rate

Cost of Equity

Expected Growth

Return on Capital

Reinvestment Rate

Terminal Value = FCFF_{n+1}/(r-g_n)

Firm is in stable growth:
Grows at constant rate
Discounted Cash Flow Valuation: The Inputs
I. Estimating Discount Rates
Estimating Inputs: Discount Rates

**Critical Ingredient:** In discounted cashflow valuation, errors in estimating the discount rate or mismatching cashflows and discount rates can lead to serious errors in valuation.

- **Nominal versus Real:** If the cash flows being discounted are nominal, the discount rate should also be the currency in which the discount rate is estimated.
- **Currency:** The currency in which the cash flows are estimated should also be the currency in which the discount rate is estimated.
- **Equity versus Firm:** If the cash flows being discounted are cash flows to equity, the appropriate discount rate is a cost of equity. If the cash flows are cash flows to the firm, the appropriate discount rate is the cost of capital.
- **Nominal versus Real:** If the cash flows to the firm are real, the appropriate discount rate is the cost of capital.
- **Nominal versus Real:** If the cash flows being discounted are nominal, the discount rate should reflect expected inflation.

At an intuitive level, the discount rate used should be consistent with both the riskiness and the type of cashflow being discounted.
Cost of Equity

The cost of equity should be higher for riskier investments and lower for safer investments. Markets or non-diversifiable risk (i.e., perceived in an investment is risk that cannot be diversified away) and that the only risk that he or she investor is well diversified, and that the only risk that he or she perceives in an investment is risk that should be rewarded (and thus built into the discount rate) in valuation should be the risk perceived by the marginal investor. Most risk and return models in finance also assume that the marginal investor is well diversified, and that the only risk that he or she perceives in an investment is risk that cannot be diversified away (i.e., market or non-diversifiable risk). While risk is usually defined in terms of the variance of actual returns, the cost of equity should be higher for riskier investments and lower for safer investments.
<table>
<thead>
<tr>
<th>Model</th>
<th>Expected Return</th>
<th>Inputs Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAPM</td>
<td>$E(R) = R_f + \beta(R_m - R_f)$</td>
<td>Riskfree Rate, Beta relative to market portfolio</td>
</tr>
<tr>
<td>APM</td>
<td>$E(R) = R_f + \sum_{j=1}^{N} \beta_j (R_j - R_f)$</td>
<td>Riskfree Rate, Beta relative to each factor, Factor risk premiums</td>
</tr>
<tr>
<td>Multi</td>
<td>$E(R) = R_f + \sum_{j=1}^{N} \beta_j (R_j - R_f)$</td>
<td>Riskfree Rate, Beta relative to macro factors, Macro economic risk premiums</td>
</tr>
<tr>
<td>Proxy</td>
<td>$E(R) = a + \sum_{j=1}^{N} b_j Y_j$</td>
<td>Proxies, Regression coefficients</td>
</tr>
</tbody>
</table>

The Cost of Equity: Competing Models
Aswath Damodaran

The CAPM: Cost of Equity

Consider the standard approach to estimating cost of equity:

\[ \text{Cost of Equity} = R_f + \beta \times (E(R_m) - R_f) \]

where,

- \( R_f \) is the risk-free rate
- \( \beta \) is the beta of the stock
- \( E(R_m) \) is the expected return on the market (or diversified portfolio)

In practice,

- Short-term government securities are used as risk-free rates
- Historical risk premiums are used for the risk premium
- Betas are estimated by regressing stock returns against market returns

\[ E(R_m) = \text{Expected Return on the Market Index (Diversified Portfolio)} \]

\[ R_f = \text{Risk-free Rate} \]

Consider the standard approach to estimating cost of equity:
Short term Governments are not riskfree

**The government might not be viewed as riskfree:**
- Brazil, Indonesia

**In emerging markets, there are two problems:**
- Long term (also long term)
- To the duration of the riskfree rate

A simpler approach is to match the duration of the analysis generally and
how is expected to occur and will vary across time.

Thus, the riskfree rates in valuation will depend upon when the cash
flows are expected to occur.

Thus, the riskfree rates in valuation will depend upon when the cash
flows are expected to occur.

**For an investment to be riskfree, then, it has to have:**
- No reinvestment risk
- No default risk

Therefore, there is no variance around the expected return.

On a riskfree asset, the actual return is equal to the expected return.
Estimating a Riskfree Rate

Do the analysis in another more stable currency, say US dollars.

- In which the valuation is being done, set equal, approximately, to the long term real growth rate of the economy.
- From an inflation-indexed government bond, if one exists.
- Riskfree rate, which can be obtained in one of two ways:

  Approach 1: Subtract default spread from local government bond (rather than nominal terms) using a real
  Government bond rate in local currency - Default spread for
  Government bond rate in local currency terms - Default spread for
  Approach 2: Use forward rates and the riskless rate in an index currency.

Do the analysis in real terms (rather than nominal terms) using a real

Do the analysis in another more stable currency, say Euros (or dollars) to estimate the riskless rate in the local currency.

Approach 1: Subtract default spread from local government bond rate:

Estimate a range for the riskfree rate in local terms:
You are valuing Ambev, a Brazilian company, in U.S. dollars and are attempting to estimate a risk-free rate to use in the analysis. The interest rate that you should use is

- The interest rate on a U.S. Treasury bond
- The interest rate on a U.S. dollar denominated Brazilian Brady bond (which is partially backed by the U.S. Government)
Everyone uses historical premiums, but...  

<table>
<thead>
<tr>
<th>Historical Period</th>
<th>T.Bills Arithmetic Average</th>
<th>T.Bonds Arithmetic Average</th>
<th>T.Bills Geometric Average</th>
<th>T.Bonds Geometric Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1928-2002</td>
<td>2.76%</td>
<td>4.93%</td>
<td>1.61%</td>
<td>3.36%</td>
</tr>
<tr>
<td>1962-2002</td>
<td>3.66%</td>
<td>5.37%</td>
<td>2.52%</td>
<td>4.36%</td>
</tr>
<tr>
<td>1928-2002</td>
<td>4.53%</td>
<td>6.62%</td>
<td>3.53%</td>
<td>5.53%</td>
</tr>
</tbody>
</table>

Practitioners never seem to agree on the premium; it is sensitive to

- Whether you use geometric or arithmetic averages.
- Whether you use T.bills or T.Bond rates.
- How far back you go in history.

The historical premium is the premium that stocks have historically earned over riskless securities.

For instance, looking at the US:
If you choose to use historical premiums...

About risk premiums over long periods.

Use the geometric risk premium. It is closer to how investors think.

Term bond rates, the premium should be the one over T-bonds.

Be consistent in your use of the risk-free rate. Since we argued for long

Standard Error in Premium = \frac{25\%}{\sqrt{25}} = \frac{25\%}{5} = 5\% 

Years is roughly:

25\%, the standard error in a historical premium estimated over 25

GIVEN the annual standard deviation in stock prices is about

Go back as far as you can. A risk premium comes with a standard

00
Historical risk premiums are almost impossible to estimate with any precision in markets with limited history - this is true not just of emerging markets but also of many Western European markets. For such markets, we can estimate a modified historical premium beginning with the U.S. premium as the base.

Combined approach: In this approach, the country risk premium is based upon the default spread of the bond issued by the country. For such markets, we can estimate a modified historical premium beginning with the U.S. premium as the base.

\[ \text{Country risk premium} = \text{Risk Premium}_{\text{US}}^* \left( \frac{\sigma_{\text{Country Equity}}}{\sigma_{\text{US Equity}}} \right) \]

Country Bond approach: In this approach, the country risk premium is based upon the volatility of the market in question relative to U.S. equity.

\[ \text{Country risk premium} = \text{Risk Premium}_{\text{US}}^* \sigma_{\text{Country Equity}} / \sigma_{\text{US Equity}} \]

Relative Equity Market approach: The country risk premium is based upon the default spread of the bond issued by the country.

\[ \text{Country risk premium} = \text{Risk Premium}_{\text{US}}^* + \text{Country bond default spread} \]

Relative Equity Market approach: In this approach, the country risk premium is based upon the volatility of the market in question relative to U.S. equity.

Relative Equity Market approach: The country risk premium is based upon the volatility of the market in question relative to U.S. equity.

\[ \text{Country risk premium} = \text{Risk Premium}_{\text{US}}^* \left( \frac{\sigma_{\text{Country Equity}}}{\sigma_{\text{US Equity}}} \right) \]

\[ \text{Country risk premium} = \text{Risk Premium}_{\text{US}}^* \sigma_{\text{Country Equity}} / \sigma_{\text{US Equity}} \]
<table>
<thead>
<tr>
<th>Country</th>
<th>Rating</th>
<th>Typical Spread</th>
<th>Market Spread</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>B1</td>
<td>450</td>
<td>563</td>
</tr>
<tr>
<td>Bolivia</td>
<td>B1</td>
<td>551</td>
<td>601</td>
</tr>
<tr>
<td>Brazil</td>
<td>B1</td>
<td>450</td>
<td>537</td>
</tr>
<tr>
<td>Colombia</td>
<td>Baa2</td>
<td>300</td>
<td>381</td>
</tr>
<tr>
<td>Ecuador</td>
<td>Ba3</td>
<td>145</td>
<td>77</td>
</tr>
<tr>
<td>Guatemala</td>
<td>Ba3</td>
<td>145</td>
<td>41</td>
</tr>
<tr>
<td>Honduras</td>
<td>Ba3</td>
<td>400</td>
<td>361</td>
</tr>
<tr>
<td>Mexico</td>
<td>Baa3</td>
<td>400</td>
<td>593</td>
</tr>
<tr>
<td>Peru</td>
<td>B1</td>
<td>450</td>
<td>563</td>
</tr>
<tr>
<td>Paraguay</td>
<td>B2</td>
<td>550</td>
<td>581</td>
</tr>
<tr>
<td>Peru</td>
<td>B2</td>
<td>550</td>
<td>601</td>
</tr>
<tr>
<td>Venezuela</td>
<td>B3</td>
<td>145</td>
<td>77</td>
</tr>
<tr>
<td>Uruguay</td>
<td>Baa3</td>
<td>145</td>
<td>193</td>
</tr>
</tbody>
</table>
Step 2: From Bond Default Spreads to Equity

Ratings agencies make mistakes. They are often late in recognizing and building in risk.

One way to adjust the country spread upwards is to use information from the US market. In the US, the equity risk premium has been roughly twice the default spread on junk bonds.

Another is to multiply the bond spread by the relative volatility of stock and bond prices in that market. For example,

- Adjusted Equity Spread = 5.37% (32.6/17.1) = 10.24%
- Standard Deviation in Bovespa (Equity) = 32.6%
- Standard Deviation in Brazil C-Bond = 17.1%

Another way to adjust the country spread upwards is to use information from spreads to be higher than debt spreads.

Country ratings measure default risk, while default risk premiums and equity risk premiums are highly correlated, one would expect equity spreads to be higher than debt spreads.

Ratings agencies make mistakes. They are often late in recognizing and building in risk.
Another Example: Assessing Country Risk

Using Currency Ratings: Western Europe

<table>
<thead>
<tr>
<th>Country</th>
<th>Rating</th>
<th>Typical Spread</th>
<th>Actual Spread</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>Aaa</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Belgium</td>
<td>Aaa</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Denmark</td>
<td>Aaa</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Finland</td>
<td>Aaa</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>France</td>
<td>Aaa</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Germany</td>
<td>Aaa</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Greece</td>
<td>Aa3</td>
<td>60</td>
<td>30</td>
</tr>
<tr>
<td>Iceland</td>
<td>Aa2</td>
<td>55</td>
<td>35</td>
</tr>
<tr>
<td>Ireland</td>
<td>Aa3</td>
<td>55</td>
<td>35</td>
</tr>
<tr>
<td>Italy</td>
<td>Aa3</td>
<td>55</td>
<td>35</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Aa2</td>
<td>55</td>
<td>35</td>
</tr>
<tr>
<td>Norway</td>
<td>Aaa</td>
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<td>0</td>
</tr>
<tr>
<td>Portugal</td>
<td>Aaa</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Spain</td>
<td>Aa1</td>
<td>60</td>
<td>30</td>
</tr>
<tr>
<td>Sweden</td>
<td>Aa1</td>
<td>60</td>
<td>30</td>
</tr>
<tr>
<td>Switzerland</td>
<td>Aaa</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Switzerland</td>
<td>Aaa</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Country Risk Premium

Ratings agencies make mistakes. They are often late in recognizing and building in risk.

- Adjusted Equity Spread = 0.95% (40.5%/26.1%) = 1.59%
- Standard Deviation in Greek CDS = 26.1%
- Standard Deviation in Greek ASE (Equity) = 40.5%

Another is to multiply the bond spread by the relative volatility of stock and bond prices in that market. For example,

- Adjusted Equity Spread = 0.95% (40.5%/26.1%) = 1.59%
- Standard Deviation in Greek CDS = 26.1%
- Standard Deviation in Greek ASE (Equity) = 40.5%

One way to adjust the country spread upwards is to use information from the default spread on junk bonds. While default risk, while default risk

Country Risk Premium

Greek Country Risk Premium
From Country Spreads to Corporate Risk

Approach 1: Assume that every company in the country is equally exposed to country risk (perhaps based upon the proportion of their revenues come from non-domestic sales). In this case,

\[ E(\text{Return}) = \text{Riskfree Rate} + \beta (\text{US premium} + \gamma \text{Country Spread}) \]

Approach 2: Assume that a company's exposure to country risk is similar to its exposure to other market risk. In this case,

\[ E(\text{Return}) = \text{Riskfree Rate} + \text{Beta (US premium + Country Spread)} \]

Approach 3: Treat country risk as a separate risk factor and allow firms to have different exposures to country risk (perhaps based upon the proportion of their revenues come from non-domestic sales). In this case,

\[ E(\text{Return}) = \text{Riskfree Rate} + \beta (\text{US premium}) + \lambda \text{Country Spread} \]
Aswath Damodaran

Estimating Company Exposure to Country Risk

Firms might be able to actively manage their country risk exposures where it is located. A company’s risk exposure is determined by where it does business and not by where it is located.

There are two implications:

- A company’s risk exposure is determined by where it does business and not by where it is located.
- Firms might be able to actively manage their country risk exposures.

For instance, if a firm gets 35% of its revenues domestically, while the average firm gets 70% of its revenues domestically, the following simplistic solution would be to do the following:

\[ \lambda = \frac{35\%}{70\%} = 0.5 \]

\[ \gamma = \frac{\% \text{ of revenues domestically}_{\text{firm}}}{\% \text{ of revenues domestically}_{\text{avg firm}}} \]

Firms in that market get 70% of its revenues domestically, while the average firm gets 35% of its revenues domestically. The factor \( \gamma \) measures the relative exposure of a firm to country risk. One generates all its business within Brazil, United States should be less exposed to country risk in Brazil than one that

For instance, a Brazilian firm that generates the bulk of its revenues in the United States should be less exposed to different degrees to country risk.
Estimating E(\text{Return}) for Embraer

Emb�er is less exposed to country risk than the typical Brazilian firm since much of its business is overseas.

\[ E(\text{Return}) = 4.5\% + 0.88(5.51\% + 10.24\%) = 14.47\% \]

\[ E(\text{Return}) = 4.5\% + 0.88(5.51\% + 10.24\%) = 18.36\% \]

\[ E(\text{Return}) = 4.5\% + 0.88(5.51\% + 10.24\%) + 0.50(10.24\%) = 19.36\% \]

- Approach 1: Assume every company is equally exposed to country risk. In this case, the real risk-free rate is 4.5%.

- Approach 2: Assume that a company’s exposure to country risk is similar to its exposure to other market risk.

- Approach 3: Treat country risk as a separate risk factor and allow firms to have different exposures to country risk. (perhaps based upon the proportion of their revenues come from non-domestic sales.)

Assume that the beta for Embraer is 0.88, and that the risk-free rate used is 4.5% (\text{Real Risk-Free Rate}).
Aswath Damodaran

Implied Equity Premiums

If we use a basic discounted cash flow model, we can estimate the implied risk premium from the current level of stock prices.

For instance, if stock prices are determined by a variation of the simple Gordon Growth Model:

\[
\text{Value} = \frac{\text{Expected Dividends} \times (1 + \text{High Growth Period})}{\text{Expected Growth Rate} - \text{Required Returns on Stocks}}
\]

Subtracting out the risk-free rate will yield the implied premium.

This model can be extended to allow for two stages of growth - an initial period where the entire market will have earnings growth greater than that of the economy, and then a stable growth period.

Expected growth rate will yield a "implied" expected return on stocks. Plugging in the current level of the index, the dividends on the index and dividends can be extended to include expected stock buybacks and a high growth period.

\[
\text{Value} = \frac{\text{Expected Dividends next year}}{(\text{Required Returns on Stocks} - \text{Expected Growth Rate}) \times (1 + \text{High Growth Period})}
\]

Implied risk premium from the current level of stock prices.

If we use a basic discounted cash flow model, we can estimate the implied equity premium.
Jan 1, 2003

Estimating Implied Premium for U.S. Market:

\[
\text{Implied risk premium} = 7.91\% - 3.81\% = 4.10\%
\]

Solving for \( r \) = 7.91\% (Only way to do this is trial and error)

\[
879.82 = 31.25/(1+r) + 33.75/(1+r)^2 + 36.45/(1+r)^3 + 39.37/(1+r)^4 + (42.52 + (44.14/(1.0381)))/(1+r)^5
\]

Expected dividends + stock buybacks in year 6 = 42.52 (1.0381) = 44.14

Expected dividends + stock buybacks = 3.29% of index (in latest year)

Dividends + stock buybacks = 3.29% of index (in latest year)

Expected growth rate after year 5 = 3.81%

Estimated for S&P 500 earnings

Expected growth rate in earnings (next 5 years) = 8% (Consensus)

Treasury bond rate = 3.81%

Level of the index = 879.82
Implied Equity premium = 11.16% - 4.5% = 6.66%

Expected return on Equity = 11.16%

Solving for the expected return:

- After year 5 = 4.5% (real growth rate in long term)
- Next 5 years = 13.5% (Used expected real growth rate in Earnings)
- Expected Growth
- Riskfree Rate = 4.5% (real riskfree rate)

Other Parameters

Dividends on the Index = 4.40% of (Used weighted yield)

Level of the Index = 16417

2001

Implied Premium for Brazilian Market: March 1,
Embraer's stock price (at the time of the valuation) = 15.25 BR

Embraer's value per share (using implied equity premium of 6.66%) = 20.02 BR

Embraer's value per share (using historical premium of 6.66%) + adjustment = 11.22 BR

The Effect of Using Implied Equity Premiums on Value
The standard procedure for estimating betas is to regress stock returns ($R_j$) against market returns ($R_m$) -

$$R_j = a + b R_m$$

where $a$ is the intercept and $b$ is the slope of the regression.

This beta has three problems:

1. It has high standard error.
2. It reflects the firm's business mix over the period of the regression, not the current mix.
3. It reflects the firm's average financial leverage over the period rather than the current leverage.

The slope of the regression corresponds to the beta of the stock, and measures the riskiness of the stock.

The standard procedure for estimating betas is to regress stock returns against market returns ($R_m$) -

$$R_j = a + b R_m$$

where $a$ is the intercept and $b$ is the slope of the regression.
Beta Estimation: The Noise Problem
Beta Estimation: The Index Effect
Determinants of Betas

**Product or Service:** The beta value for a firm depends upon the sensitivity of the demand for its products and services and of its costs to macroeconomic factors that affect the overall market.

**Operating Leverage:** The greater the proportion of fixed costs in the cost structure of a business, the higher the beta will be for that business.

**Financial Leverage:** The more debt a firm takes on, the higher the beta will be of the equity in that business.

**R&D Intensity:** Firms that spend more on R&D will have higher betas than firms that spend less.

**Cyclical Companies:** Cyclically sensitive firms will have higher betas than non-cyclical firms.

**Product or Service:** Firms which sell more discretionary products will have higher betas than firms that sell less discretionary products.

**Operating Leverage:** The greater the proportion of fixed costs in the cost structure of a business, the higher the beta will be for that business.

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Equity Betas and Leverage

The beta of equity alone can be written as a function of the unlevered betas and the debt-equity ratio:

$\beta_L^n = \beta_u^n (1 + ((1-t)D/E)) \cdot \beta^\text{dep}(1-1(D/E))$  

While this beta is estimated on the assumption that debt carries no market risk (and has a beta of zero), you can have a modified version:

$\beta_L^n = \beta_u^n (1 + ((1-t)D/E)) \cdot \beta^\text{dep}(1-1(D/E)) - \beta^\text{debt}(1-t) \cdot (D/E)$

where:

- $\beta_L^n$ = Levered Equity Beta
- $\beta_u^n$ = Unlevered Equity Beta
- $D$ = Market Value of Debt
- $E$ = Market Value of Equity
- $1$ = Corporate Marginal Tax Rate
- $\beta^\text{dep}$ = Market Betas and Level of Equity
- $\beta^\text{debt}$ = Market Betas and Level of Debt

The beta of equity alone can be written as a function of the unlevered beta and the debt-equity ratio.
Solutions to the Regression Beta Problem

- Use an alternative measure of market risk that does not need a regression.
  - Estimating the financial leverage of the firm.
  - Understanding the business mix of the firm.
- Estimate the beta for the firm from the bottom up without employing the regression technique. This will require:
  - Accounting earnings or revenues, which are less noisy than market prices.
  - The standard deviation in stock prices instead of a regression against an index.
- Estimate the beta for the firm using:
  - Fundamentals of the company.
  - Adjusting the regression beta estimate by bringing in information about the change in the index used to estimate the beta.
- Modify the regression beta by:
The bottom-up beta can be estimated by:

1. Taking a weighted (by sales or operating income) average of the unlevered betas of the different businesses a firm is in.

   (The unlevered beta of a business can be estimated by looking at other firms in the same business)

2. Levering up the firm's current debt/equity ratio

   The bottom-up beta will give you a better estimate of the true beta when:

   - It has lower standard error (\( \text{SE}_{\text{average}} = \frac{\text{SE}_{\text{firm}}}{\sqrt{n}} \), where \( n \) is the number of firms)
   - It reflects the firm's current business mix and financial leverage
   - It can be estimated for divisions and private firms.

\[
\beta_{\text{levered}} = \beta_{\text{unlevered}} + \text{(Current Debt/Equity Ratio)} \times (1 - \text{tax rate}) \times \beta_{\text{unlevered}}
\]

(\( \beta_{\text{levered}} \))

The unlevered beta of a business can be estimated by looking at other firms in the same business:

\[
\beta_{\text{unlevered}} = \frac{\sum_{j=1}^{n} \left( \frac{\text{Operating Income}}{\text{Operating Income}_j} \right) \beta_j}{\sum_{j=1}^{n} \left( \frac{\text{Operating Income}}{\text{Operating Income}_j} \right)}
\]

The bottom-up beta can be estimated by taking a weighted (by sales or operating income) average of the unlevered betas of the different businesses a firm is in.
Boeing in 1998

<table>
<thead>
<tr>
<th>Segment</th>
<th>Estimated Value</th>
<th>Unlevered Beta</th>
<th>Segment Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial Aircraft</td>
<td>$30,160.48</td>
<td>0.917</td>
<td>0.39%</td>
</tr>
<tr>
<td>Defense</td>
<td>$12,687.50</td>
<td>0.802</td>
<td>0.61%</td>
</tr>
</tbody>
</table>

Estimated Value = Revenues of division * Enterprise Value/Sales

Unlevered Beta = 0.91 (0.7039) + 0.80 (0.2961) = 0.88

Levered Beta Calculation

\[
\text{Levered Beta for Boeing} = 0.88 (1 + (1 - .35) (.2438)) = 1.02
\]

Market Debt/Equity Ratio = 24.38%

Market Value of Debt = $8.143

Market Value of Equity = $ 33.401

Levered Beta = 0.88 (1 + (1 - .35) (.2438)) = 1.02
Siderar is an Argentine steel company.

<table>
<thead>
<tr>
<th>Steel Beta</th>
<th>Beta</th>
<th>Unlevered D/E Ratio</th>
<th>Levered D/E Ratio</th>
<th>Proportion of operating income from steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.68</td>
<td>0.71</td>
<td>5.97</td>
<td>0.71</td>
<td>100%</td>
</tr>
</tbody>
</table>

Leveled Beta for Siderar = 0.71
Can an unlevered beta estimated using U.S. steel companies be used to estimate the beta for an Argentine steel company?

- Yes
- No
The Cost of Equity: A Recap

Cost of Equity = Riskfree Rate + Beta * (Risk Premium)

Has to be in the same currency as cash flows, and defined in same terms (real or nominal) as the cash flows.

Preferably, a bottom-up beta, based upon other firms in the business, and firm's own financial leverage.

Historical Premium

Country Default Spread = \sigma_{Equity/Country Bond}

1. Mature Equity Market Premium: Average premium earned by stocks over T-Bonds in U.S.
2. Country risk premium = Country Default Spread \times (\sigma_{Equity/\sigma_{Country bond}})
The cost of debt is the rate at which you can borrow currently. It will reflect not only your default risk but also the level of interest rates for a firm, estimate a synthetic rating for your firm and the cost of debt based upon that rating.

When in trouble (either because you have no ratings or multiple ratings for the firm) you have to use a median rating. While this approach is more robust, different bonds from the same firm can have different ratings. You have to use a median rating.

Looking up the rating for the firm and estimating a default spread based upon the rating. While this approach is more robust, different bonds from the same firm have long term straight bonds that are liquid and widely traded.

The yield to maturity on a straight bond outstanding from the firm. The limitation of this approach is that very few firms have long term bonds.

The two most widely used approaches to estimating cost of debt are:

- Estimating the Cost of Debt
Estimating Synthetic Ratings

The rating for a firm can be estimated using the financial characteristics of the firm. In its simplest form, the rating can be estimated from the interest coverage ratio:

\[ \text{Interest Coverage Ratio} = \frac{\text{EBIT}}{\text{Interest Expenses}} \]

For Siderar, in 1999, for instance:

\[ \text{Interest Coverage Ratio} = \frac{161/4}{48} = 3.33 \]

Based upon the relationship between interest coverage ratios and ratings, we would estimate a rating of A- for Siderar. With a default spread of 1.25% (given the rating of A-), we would estimate a rating of A- for Siderar.

For Titan’s interest coverage ratio, we used the interest expenses and EBIT from 2000:

\[ \text{Interest Coverage Ratio} = \frac{55,467}{4028} = 13.77 \]

The rating for a firm can be estimated using the financial characteristics of the firm. In its simplest form, the rating can be estimated from the interest coverage ratio.
<table>
<thead>
<tr>
<th>Coverage Ratio</th>
<th>Bond Rating</th>
<th>Default Spread (1/99)</th>
<th>Default Spread (1/01)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 8.50%</td>
<td>AAA</td>
<td>0.20%</td>
<td>0.75%</td>
</tr>
<tr>
<td>6.50% - 8.50%</td>
<td>AA</td>
<td>0.50%</td>
<td>1.00%</td>
</tr>
<tr>
<td>5.50% - 6.50%</td>
<td>A+</td>
<td>0.80%</td>
<td>1.50%</td>
</tr>
<tr>
<td>4.25% - 5.50%</td>
<td>A</td>
<td>1.00%</td>
<td>1.80%</td>
</tr>
<tr>
<td>3.00% - 4.25%</td>
<td>A–</td>
<td>1.25%</td>
<td>2.00%</td>
</tr>
<tr>
<td>2.50% - 3.00%</td>
<td>BBB</td>
<td>1.50%</td>
<td>2.25%</td>
</tr>
<tr>
<td>2.00% - 2.50%</td>
<td>BB</td>
<td>2.00%</td>
<td>3.50%</td>
</tr>
<tr>
<td>1.75% - 2.00%</td>
<td>B+</td>
<td>2.50%</td>
<td>4.75%</td>
</tr>
<tr>
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<td>B–</td>
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<td>8.00%</td>
</tr>
<tr>
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<td>CCC</td>
<td>5.00%</td>
<td>10.00%</td>
</tr>
<tr>
<td>0.65% - 0.80%</td>
<td>CC</td>
<td>6.00%</td>
<td>11.50%</td>
</tr>
<tr>
<td>&lt; 0.65%</td>
<td>C</td>
<td>7.50%</td>
<td>12.70%</td>
</tr>
<tr>
<td>&lt; 0.20%</td>
<td>D</td>
<td>10.00%</td>
<td>15.00%</td>
</tr>
</tbody>
</table>
Cost of Debt Computations

Aswath Damodaran

Cost of Debt computations

Companies in countries with low bond ratings and high default risk might bear the burden of country default risk. For Siderar, the rating estimated of A- yields a cost of debt as follows:

Pre-tax Cost of Debt in 1999

= Pre-tax Cost of Debt + Company Default Spread + Country Default Spread

= Risk-free Rate + Country Default Spread + Company Default Spread

= 5.10% + 0.75% + 0.95% = 6.80%

For Siderar, the rating estimated of A- yields a cost of debt as follows:

The synthetic rating for Titan is AAA. The default spread in 2001 is 0.75%.

Pre-tax Cost of Debt

= Risk-free Rate + Company Default Spread + Country Default Spread

= U.S. Bond Rate + Country default spread + Company Default Spread

= 6% + 5.25% + 1.25% = 12.50%
The relationship between interest coverage ratios and ratings, developed using US companies, tends to travel well, as long as we are analyzing large manufacturing firms in markets with interest rates close to the US interest rate. They are more problematic when looking at smaller companies in markets with higher interest rates than the US. The Synthetic Ratings: Some Caveats.
The weights used to compute the cost of capital should be the market value weights for debt and equity. As a general rule, the debt that you should subtract from firm value to arrive at the value of equity should be the same debt that you used to calculate the cost of capital.

There is an element of circularity that is introduced into every valuation by doing this, since the values that we attach to the firm and equity at the end of the analysis are different from the values we gave at the beginning. Since the values that we attach to the firm and equity are different, there is an element of circularity that is introduced into every valuation by doing this, since the values that we attach to the firm and equity are different. The weights used to compute the cost of capital should be the market value weights for debt and equity.
Estimating Cost of Capital: Titan Cements

- **Equity**
  - Cost of Equity = 5.10% + 0.96(4%+1.59%) = 10.47%
  - Market Value of Equity = 739,217 million GDr (78.7%)

- **Debt**
  - Cost of Debt = 5.10% + 0.75% + 0.95% = 6.80%
  - Market Value of Debt = 199,766 million GDr (21.3%)

- **Cost of Capital**
  - Cost of Capital = 10.47% (0.787) + 6.80% (1 - 0.2449)(0.213)) = 9.33%
Titan Cement: Book Value Weights

Titan Cement has a book value of equity of 135,857 million GDR and a book value of debt of 200,000 million GDR. Estimate the cost of capital using book value weights instead of market value weights.
Estimating A U.S. Dollar Cost of Capital: Siderar - An Argentine Steel Company

**Equity**
- Cost of Equity = $6.00\% + 5.25\% (Country default) + 1.25\% (Company default)
- Market Value of Equity = 3.20 * 310.89 = 995 million (94.37%)
- Cost of Equity = 16.32\% (94.37) + 12.50\% (1 - 0.3345) (0.0563)
- Cost of Capital = 16.32\% (0.9437) + 12.50\% (1 - 0.3345) (0.0563) = 15.87\%

**Debt**
- Cost of Debt = $6.00\% + 0.71 \times (4\% + 10.53\%) = 16.32\% + 0.71 \times (4\% + 10.53\%) = 15.87\%
- Market Value of Debt = 59 Mil (5.63%)

Mature Market Premium
- Country Risk Premium for Argentina = 9.437\%
Approach 1: Use a peso riskfree rate in all of the calculations above. For instance, if the peso riskfree rate was 10%, the cost of capital would be computed as follows:

- Cost of Equity = 10.00% + 0.71 (4% + 10.53%) = 20.32%
- Cost of Debt = 10.00% + 5.25% (Country default) + 1.25% (Company default) = 16.5%

This assumes the peso riskfree rate has no country risk premium embedded in it.

Approach 2: Use the differential inflation rate to estimate the cost of capital. For instance, if the inflation rate in pesos is 7% and the inflation rate in the U.S. is 3%:

\[
\text{Cost of Capital} = \left(1 + \frac{\text{Inflation}_{\text{Peso}}}{1 + \text{Inflation}_{\text{U.S.}}}\right) \times (1 + \text{Cost of Capital})
\]

\[
= 1.1587 \times (1.07/1.03) = 1.2037 \rightarrow 20.37\%
\]

This assumes the peso riskfree rate has no country risk premium embedded in it.

Computed as follows:

- Cost of Debt = 10.00% + 5.25% (Country default) + 1.25% (Company default) = 16.5%
- Cost of Equity = 10.00% + 0.71 % (4% + 10.53%) = 20.32%

For instance, if the peso riskfree rate was 10%, the cost of capital would be 20.37%.

Converting a Dollar Cost of Capital into a Peso Cost of Capital

Aswath Damodaran
When dealing with hybrids (convertible bonds, for instance), break the security down into debt and equity and allocate the amounts accordingly. Thus, if a firm has $125 million in convertible debt and conversion option components, break the $125 million into straight debt and conversion option conversion option. The conversion option is equity.

Outstanding market value of the firm, lumping it in with debt will make no significant impact on your valuation. As a rule of thumb, if the preferred stock is less than 5% of the outstanding value, it is better to keep it as a separate component. When dealing with preferred stock, it is better to keep it as a separate component.
Recapping the Cost of Capital

Cost of Equity: \( \frac{\text{Cost of Equity}}{(1 - \text{Marginal tax rate})} \times \beta \)

Cost of Borrowing: \( \text{Risk-free rate} + \text{Default spread} + \text{Synthetic or actual bond rating} \)

Cost of Capital: \( \frac{\text{Cost of Equity}}{(\text{Debt} + \text{Equity})} + \frac{\text{Cost of Borrowing} \times (1 - \text{Default spread})}{(\text{Debt} + \text{Equity})} \)

Weights should be market value weights.
II. Estimating Cash Flows

DCF Valuation
Steps in Cash Flow Estimation

1. Estimate the current earnings of the firm
   - If looking at cash flows to equity, look at earnings after interest expenses – i.e., net income. If looking at cash flows to the firm, look at operating earnings after taxes.

2. Consider how much the firm invested to create future growth
   - Increasing working capital needs are also investments for future growth. Cover some of these expenditures.
   - If the investment is not expensed, it will be categorized as capital expenditures. The extent to which depreciation provides a cash flow, it will
   - If the investment is not expensed, it will be categorized as capital expenditures.

3. Estimate the current earnings of the firm
   - If looking at cash flows to equity, look at earnings after interest expenses and expenses.
Measuring Cash Flows

Cash flows can be measured to:

- All claimholders in the firm

Just Equity Investors

Net Income - (Capital Expenditures - Depreciation) - Change in non-cash Working capital - (Principal Repaid - New Debt Issues) = Free Cash Flow to Firm (FCFF)

Preferred Dividends + Stock Buybacks

Dividends

Preferred Dividends - (Capital Expenditures - Depreciation) - Change in non-cash Working Capital = Free Cash Flow to Firm (FCFF)

EBIT (1 - tax rate)

Net Income - (Capital Expenditures - Depreciation) - Preferred Dividends - Change in non-cash Working capital = Free Cash Flow to Firm (FCFF)
Measuring Cash Flow to the Firm

Where are the tax savings from interest payments in this cash flow?

EBIT \times (1 - \text{tax rate}) - \text{(Capital Expenditures - Depreciation)} - \text{Change in Working Capital} = \text{Cash Flow to the Firm}

Measuring Earnings

Update

- Unofficial numbers
- Trailing Earnings

Cleanse

- Non-recurring expenses
- Capital expenses
- Financial expenses
- Operating items of

Normalize

Earnings

Firm's history

Comparable firms

From Reported to Actual Earnings

Adjust operating income
- Convert into debt
- Convert into asset

R&D expenses

Adjust operating income
- Convert into debt
- Operating leases
When valuing companies, we often depend upon financial statements. Updating earnings is important as well as for firms that have undergone significant restructuring. Updating makes the most difference for smaller and more volatile firms, as well as for firms that have undergone significant restructuring.

Informal and unofficial news reports, if quarterly reports are unavailable,

- Trailing 12-month data, constructed from quarterly earnings reports,

and can be updated by using:

- For inputs on earnings and assets, Annual reports are often outdated.

I. Update Earnings
II. Correcting Accounting Earnings

The Operating Lease Adjustment: While accounting convention treats operating leases as operating expenses, they are really financial expenses and need to be reclassified as such. This has no effect on equity earnings but does change the operating earnings. Since R&D is a capital expenditure (rather than an operating expense), the operating income has to be adjusted to reflect its treatment.

The R & D Adjustment: Since R&D is a capital expenditure (rather than an operating expense), the operating income has to be adjusted to reflect its treatment.
The Magnitude of Operating Leases

Operating Lease expenses as % of Operating Income

- Restaurants
- Furniture Stores
- Apparel Stores
- Market
Dealing with Operating Lease Expenses

Operating Lease Expenses are treated as operating expenses in computing operating income. In reality, operating lease expenses should be treated as financing expenses, with the following adjustments to earnings and capital:

1. Debt Value of Operating Leases = PV of Operating Lease Expenses + Pre-tax cost of Debt

As an approximation, this works:

Adjusted Operating Earnings = Operating Earnings + Operating Lease Expenses - Depreciation on Leased Asset

Adjusted Operating Earnings = Operating Earnings + Pre-tax cost of Debt * PV of Operating Leases.
The Home Depot has $1.205 billion in other debt outstanding. The pre-tax cost of debt at the Home Depot is 6.25%.

The present value of the following operating leases is $2.571 billion:

<table>
<thead>
<tr>
<th>Year</th>
<th>Lease Expense</th>
<th>Present Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>$294</td>
<td>$291</td>
</tr>
<tr>
<td>2003</td>
<td>$264</td>
<td>$258</td>
</tr>
<tr>
<td>2004</td>
<td>$245</td>
<td>$220</td>
</tr>
<tr>
<td>2005</td>
<td>$236</td>
<td>$192</td>
</tr>
<tr>
<td>2006-2015</td>
<td>$270</td>
<td>$(1,450)</td>
</tr>
</tbody>
</table>

The pre-tax cost of debt at the Home Depot is 6.25%.

Operating Leases at The Home Depot in 1998

Adjusted Operating Income = $2,016 + 2,571 (0.0625) = $2,177 billion

Debt outstanding at The Home Depot = $1,205 + $2,571 = $3,776 billion

The present value of operating leases = $2,571 billion
The Effects of Capitalizing Operating Leases

- Book capital invested will generally decrease since the increase in operating income will be proportionately lower than the increase in financial expenses anyway.
- Net income: will be unaffected since it is after both operating and financial expenses.
- Operating income: will increase, since operating leases will now be capitalized.
- Debt: will increase, leading to an increase in debt ratios used in the cost of capital and levered beta calculation.
- Return on Capital will generally decrease since the increase in operating income will be proportionately lower than the increase in debt ratios used in the cost of capital and levered beta calculation.
- Debt: will increase, leading to an increase in debt ratios used in the cost of capital and levered beta calculation.
The Magnitude of R&D Expenses

R&D as % of Operating Income
R&D Expenses: Operating or Capital Expenses

Accounting standards require us to consider R&D as an operating expense even though it is designed to generate future growth. It is more logical to treat it as capital expenditures. Although even though it is designed to generate future growth, it is unamortizable over the period. Thus, if the amortizable life is 5 years, the research asset can be obtained by adding up 1/5th of the R&D expense from five years ago, 2/5th of the R&D expense from four years ago, and so on for the remaining years.

To capitalize R&D:
- Specify an amortizable life for R&D for as long as the amortizable life.
- Collect past R&D expenses for as long as the amortizable life.
- Sum up the unamortized R&D over the period.

Years ago...

R&D expense from five years ago, 2/5th of the R&D expense from four years ago, 3/5th of the R&D expense from three years ago, and so on for the remaining years.
Aswath Damodaran

Capitalizing R&D Expenses: Cisco

R&D was assumed to have a 5-year life.

<table>
<thead>
<tr>
<th>Year</th>
<th>R&amp;D Expense</th>
<th>Unamortized portion</th>
<th>Amortization this year</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>1594.00</td>
<td>1594.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>820.80</td>
<td>42.20</td>
<td>159.60</td>
<td>966.10</td>
</tr>
<tr>
<td>1997</td>
<td>89.00</td>
<td>0.00</td>
<td>0.00</td>
<td>89.00</td>
</tr>
<tr>
<td>1996</td>
<td>89.00</td>
<td>0.00</td>
<td>0.00</td>
<td>89.00</td>
</tr>
<tr>
<td>1995</td>
<td>89.00</td>
<td>0.00</td>
<td>0.00</td>
<td>89.00</td>
</tr>
<tr>
<td>1994</td>
<td>89.00</td>
<td>0.00</td>
<td>0.00</td>
<td>89.00</td>
</tr>
</tbody>
</table>

Value of research asset = $3,035.4 million

Amortization of research asset in 1998 = 864.6 million

Adjustment to Operating Income = $1,594 million - 864.6 million = 729.4 million

Adjusted R&D Expense

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>820.80</td>
</tr>
<tr>
<td>1998</td>
<td>42.20</td>
</tr>
<tr>
<td>1997</td>
<td>0.00</td>
</tr>
<tr>
<td>1996</td>
<td>0.00</td>
</tr>
<tr>
<td>1995</td>
<td>0.00</td>
</tr>
<tr>
<td>1994</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Current (1999) research and development expenses were assumed to have a 5-year life.
The Effect of Capitalizing R&D

After-tax operating income:
For all firms, the net cap ex will increase by the same amount as the R&D.
Depreciation will increase by the amortization of the research asset.
Capital expenditures will increase by the amount of R&D.
Research asset
Book value of equity (and capital) will increase by the capitalized R&D.
Net income will increase proportionately, depending again upon how fast R&D is growing.
Operating income will generally increase, though it depends upon whether R&D is growing or not. If it is flat, there will be no effect.

The Effect of Capitalizing R&D
III. One-Time and Non-recurring Charges

Assume that you are valuing a firm that is reporting a loss of $500 million, due to a one-time charge of $1 billion. What is the earnings you would use in your valuation?

A profit of $500 million
A loss of $500 million

Would your answer be any different if the firm had reported one-time losses like these once every five years?

Yes
No

If losses like these occur every five years, would your answer be any different if the firm had reported one-time charges of $1 billion, due to a one-time charge of $500 million, due to a one-time charge of $1 billion. What is the earnings you would use in your valuation?

Assume that you are valuing a firm that is reporting a loss of $500 million.
Though all firms may be governed by the same accounting standards, the fidelity that they show to these standards can vary. More aggressive firms will show higher earnings than more conservative firms.

While you will not be able to catch outright fraud, you should look for warning signals in financial statements and correct for them:

- Income from unspecified sources - holdings in other businesses that are not revealed or from special purpose entities.
- Income from asset sales or financial transactions (for a non-financial firm).
- Sudden changes in standard expense items - a big drop in S, G & A or R&D expenses.
- While you will not be able to catch outright fraud, you should look for warning signals in financial statements and correct for them.

IV. Accounting Malfeasance...
V. Dealing with Negative or Abnormally Low Earnings

A Framework for Analyzing Companies with Negative or Abnormally Low Earnings

Why are the earnings negative or abnormally low?

- Problem: Production or cost with significant problems: E.g. Long-term
- Problem: Too much debt with significant problems: E.g. Leverage
- Problem: Inefficient management and misalignment of interests with significant problems: E.g. Aligning

Earnings

Value the firm by doing detailed cash flow forecasts starting with revenues and profits to become familiar with numbers and industry average margins. Normalize earnings by reducing or eliminating the problem over time. If the problem is structural:

- Target for operating margins of stable firms in the sector.
- Target for a debt ratio that the firm will be comfortable with by the end of the period, which could be its own optimal or the industry average.
- Target for an industry-average operating margin.

If firm's size has not changed significantly over time:

- Average Dollar Earnings (Net Income if Equity and EBIT if Firm made by the firm over time)

If firm's size has changed over time:

- Use firm's average ROE (if valuing equity) or average ROC (if valuing equity) on current BV of equity (if ROE) or current BV of capital (if ROC)

By or equity (if ROE) or current earnings (Net Income if Equity and EBIT if Firm made by the firm over time)

The flowchart illustrates the process of analyzing companies with negative or abnormally low earnings, focusing on identifying the underlying causes, normalizing earnings over time, and valuing the firm based on industry benchmarks.
Aswath Damodaran

What tax rate?

The tax rate that you should use in computing the after-tax operating income should be:

- The effective tax rate in the financial statements (taxes paid/EBT)
- The marginal tax rate
- The tax rate based upon taxes paid and EBIT (taxes paid/EBIT)
- None of the above
- Any of the above, as long as you compute your after-tax cost of debt

Using the same tax rate as long as you compute your after-tax cost of debt

None of the above

The marginal tax rate

The tax rate that you should use in computing the after-tax operating income

What tax rate?
The Right Tax Rate to Use

The choice really is between the effective and the marginal tax rate. In doing projections, it is far safer to use the marginal tax rate since the effective tax rate is really a reflection of the difference between the accounting and the tax books. By using the marginal tax rate, we tend to understate the after-tax operating income in the earlier years, but the after-tax operating income is more accurate in later years.

If you choose to use the effective tax rate, adjust the tax rate towards the marginal tax rate over time.
A Tax Rate for a Money Losing Firm

Assume that you are trying to estimate the after-tax operating income for a firm with $1 billion in net operating losses carried forward. This firm is expected to have operating income of $500 million each year for the next 3 years. Assume that you are trying to estimate the after-tax operating income for all firms that make money is 40%.

<table>
<thead>
<tr>
<th>Year</th>
<th>EBIT</th>
<th>Taxes</th>
<th>After-Tax EBIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>500</td>
<td>200</td>
<td>300</td>
</tr>
<tr>
<td>2</td>
<td>500</td>
<td>200</td>
<td>300</td>
</tr>
<tr>
<td>3</td>
<td>500</td>
<td>200</td>
<td>300</td>
</tr>
</tbody>
</table>
Net Capital Expenditures

Net capital expenditures represent the difference between capital expenditures and depreciation. Depreciation is a cash inflow that pays for some or all of the capital expenditures. For some or a lot (or sometimes all of) the capital expenditures and depreciation, assumptions about net capital expenditures cannot therefore never be made independently of assumptions about growth in the future. Assumptions about net capital expenditures can therefore never be much higher net capital expenditures than low growth firms. High growth firms will have firms is growing or expecting to grow. In general, the net capital expenditures will be a function of how fast a.
Capital expenditures should include

usually categorized under other investment activities

2. The best place to find acquisitions is in the statement of cash flows.

I. Most firms do not do acquisitions every year. Hence, a normalized measure of acquisitions (looking at an average over time) should be used.

Two caveats:

1. Firms - Amortization of Research and Development expenses - Amortization of Research Asset - Year’s R&D expenses - Amortization of Research Asset

Adjusted Net Capital Expenditures = Net Capital Expenditures + Current

Acquisitions of other firms, since these are like capital expenditures.

Adjusted net cap ex will be

The adjusted net cap ex will be

Adjusted net cap ex will be

The adjusted net cap ex will be

Research and development expenses, once they have been re-

<table>
<thead>
<tr>
<th>Acquired</th>
<th>Method of Acquisition</th>
<th>Price Paid</th>
</tr>
</thead>
<tbody>
<tr>
<td>GeoTel</td>
<td>Purchase</td>
<td>$1,344</td>
</tr>
<tr>
<td>Fibex</td>
<td>Purchase</td>
<td>$318</td>
</tr>
<tr>
<td>Sentient</td>
<td>Purchase</td>
<td>$103</td>
</tr>
<tr>
<td>American Internet</td>
<td>Purchase</td>
<td>$58</td>
</tr>
<tr>
<td>Summa Four</td>
<td>Purchase</td>
<td>$129</td>
</tr>
<tr>
<td>Clarity Wireless</td>
<td>Pooling</td>
<td>$153</td>
</tr>
<tr>
<td>Selsius Systems</td>
<td>Purchase</td>
<td>$134</td>
</tr>
<tr>
<td>PipeLinks</td>
<td>Purchase</td>
<td>$118</td>
</tr>
<tr>
<td>Amteva Tech</td>
<td>Purchase</td>
<td>$159</td>
</tr>
<tr>
<td>Fibe</td>
<td>Pooling</td>
<td>$103</td>
</tr>
<tr>
<td>GeoTel</td>
<td>Pooling</td>
<td>$344</td>
</tr>
</tbody>
</table>

Total: $2,516
Cisco's Net Capital Expenditures in 1999

Cap Expenditures (from statement of CF) = $584 mil
- Depreciation (from statement of CF) = $486 mil
Net Cap Ex (from statement of CF) = $98 mil
+ R & D expense = $1,594 mil
+ Acquisitions = $2,516 mil

Adjusted Net Capital Expenditures = $3,723 mil

(Amortization was included in the depreciation number)
Aswath Damodaran

Working Capital Investments

In accounting terms, the working capital is the difference between current assets (inventory, cash and accounts receivable) and current liabilities (accounts payable, short term debt and debt due within the next year). In accounting terms, the working capital is the difference between

A cleaner definition of working capital from a cash flow perspective is:

(Non-debt current liabilities (accounts payable) and non-debt current assets (inventory) and accounts receivable) - (Accounts payable, short term debt and debt due within the next year)

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 building these effects into the cash flows.

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 building these effects into the cash flows.

When forecasting future growth, it is important to forecast the effects of such growth on working capital needs, and building these effects into the cash flows.
Changes in non-cash working capital from year to year tend to be volatile. A far better estimate of non-cash working capital, looking forward, can be estimated by looking at non-cash working capital as a proportion of revenues. While this is indeed feasible for a period of time, it is not forever. Thus, it is better that non-cash working capital needs be set to zero, when it is negative.
Volatility Working Capital?
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) if managers are conservative and try to smooth out dividends and investment opportunities. When actual dividends are less than potential dividends, using a model that focuses only on dividends will understate 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 out all its earnings as dividends would not be investing in new assets and thus could not grow.
- Valuation models, which discount future cash flows, do not reflect potential dividends.
- The common categorization of capital expenditures into discretionary and non-discretionary loses its basis when there is future growth built into the firm's equity.

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).

The common calculation of capital expenditures into discretionary and non-discretionary loses its basis when there is future growth built into the firm.
Estimating Cash Flows: FCFE

Cash flows to Equity for a Levered Firm

Net Income - (Capital Expenditures - Depreciation) - Changes in non-cash Working Capital - (Capital Expenditures - Depreciation) - Net Income - (Principal Repayments - New Debt Issues) = Free Cash Flow to Equity

I have ignored preferred dividends. If preferred stock exist, preferred dividends will also need to be netted out.
Estimating FCFE when Leverage is Stable

Net Income - (1 - δ) (Capital Expenditures - Depreciation) - (1 - δ) Working Capital Needs = Free Cash Flow to Equity

δ = Debt/Capital Ratio

Proceeds from new debt issues = Principal Repayments + d (Capital Expenditures - Depreciation) + Working Capital Needs

For this firm,

\[ \delta = \text{Debt/Capital Ratio} \]

\[ \frac{\text{Proceeds from new debt issues}}{\text{Capital}} = \text{Free Cash Flow to Equity} \]

\[ = \text{Net Income} - (1 - \delta) \text{Working Capital Needs} - (1 - \delta) (\text{Capital Expenditures} - \text{Depreciation}) \]
Estimating FCFE: Disney

Q Net Income = $1,533 Million
Q Capital spending = $1,746 Million
Q Depreciation per Share = $1,134 Million
Q Increase in non-cash working capital = $477 Million
Q Debt to Capital Ratio = 23.83%


\[
\text{FCFE} = \text{Net Income} - (\text{Cap. Exp} - \text{Dep}) \times (1 - \text{DR}) - \text{Net Income} \times (\text{Debt to Capital Ratio})
\]

\[
\begin{align*}
\text{Dividends Paid} & = \text{Net Income} - (\text{Cap. Exp} - \text{Dep}) \times (1 - \text{DR}) - \text{Net Income} \times (\text{Debt to Capital Ratio}) \\
\text{FCFE} & = \text{Net Income} - (1,746 - 1,134) \times (1 - 0.2383) - 1,533 \times 0.2383 \\
\text{Depreciation per Share} & = \frac{1,134}{1,746} - \frac{1,746}{1,746} \\
\text{Net Income} & = 1,533 \text{ Million}
\end{align*}
\]

\[
\begin{align*}
\text{Net Income} & = 1,533 \text{ Million} \\
\text{Dividends Paid} & = 345 \text{ Million} \\
\text{FCFE} & = 704 \text{ Million}
\end{align*}
\]
FCFE and Leverage: Is this a free lunch?
In a discounted cash flow model, generally increasing the expected free cash flows to equity investors over future time periods and also the cost of equity applied in discounting these cash flows will increase value.

Increasing leverage will increase value because the cash flow effects will dominate the discount rate effects.

Increasing leverage will not affect value because the risk effect will exactly offset the cash flow effect.

Increasing leverage will decrease value because the risk effect will be greater than the cash flow effects.

Any of the above, depending upon what company you are looking at and where it is in terms of current leverage.

Leverage, FCFE and Value
Estimating FCFE: Brahma

Net Income (1996) = 325 Million BR

Capital spending (1996) = 396 Million

Depreciation (1996) = 183 Million BR

Increase in Non-cash Working Capital Change (1996) = 12 Million BR

Debt Ratio = 43.48%

Free Cashflow to Equity

Earnings per Share (1996):

Dividends Paid

232.00 Million BR

197.83 Million BR

191.78 Million BR

325.00 Million BR

396.00 Million BR
III. Estimating Growth

DCF Valuation
Look at the past
• The historical growth in earnings per share is usually a good starting point for growth estimation.

Look at what others are estimating
• 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.
I. Historical Growth in EPS

Historical growth rates can be estimated in a number of different ways:

- Arithmetic versus Geometric Averages
- Simple versus Regression Models
- Arithmetical versus Geometric Averages

In using historical growth rates, the following factors have to be considered:

- How to deal with negative earnings
- How to deal with changing size

In using historical growth rates, the following factors have to be considered:

- How to deal with negative earnings
- How to deal with changing size
## Motorola: Arithmetic versus Geometric Growth Rates

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenues</th>
<th>% Change</th>
<th>EBIT</th>
<th>% Change</th>
<th>EBITDA</th>
<th>% Change</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>22,245</td>
<td>4.31%</td>
<td>4,151</td>
<td>10.89%</td>
<td>2,604</td>
<td>8.61%</td>
<td>141.78%</td>
</tr>
<tr>
<td>1995</td>
<td>27,037</td>
<td>21.54%</td>
<td>4,850</td>
<td>16.84%</td>
<td>2,931</td>
<td>12.56%</td>
<td>42.45%</td>
</tr>
<tr>
<td>1996</td>
<td>27,973</td>
<td>3.46%</td>
<td>4,268</td>
<td>-12.00%</td>
<td>1,960</td>
<td>-33.13%</td>
<td>4.31%</td>
</tr>
<tr>
<td>1997</td>
<td>29,794</td>
<td>6.51%</td>
<td>4,276</td>
<td>0.19%</td>
<td>1,947</td>
<td>-0.66%</td>
<td>7.08%</td>
</tr>
<tr>
<td>1998</td>
<td>29,398</td>
<td>-1.33%</td>
<td>4,019</td>
<td>-29.40%</td>
<td>822</td>
<td>-57.78%</td>
<td>5.39%</td>
</tr>
<tr>
<td>1999</td>
<td>30,931</td>
<td>5.21%</td>
<td>5,398</td>
<td>78.80%</td>
<td>3,216</td>
<td>291.24%</td>
<td>10.89%</td>
</tr>
</tbody>
</table>

**Arithmetic Average**: 7.08% 10.89% 42.45%

**Geometric Average**: 6.82% 5.39% 4.31%

**Standard Deviation**: 8.61% 41.56% 141.78%
<table>
<thead>
<tr>
<th>Year</th>
<th>EPS</th>
<th>ln(EPS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>$0.01</td>
<td>-4.6052</td>
</tr>
<tr>
<td>1992</td>
<td>$0.02</td>
<td>-3.9120</td>
</tr>
<tr>
<td>1993</td>
<td>$0.04</td>
<td>-3.2189</td>
</tr>
<tr>
<td>1994</td>
<td>$0.07</td>
<td>-2.6593</td>
</tr>
<tr>
<td>1995</td>
<td>$0.08</td>
<td>-2.5257</td>
</tr>
<tr>
<td>1996</td>
<td>$0.16</td>
<td>-1.8326</td>
</tr>
<tr>
<td>1997</td>
<td>$0.18</td>
<td>-1.7148</td>
</tr>
<tr>
<td>1998</td>
<td>$0.25</td>
<td>-1.3863</td>
</tr>
<tr>
<td>1999</td>
<td>$0.32</td>
<td>-1.1394</td>
</tr>
</tbody>
</table>

\[ \ln(EPS) = -4.66 + 0.4212 (t) \]

Growth Rate = $0.0383 / $0.13 = 30.5% (Average EPS from 91-99)

\[ EPS = 0.066 + 0.0383 \times \text{Year} \]

\[ EPS \text{ grows by } $0.0383 \text{ a year} \]

\[ QS = -0.066 + 0.0383 \times \text{Year} \]
You are trying to estimate the growth rate in earnings per share at Time Warner from 1996 to 1997. In 1996, the earnings per share was a deficit of $0.05. In 1997, the expected earnings per share is $0.25. What is the growth rate?

- Cannot be estimated
- -600%
- +600%
- +120%

A Test
Dealing with Negative Earnings

- When the earnings in the starting period are negative, the growth rate cannot be estimated. \(0.30/-0.05 = -600\%\)
- There are three solutions:
  - Use the higher of the two numbers as the denominator \(0.30/0.25 = 120\%\)
  - Use the absolute value of earnings in the starting period as the denominator \(0.30/0.05 = 600\%\)
  - Use a linear regression model and divide the coefficient by the average earnings.
- When earnings are negative, the growth rate is meaningless. Thus, while the growth rate can be estimated, it does not tell you much about the future.
The Effect of Size on Growth: Callaway Golf

<table>
<thead>
<tr>
<th>Year</th>
<th>Net Profit Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>1.80%</td>
</tr>
<tr>
<td>1991</td>
<td>6.40%</td>
</tr>
<tr>
<td>1992</td>
<td>19.30%</td>
</tr>
<tr>
<td>1993</td>
<td>41.20%</td>
</tr>
<tr>
<td>1994</td>
<td>78.00%</td>
</tr>
<tr>
<td>1995</td>
<td>97.70%</td>
</tr>
<tr>
<td>1996</td>
<td>122.30%</td>
</tr>
</tbody>
</table>

Geometric Average Growth Rate = 102%
Extrapolation and its Dangers

If net profit continues to grow at the same rate as it has in the past 6 years, the expected net income in 5 years will be $4.13 billion.

<table>
<thead>
<tr>
<th>Year</th>
<th>Net Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>$122.30</td>
</tr>
<tr>
<td>1997</td>
<td>$247.05</td>
</tr>
<tr>
<td>1998</td>
<td>$499.03</td>
</tr>
<tr>
<td>1999</td>
<td>$1,008.05</td>
</tr>
<tr>
<td>2000</td>
<td>$2,036.25</td>
</tr>
<tr>
<td>2001</td>
<td>$4,113.23</td>
</tr>
</tbody>
</table>

2001 $4,113.23
2000 $2,036.25
1999 $1,008.05
1998 $499.03
1997 $247.05
1996 $122.30
II. 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. While the job of an analyst is to find under and over valued stocks, the sectors that they follow, a significant portion of an analyst’s time (outside of selling) is spent forecasting earnings per share. While most of this time, in turn, is spent forecasting earnings per share, the sectors that they follow, a significant proportion of an analyst’s time (outside of selling) is spent forecasting earnings per share. 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?

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

<table>
<thead>
<tr>
<th>Study</th>
<th>Time Period</th>
<th>Analyst Forecast Error</th>
<th>Time Series Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown &amp; Kozler Value Line Forecasts</td>
<td>1997-1998</td>
<td>16.4%</td>
<td>19.8%</td>
</tr>
<tr>
<td>Fried &amp; Givoly Earnings Forecaster</td>
<td>1997-1998</td>
<td>3.2%</td>
<td>4.4%</td>
</tr>
<tr>
<td>Collins &amp; Hopwood Value Line Forecasts</td>
<td>1997-1998</td>
<td>34.1%</td>
<td>31.7%</td>
</tr>
</tbody>
</table>

The advantage that analysts have over time series models tends to decrease with the forecast period (next quarter versus 5 years) and to be greater for larger firms than for smaller firms. It tends to be greater at the industry level than at the company level. Forecasts of growth (and revisions thereof) tend to be highly correlated among analysts.
Are some analysts more equal than others?

A study of All-America Analysts (chosen by Institutional Investor) found that

- There is no evidence that analysts who are chosen for the All-America Analyst team were chosen because they were better forecasters of earnings. (Their median forecast error in the quarter prior to being chosen was 30%; the median forecast error of other analysts was 28%)

- However, in the calendar year following being chosen as All-America analysts, these analysts become slightly better forecasters than their less fortunate brethren. (The median forecast error for All-America analysts is 2% lower than the median forecast error for other analysts)

- Earnings revisions made by All-America analysts tend to have a much greater impact on the stock price than revisions from other analysts

- The recommendations made by the All America analysts have a greater impact on stock prices (3% on buys; 4.7% on sells). For these recommendations the price changes are sustained, and they continue to rise in the following period (2.4% for buys; 13.8% for the sells).
The Five Deadly Sins of an Analyst

Tunnel Vision: Becoming so focused on the sector and valuations that you lose sight of the bigger picture.

Lemmingitis: Strong urge felt to change recommendations when other analysts do the same.

Stockholm Syndrome (shortly to be renamed the Bre-X syndrome): Tendency to base a recommendation on a "story" coupled with delusions of being a famous story teller.

Factophobia (generally is coupled with delusions of being a famous story teller): Tendency to base a recommendation on a "story" coupled with delusions of being a famous story teller.

DR. Jekyll/Mr. Hyde: Analyst who thinks his primary job is to bring in investment banking business to the firm, with a refusal to face the facts.

The Five Deadly Sins of an Analyst

1. Tunnel Vision
2. Lemmingitis
3. Stockholm Syndrome
4. Factophobia
5. Dr. Jekyll/Mr. Hyde
Proposition 1: There is far less private (lemoniety) and when they agree too little (in which case the information that they have is so noisy as to be useless).

Proposition 2: The biggest source of private information for analysts remains the company itself, which might explain why there are more buy recommendations than sell recommendations and why All-America analysts become better forecasters than other analysts. Why there is such a high correlation across analysts forecasts and revisions (information bias and the need to preserve sources) remains the company itself which might explain why there are more buy recommendations than sell recommendations and far more public information in most analyst forecasts than is generally claimed.

Proposition 3: There is value in knowing what analysts are forecasting and when they agree too much (lemmingit).
III. Fundamental Growth Rates

$120 = \text{Change in Earnings}_1 \times \text{ROE}_1 \times \text{Investment in Existing Projects} + \text{Change in ROI from current to next period} \times \text{Investment in New Projects} + \text{Change in Earnings}_1 \times \text{ROI from Next Period} \times \text{Investment in Existing Projects}$

Where:
- $120$ is the change in earnings.
- $\text{ROE}_1$ is the return on investment on projects.
- $\text{Investment in Existing Projects}$ is the investment in existing projects.
- $\text{ROI from Next Period}$ is the return on investment in the next period.
- $\text{Investment in New Projects}$ is the investment in new projects.
- $\text{Change in ROI from current to next period}$ is the change in ROI from the current period to the next period.

$120 = \text{Change in Earnings}_2 \times \text{ROE}_2 \times \text{Investment in Existing Projects} + \text{Change in ROI from current to next period} \times \text{Investment in New Projects} + \text{Change in Earnings}_2 \times \text{ROI from Next Period} \times \text{Investment in Existing Projects}$

$120 = \text{Change in Earnings}_3 \times \text{ROE}_3 \times \text{Investment in Existing Projects} + \text{Change in ROI from current to next period} \times \text{Investment in New Projects} + \text{Change in Earnings}_3 \times \text{ROI from Next Period} \times \text{Investment in Existing Projects}$

II. Fundamental Growth Rates

Aswath Damodaran
Growth Rate Derivations

In the special case where ROI on existing projects remains unchanged and is equal to the ROI on new projects, the expected growth rate can be written as follows:

\[
\text{Change in Earnings} = \text{Current Earnings} \times \text{Return on Investment} = \text{Growth Rate in Earnings}
\]

In the more general case where ROI can change from period to period, this can be expanded as follows:

\[
\text{Change in Earnings} = \text{Investment in Existing Projects} \times (\text{Current ROI} + \text{Change in ROI}) + \text{Investment in New Projects} \times (\text{ROI}(\text{ROI}) + \text{New Projects} (\text{ROI}))
\]

For instance, if the ROI increases from 12% to 13%, the expected growth rate can be written as follows:

\[
\text{Growth Rate in Earnings} = \text{Current Earnings} \times \text{Return on Investment} = \text{Investment in Existing Projects} \times (\text{Current ROI} + \text{Change in ROI}) + \text{Investment in New Projects} \times (\text{ROI}(\text{ROI}) + \text{New Projects} (\text{ROI}))
\]

\[
\text{Example:} \quad \text{ROI} = 12\% \quad \text{ROI} = 13\% \quad \text{Growth Rate} = 10\%
\]

\[
\text{Investment in Existing Projects} = 1200 \quad \text{Investment in New Projects} = 100 \quad \text{Reinvestment Rate} = 83.33\%
\]

\[
\text{Current Earnings} = \frac{120}{1.2} \quad \text{Change in Earnings} = 12 \quad \text{Growth Rate} = 10\%
\]

\[
\text{Return on Investment} = 10\% \quad \text{Investment in Existing Projects} = 1200 \quad \text{Investment in New Projects} = 100
\]

\[
\text{Growth Rate} = \frac{120}{12} = 10\% \quad \text{Return on Investment} = 10\%
\]

\[
\text{Expected Growth Rate} = \text{Growth Rate in Earnings} = \frac{120}{12} \times 10\% = 10\%
\]
I. Expected Long Term Growth in EPS

When looking at growth in earnings per share, these inputs can be cast as follows:

- **Retention Ratio** = Retained Earnings / Current Earnings
- **Return on Investment** = ROE = Net Income / Book Value of Equity

In the special case where the current ROE is expected to remain unchanged,

\[ \text{EPS}_t = \text{Retention Ratio} \times \text{ROE} \]

\[ \text{EPS}_t = \frac{\text{Retained Earnings}_{t-1}}{\text{Net Income}_{t-1}} \times \text{ROE} \]

**Proposition 1:** The expected growth rate in earnings for a company cannot exceed its return on equity in the long term.

\[ b \times \text{ROE} \]

\[ \text{Retention Ratio} \times \text{ROE} \]

\[ b \times \text{ROE} \]

When looking at growth in earnings per share, these inputs can be cast as follows:

I. Expected Long Term Growth in EPS
Aswath Damodaran

Estimating Expected Growth in EPS: ABN Amro

If ABN Amro can maintain its current ROE and retention ratio, its expected growth in EPS will be:

\[ \text{Expected Growth Rate} = 0.5388 \times (15.79\%) = 8.51\% \]

Current Return on Equity = 15.79%
Current Retention Ratio = 1 - \( \frac{\text{DPS}}{\text{EPS}} \) = 1 - 1.13/2.45 = 53.88%

Expected Growth in EPS = 0.5388 \times 15.79\% = 8.51\%
Assume now that ABN Amro’s ROE next year is expected to increase to 17%, while its retention ratio remains at 53.88%. What is the new expected long term growth rate in earnings per share?

Will the expected growth rate in earnings per share next year be greater than, less than or equal to this estimate?
Changes in ROE and Expected Growth

When the ROE is expected to change,
\[ g_{EPS} = b \times ROE_{t+1} + (ROE_{t+1} - ROE_{t}) / ROE_{t} \]

Proposition 2: Small changes in ROE translate into large changes in the expected growth rate.

Proposition 3: No firm can, in the long term, sustain growth in earnings per share from improvement in ROE.

Corollary: The higher the existing ROE of the company (relative to the business in which it operates) and the more competitive the business in which it operates, the lower the current ROE, the greater the effect on growth of changes in the ROE.

Corollary: The higher the existing ROE, the greater the effect on growth of changes in the expected growth rate.

Proposition 2: Small changes in ROE translate into large changes in expected growth.

When the ROE is expected to change,
Assume now that ABN’s expansion into Asia will push up the ROE to 17%.

Growth rate in that year will be:

Note that 1.21% improvement in ROE translates into almost a doubling of the growth rate from 8.31% to 16.83%.

\[
\frac{EPS}{b} = \frac{ROE_{t+1} + \frac{(ROE_{t+1} - ROE_t)}{ROE_t}}{1}
\]

\[
\frac{EPS}{b} = \frac{0.5388(0.17) + (0.17 - 0.1579)}{0.1579}
\]

\[
\frac{EPS}{b} = 16.83\%
\]

1.21% improvement in ROE translates into almost a doubling of the growth rate from 8.31% to 16.83%.
Aswath Damodaran

ROE and Leverage

\[ \text{ROE} = \text{ROC} + \frac{\text{D/E}}{1 - \text{t}} \]

where,

\[ \text{ROC} = \frac{\text{EBIT}}{\text{BV of Capital}} \]

\[ \text{D/E} = \frac{\text{BV of Debt}}{\text{BV of Equity}} \]

\[ \text{BV: Book Value} \]

Note that BV of capital = BV of Debt + BV of Equity.

\[ \text{t} = \text{Tax rate on ordinary income} \]

\[ \text{i} = \text{Interest Expense on Debt / BV of Debt} \]

\[ \text{D/E} = \frac{\text{BV of Debt}}{\text{BV of Equity}} \]

where,

\[ \text{ROE} = \text{ROC} + \frac{\text{D/E}}{1 - \text{t} - \text{i}} \]
Decomposing ROE: Brahma

\[
\text{Real Return on Capital} = \frac{19.91\% - 0.77 (19.91\% - 1.1\%)}{1326 + 542 + 478} = 19.91\%
\]

- This is assumed to be real because both the book value and income are inflation adjusted.

\[
\text{Debt/Equity Ratio} = \frac{542 + 478}{1326} = 0.77
\]

\[
\text{After-tax Cost of Debt} = 8.25\% (1 - 0.32) = 5.61\% (\text{Real BR})
\]

\[
\text{Return on Equity} = \text{ROC} + \text{D/E} (\text{ROC} - \text{i}(1-t))
\]

\[
19.91\% + 0.77 (19.91\% - 5.61\%) = 30.92\%
\]
Decomposing ROE: Titan Watches (India)

Return on Equity = ROC + D/E (ROC - i(1-t))

Debt/Equity Ratio = (2378 + 1303)/1925 = 1.91

After-tax Cost of Debt = 13.5% (1 - 0.25) = 10.125%

Return on Capital = 713 (1 - 25%) / (1925 + 2378 + 1303) = 9.54%

9.54% + 1.91 (9.54% - 10.125%) = 8.42%
II. Expected Growth in Net Income

The limitation of the EPS fundamental growth equation is that it focuses on per-share earnings and assumes that reinvested earnings are invested in projects earning the return on equity. A more general version of expected growth in earnings can be obtained by substituting in the equity reinvestment into real investments (net capital expenditures and working capital) and realizing the return on equity.

\[
\text{Expected Growth in Net Income} = \text{Equity Reinvestment Rate} \times \text{ROE}
\]

\[
\text{Equity Reinvestment Rate} = \frac{\text{Net Capital Expenditures + Change in Working Capital}}{(1 - \text{Debt Ratio})/\text{Net Income}}
\]

The limitation of the EPS fundamental growth equation is that it focuses on per-share earnings and assumes that reinvested earnings are invested in projects earning the return on equity. A more general version of expected growth in earnings can be obtained by substituting in the equity reinvestment into real investments (net capital expenditures and working capital) and realizing the return on equity.
III. Expected Growth in EBIT And Fundamentals: Stable ROC and Reinvestment Rate

When looking at growth in operating income, the definitions are:

Reinvestment Rate = (Net Capital Expenditures + Change in WC)/EBIT(1-t) * ROC

Reinvestment Rate and Return on Capital

(Net Capital Expenditures + Change in WC)/EBIT(1-t) = Return on Investment

Proposition: The net capital expenditure needs of a firm, for a given growth rate, should be inversely proportional to the quality of its investments.
You are looking at a valuation, where the terminal value is based upon the assumption that operating income will grow 3% a year forever, but there are no net capital or working capital investments being made after the terminal year. When you confront the analyst, he contends that this is still feasible because the company is becoming more efficient with its existing assets and can be expected to increase its return on capital over time. Is this a reasonable explanation?
Estimating Growth in EBIT: Cisco versus Motorola

Cisco’s Fundamentals

- Reinvestment Rate = 106.81%
- Return on Capital = 34.07%
- Expected Growth in EBIT = (1.0681)(0.3407) = 6.45%

Motorola’s Fundamentals

- Reinvestment Rate = 52.99%
- Return on Capital = 12.18%
- Expected Growth in EBIT = (0.5299)(0.1218) = 6.45%
IV. Operating Income Growth when Return on Capital is Changing

When the return on capital is changing, there will be a second component to growth, positive if the return on capital is increasing and negative if the return on capital is decreasing.

If ROC\(_t\) is the return on capital in period \(t\) and ROC\(_{t+1}\) is the return on capital in period \(t+1\), the expected growth rate in operating income will be:

\[
\text{Expected Growth Rate} = \text{Reinvestment Rate} \times \frac{\text{ROC}_{t+1} \times \text{Reinvestment Rate}}{\text{ROC}_t} + \frac{\text{ROC}_{t+1} - \text{ROC}_t}{\text{ROC}_t}
\]

If the change is over multiple periods, the second component should be spread out over each period.

When the return on capital is changing, there will be a second component to growth, positive if the return on capital is increasing and negative if the return on capital is decreasing.

If ROC\(_1\) is the return on capital in period 1, the expected growth rate in operating income will be:

\[
\text{Expected Growth Rate} = \text{Reinvestment Rate} \times \frac{\text{ROC}_{1+1} \times \text{Reinvestment Rate}}{\text{ROC}_1} + \frac{\text{ROC}_{1+1} - \text{ROC}_1}{\text{ROC}_1}
\]
Motorola's current return on capital is 12.18% and its reinvestment rate is 52.99%. We expect Motorola's return on capital to rise to 17.22% over the next 5 years (which is halfway towards the industry average of 17.40%).

Expected Growth Rate = \( \frac{\text{Expected Return on New Investments} \times \text{Reinvestment Rate}}{\text{Current Return on Capital} + \left( \frac{\text{Expected Return on New Investments} - \text{Current Return on Capital}}{\text{Current Return on Capital}} \right)^{\frac{1}{5}} - 1} \)

\( = 0.1722 \times 0.5299 + \left( \frac{0.1722 - 0.1218}{0.1218} \right)^{\frac{1}{5}} - 1 \)

\( = 0.174 \) or 17.40%

One way to think about this is to decompose Motorola's expected growth into:

- Growth from new investments: 17.22% \times 52.99% = 9.12%
- Growth from more efficiently using existing investments: 17.40% - 9.12% = 8.28%

Note that I am assuming that the new investments start making 17.22% immediately, while allowing for existing assets to improve returns gradually.

Motorola's current return on capital is 12.18% and its reinvestment rate is 52.99%.
Estimating Growth when Operating Income is Negative or Margins are Changing

- Estimate expected revenue growth needs each year.
  - Estimate a sales to capital ratio that you will use to generate reinvestment
  - Estimate the capital that needs to be invested to generate revenue growth
  - Estimate expected operating margins each year
    - Adjust the current margin towards the target margin
    - Set a target margin that the firm will move towards

- Estimate expected operating margins each year
  - Keep track of absolute revenues to make sure that the growth is feasible
  - Decrease the growth rate as the firm becomes larger
  - Use historical revenue growth to get estimates of revenue growth in the near
  - Use historical revenue growth in the near
  - Use historical revenue growth to estimate growth when operating income is negative or margins are expected to change

V. Estimating Growth when Operating Income is Negative or Margins are Changing
<table>
<thead>
<tr>
<th>Year</th>
<th>Revenues</th>
<th>Growth Rate</th>
<th>Operating Margin</th>
<th>Operating Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$2,068</td>
<td>13.08%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>$1,849</td>
<td>12.77%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>$1,510</td>
<td>11.04%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>$1,049</td>
<td>9.20%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>$565</td>
<td>6.44%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>$1,182</td>
<td>2.30%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>$824</td>
<td>-3.19%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>$1,272</td>
<td>-13.23%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>$1,188</td>
<td>-27.21%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>$982</td>
<td>-48.17%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$537</td>
<td>13.08%</td>
<td>30.00%</td>
<td>2,068</td>
</tr>
<tr>
<td>Year</td>
<td>Current Year Revenues</td>
<td>Reinvestment Capital</td>
<td>∆Revenues</td>
<td>Sales/Capital Reinvestment Capital</td>
</tr>
<tr>
<td>------</td>
<td>-----------------------</td>
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<td>-----------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>$537</td>
<td>$2,744</td>
<td>$122</td>
<td>$122</td>
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<tr>
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<td>$806</td>
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<tr>
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<td>$1,611</td>
<td>$3,818</td>
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<td>$3,818</td>
</tr>
<tr>
<td>4</td>
<td>$2,900</td>
<td>$5,452</td>
<td>$2,206</td>
<td>$5,452</td>
</tr>
<tr>
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<td>$4,640</td>
<td>$5,452</td>
<td>$2,206</td>
<td>$5,452</td>
</tr>
<tr>
<td>6</td>
<td>$8,770</td>
<td>$7,682</td>
<td>$1,088</td>
<td>$7,682</td>
</tr>
<tr>
<td>7</td>
<td>$13,681</td>
<td>$8,718</td>
<td>$5,064</td>
<td>$8,718</td>
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<tr>
<td>8</td>
<td>$15,802</td>
<td>$9,962</td>
<td>$5,064</td>
<td>$9,962</td>
</tr>
</tbody>
</table>

Industry average = 15%
Expected Growth Rate

1. Revenue Growth
2. Operating Margins
3. Reinvestment Needs

Stable ROE

Changing ROE

Net Income

Earnings per share

ROE * Retention Ratio

+ (ROE + 1 - ROE) / ROE

Stable ROE

Net Income

Historical Fundamentals

Analysis

Historical

Fundamentals

Equity Earnings

Operating Income

Stable ROC

Changing ROC

Net Income

ROE * Retention Ratio

+ (ROE + 1 - ROE) / ROE

Stable ROC

Net Income

Historical Fundamentals

Analysis

Historical

Fundamentals

Equity Earnings

Operating Income

Stable ROC

Changing ROC

Net Income

ROE * Retention Ratio

+ (ROE + 1 - ROE) / ROE

Stable ROC

Net Income

Historical Fundamentals

Analysis

Historical

Fundamentals

Equity Earnings

Operating Income

Stable ROC

Changing ROC

Net Income

ROE * Retention Ratio

+ (ROE + 1 - ROE) / ROE

Stable ROC

Net Income

Historical Fundamentals

Analysis

Historical

Fundamentals

Equity Earnings

Operating Income

Stable ROC

Changing ROC

Net Income

ROE * Retention Ratio

+ (ROE + 1 - ROE) / ROE

Stable ROC

Net Income

Historical Fundamentals

Analysis

Historical

Fundamentals

Equity Earnings

Operating Income

Stable ROC

Changing ROC

Net Income

ROE * Retention Ratio

+ (ROE + 1 - ROE) / ROE

Stable ROC

Net Income

Historical Fundamentals

Analysis

Historical

Fundamentals

Equity Earnings

Operating Income

Stable ROC

Changing ROC

Net Income

ROE * Retention Ratio

+ (ROE + 1 - ROE) / ROE

Stable ROC

Net Income

Historical Fundamentals

Analysis

Historical

Fundamentals

Equity Earnings

Operating Income

Stable ROC

Changing ROC

Net Income

ROE * Retention Ratio

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Equity Earnings

Operating Income
Discounted Cashflow Valuation

IV. Closure in Valuation
Getting Closure in Valuation

A publicly traded firm potentially has an infinite life. Therefore the present value of cash flows forever is:

\[
\text{Value} = \sum_{t=1}^{\infty} \frac{CF_t}{(1+r)^t}
\]

Therefore the present value of cash flows forever:

\[
\text{Value} = \frac{1}{(1+r)^1} \sum_{t=1}^{\infty} \frac{1}{(1+r)^t}
\]

Since we cannot estimate cash flows forever, we estimate cash flows for a "growth period" and then estimate a terminal value, to capture the value at the end of the period:

\[
\text{Value} = \sum_{t=1}^{N} \frac{CF_t}{(1+r)^t} + \frac{1}{(1+r)^1} \sum_{t=N+1}^{\infty} \frac{1}{(1+r)^t}
\]
Ways of Estimating Terminal Value

- Liquidation Value
- Multiple Approach
- Stable Growth Model

Most useful when assets are separable and marketable.

Easiest approach but makes the valuation a relative valuation.

Technically soundest, but requires that you make judgments about when the firm will grow at a stable rate which it can sustain forever, and the excess returns (if any) that the firm will earn during the period.
When a firm's cash flows grow at a "constant" rate forever, the present value of those cash flows can be written as:

\[ \text{Value} = \frac{\text{Expected Cash Flow Next Period}}{r - g} \]

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.
Limits on Stable Growth

The stable growth rate cannot exceed the growth rate of the economy. If you assume that the economy is composed of high growth and stable growth firms, the growth rate of the latter will probably be lower than the growth rate of the economy. The terminal value can be negative. If you assume that your firm will disappear over time, the stable growth rate can be set lower. But it can be set lower.
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:

1. There is no high growth; in which case the firm is already in stable growth.
2. 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).
3. 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).

Each year will have different margins and different growth rates (n-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.

- Size of the firm

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 at 10% a year now.

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 strong they are, and how long they will remain.

- Ultimately, high growth comes from high project returns, which, in turn, come from barriers to entry and differential advantages.

Determine size of the firm.
Stable Growth and Fundamentals

The growth rate of a firm is driven by its fundamentals - how much it reinvests and how high project returns are. As growth rates approach "stability," the firm should be given the characteristics of a stable growth firm.

<table>
<thead>
<tr>
<th>High Growth Firms Usually</th>
<th>Stable Growth Firms Usually</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pay high dividends</td>
<td>1. Have low leverage</td>
</tr>
<tr>
<td>2. Have high risk</td>
<td>2. Have ROC closer to WACC</td>
</tr>
<tr>
<td>3. Earn high ROC</td>
<td>3. Earn ROC closer to WACC</td>
</tr>
<tr>
<td>4. Have lower net cap ex</td>
<td>4. Have leverage closer to industry average</td>
</tr>
</tbody>
</table>

The growth rate of a firm is driven by its fundamentals - how much it reinvests and how high project returns are. As growth rates approach "stability," the firm should be given the characteristics of a stable growth firm.
Consider the example of ABN Amro. Based upon its current return on equity of 15.79% and its retention ratio of 53.88%, we estimated a growth in earnings per share of 8.51%.

Let us assume that ABN Amro will be in stable growth in 5 years. At that point, let us assume that its return on equity will be closer to the average for European banks of 15%, and that it will grow at a nominal rate of 5% (Real Growth + Inflation Rate in NV). The expected payout ratio in stable growth can then be estimated as follows:

\[
\text{Stable Growth Payout Ratio} = 1 - \frac{g}{\text{ROE}} = 1 - \frac{0.05}{0.15} = 66.67\%
\]

\[
b = \frac{g}{\text{ROE}}
\]

\[
Payout = 1 - b
\]
The soundest way of estimating reinvestment rates in stable growth is to relate them to expected growth and returns on capital:

Reinvestment Rate = Growth in Operating Income / Return on Capital

For instance, Cisco is expected to be in stable growth for 13 years from now, growing at 5% a year and earning a return on capital of 16.52%. The reinvestment rate in Year 13 can be estimated as follows:

Reinvestment Rate = 5% / 16.52% = 30.27%

If you are consistent about estimating reinvestment rates, you will find that it is not the stable growth rate that drives your value but your excess returns. If your return on capital is equal to your cost of capital, your terminal value will be unaffected by your stable growth assumption.
Discounted Cashflow Valuation

V. Beyond Inputs: Choosing and Using the Right Model

Using the Right Model: Chosing and...
In summary, at this stage in the process, we should have an estimate of

- the current cash flows on the investment, either to equity investors or to the firm (cash flow to the firm)
- the current cost of equity and/or capital on the investment
- the current cash flows on the investment, either to equity investors or to the firm (cash flow to the firm)
- the expected growth rate in earnings, based upon historical growth, analysts forecasts and/or fundamentals
- which discount rate needs to be estimated and which cash flow to discount, which should indicate
- which pattern we will assume growth to follow

The next step in the process is deciding

- which cash flow to discount, which should indicate
- which discount rate needs to be estimated and
- what pattern we will assume growth to follow

Summarizing the Inputs
Which cash flow should I discount?

(a) for firms which have stable leverage over time, because debt payments and issues do not change the leverage over time, and expect to change the leverage over time, because debt payments and issues do not have to be factored in the cash flows and the discount rate (cost of capital) does not change dramatically over time.

(b) for firms for which you have partial information on leverage (e.g.: interest expenses are missing).

(c) in all other cases, where you are more interested in valuing the firm than the equity. (Value Consulting?)

Use Firm Valuation

Use Equity Valuation

(b) if equity (stock) is being valued,

(a) for firms which have stable leverage, whether high or not, and whichever equity.

Use Equity Valuation

Use Firm Valuation

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

- Use the Dividend Discount Model
  - 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.)
- Use the FCFE Model
  - For firms which pay dividends which are significantly lower or lower than the Free Cash Flow to Equity (Example: Private Financial Service companies are difficult to estimate (Example: Banks and... (b) For firms where FCFE are not available (Example: Private Companies, IPOs),
  - For firms which pay dividends which are significantly lower or lower than the Free Cash Flow to Equity (over a extended period)
What discount rate should I use?

Cost of Equity versus Cost of Capital

- If discounting cash flows to equity -> Cost of Equity
- If discounting cash flows to the firm -> Cost of Capital

What currency should the discount rate (risk free rate) be in?

- Match the currency in which you estimate the risk free rate to the currency of your cash flows

Should I use real or nominal cash flows?

- If inflation is high (>10%), switch to real cash flows since taxes are based upon nominal income
- If inflation is low (<10%), stick with nominal cash flows
- If nominal cash flows -> nominal cost of capital
- If real cash flows -> real cost of capital
- If discounting real cash flows -> real cost of capital
Which Growth Pattern Should I use?

Use a 3-Stage or n-Stage Model

- Large and growing at a very high rate (> Overall Growth Rate + 10%)
- Has significant barriers to entry into the business
- Has firm characteristics that are very different from the norm

Use a 2-Stage Growth Model

- Is large and growing at a moderate rate (≥ Overall Growth Rate + 10%)
- Has a single product or barriers to entry with a finite life (e.g., patents)

Use a Stable Growth Model

- Is small and growing at a very high rate (≤ Overall Growth Rate + 10%)
- Constrained by regulation from growing at a rate faster than the economy
- Large and growing at a rate close to or less than growth rate of the economy
- Has firm characteristics of a stable firm (average risk & reinvestment rates)

If your firm is...
The Building Blocks of Valuation

### Cash Flows to Equity
- Expected Dividends to Stockholders
- Net Income
  - \( (1 - \delta) \) (Capital Exp. - Deprec'n)
  - \( (1 - \delta) \) Change in Working Capital
- Free Cash Flow to Equity (FCFE)

### Cash Flows to Firm
- EBIT (1 - tax rate)
- Change in Working Capital
- Free Cash Flow to Firm (FCFF)

### Discount Rate
- Cost of Equity
  - Basis: The higher the investment, the greater is the cost of equity.
  - Models:
    - CAPM: Risk-free Rate + Beta (Risk Premium)
    - APM: Risk-free Rate + \( \sum \) Beta \( \times \) (Risk Premium)
- Cost of Capital
  - WACC = \( ke \ \frac{E}{D+E} \) + \( kd \ \frac{D}{D+E} \)
  - \( kd \) = Current Borrowing Rate (1 - t)

### Growth Patterns
- Stable Growth
- Two-Stage Growth
- Three-Stage Growth
  - Initial: High Growth
  - Stable: Transition
  - Terminal: Stable Growth

- Expected Dividends to Equity
- Cash Flows to Equity
- Dividends
- Cash Flow
6. Tying up Loose Ends
The simplest and most direct way of dealing with cash and marketable securities is to keep it out of the valuation - the cash flows should be calculated before interest income from cash and securities, and the discount rate should not be contaminated by the inclusion of cash. (Use betas of the operating assets alone to estimate the cost of equity).

If you have a particularly incompetent management, with a history of overpaying on acquisitions, markets may discount the value of this cash.

Once the firm has been valued, add back the value of cash and marketable securities.

If you have a particularly incompetent management, with a history of overpaying on acquisitions, markets may discount the value of this cash.
How much cash is too much cash?
Implicitly, we are assuming here that the market will value cash at face value. Assume now that you are buying a firm whose only asset is marketable securities worth $100 million. Can you ever consider a scenario where you would not be willing to pay $100 million for this firm?

Q: What is or are the scenario(s)?

R: Yes

Implication: If yes, we are assuming here that the market will value cash at face value.
Closed end funds are mutual funds, with a fixed number of shares. Unlike regular mutual funds, where the shares have to trade at net asset value (which is the value of the securities in the fund), closed end funds shares can and often do trade at prices which are different from net asset value (of between 10 and 20%) in the United States.

The average closed end fund has always traded at a discount on net asset value.
Discount or Premium on NAV

Discounts/Premiums on Closed End Funds - June 2002
Assume that you have a closed-end fund that invests in ‘average risk’ stocks. Assume also that you expect the market (average risk) to make 11.5% annually over the long term. If the closed-end fund underperforms the market by 0.50%, estimate the discount on the fund.
A Premium for Marketable Securities

Some closed end funds trade at a premium over the value of the marketable securities in the fund. Why might an investor be willing to pay a premium over the value of the marketable securities in the fund? For instance, the Thai closed end funds were trading at a premium of roughly 40% on net asset value and the Indonesian fund at a premium of 20%. Why might an investor be willing to pay a premium over net asset value?
Dealing with Holdings in Other Firms

Holdings in other firms can be categorized into:

- Minority passive holdings, in which case only the dividend from the holdings is shown in the balance sheet.
- Minority active holdings, in which case the share of equity income is shown in the income statements.
- Majority active holdings, in which case the financial statements are consolidated.
- Majority passive holdings, in which case the share of equity income is shown in the income statements.
How to value holdings in other firms

Parent Firm:

Value subsidiary as a firm and add portion of firm value. Add portion of debt in subsidiary to the debt in portion of firm value. Add portion of equity in subsidiary and take share of holding.

Not consolidated:

Value subsidiary in subsidiary and take equity in subsidiary.

Consolidated:

Strip operating income of subsidiary and estimating equity value. Add portion of this value to value of firm and value subsidiary separately. Add and value subsidiary separately. Add and value subsidiary separately.
How some deal with subsidiaries...
Assume that you have done an equity valuation of Microsoft. The total value for equity is estimated to be $400 billion and there are 5 billion shares outstanding. What is the value per share?
In 1999, Microsoft had 500 million options outstanding, granted to employees over time. These options had an average exercise price of $20 (the current stock price is $80). Estimate the value per share.
The conventional way of getting from equity value to per share value is to divide the equity value by the number of shares outstanding. This approach assumes, however, that common stock is the only equity claim on the firm. In many firms, there are other equity claims as well including:

- contingent value rights, that are also publicly traded.
- conversion options in convertible bonds
- warrants, that are publicly traded
- management and employee options, that have been granted, but do not trade

The value of these non-stock equity claims has to be subtracted from equity value before dividing by the number of shares outstanding.
A warrant is a security issued by a company that provides the holder with the right to buy a share of stock in the company at a fixed price during the life of the warrant. A warrant is therefore a long term call option on the equity of the firm and can be valued using option pricing models.

For: estimating debt and equity for the leverage calculation

Warrants and other equity options issued by the firm are claims on the equity of the firm and have to be treated as equity, which has relevance for:

- estimating per share value from total equity value
- estimating total share value

A warrant is therefore a long term call option on the equity of the firm with the right to buy a share of stock in the company at a fixed price, which provides the holder with: Warrants
Convertible Bonds

A convertible bond is a bond that can be converted into a predetermined number of shares, at the option of the bond holder. Firms generally add conversion options to bonds to lower the interest rate paid on the bonds. While it generally does not pay to convert at the time of the bond issue, conversion becomes a more attractive option as stock prices increase. A convertible bond can be considered to be made up of two securities - a straight bond and a conversion option. A convertible bond is a bond that can be converted into a pre-determined number of shares, at the option of the bond holder.
Aswath Damodaran

The straight bond component is clearly debt, if

\[
\text{Value of Bond} = \sum_{t=1}^{T} \frac{C_t}{(1 + r)^t} + \frac{FV}{(1 + r)^T}
\]

where \(C_t\) is the coupon payment, \(FV\) is the face value of the bond, and \(r\) is the market interest rate.

Step 1: Obtain the coupon rate on the convertible bond, the coupon rate and

Step 2: Estimate the interest rate that the company would have had to pay

if it had issued a straight bond. This can be obtained either from the

Step 3: Using the maturity of the convertible bond, the coupon rate and

value of the convertible bond, estimate the value of the straight bond component.

The easiest way to value the straight bond component is to act as if

Embedded in every convertible bond is a straight bond component.
Factors in Using Option Pricing Models to Value Convertibles and Warrants

Option pricing models can be used to value the conversion option with three caveats –

- Conversion options are long term, making the assumptions about constant variance and constant dividend yields much shakier,
- Conversion options are often exercised before expiration, making it dangerous to use European option pricing models,
- Conversion options result in stock dilution, and these problems can be partially alleviated by using a binomial option pricing model, allowing for shifts in variance and early exercise, and dilution effect.

Option pricing models can be used to value the conversion option with these caveats.
Steps in Getting to Value Per Share:

Step 1: Value the firm, using discounted cash flow or other valuation models.

Step 2: Subtract out the value of the outstanding debt to arrive at the value of equity. Alternatively, skip step 1 and estimate the value of equity directly.

Step 3: Subtract out the market value (or estimated market value) of other equity claims:

- Value of Warrants = Number of Warrants * Market Price per Warrant
- Value of Conversion Option = Market Value of Convertible Bonds - Value of Straight Debt Portion of Convertible Bonds

Alternatively, estimate the value using option pricing models.

Step 4: Divide the remaining value of equity by the number of shares outstanding to get value per share.
The equity in Sterling Software was valued at $2,036 million, based upon projected cash flows.

The firm has 1.8 million warrants outstanding, with a strike price of $55 per share.

The firm has 115,000 bonds outstanding, each of which can be converted into 20 shares of stock. The market price of each convertible bond is $1,522 and the face value is $1,000; coupon rate of 5.75%; expires in 8 years; Bond Rating is A-; Interest rate on comparable debt = 7.50%.

The firm has 1.8 million warrants outstanding, with a strike price of $55 per share.

The equity in Sterling Software was valued at $2,036 million, based upon projected cash flows.
Estimating the Value of Options

Convertible Debt has market value of $175 million; face value of $115 million; coupon rate of 5.75%; expires in 8 years;

- Bond Rating is A-; Interest rate on comparable debt = 7.50%.
- Coupon on Convertible Debt = 0.75% of $115 million = $0.8625 million.
- Value of Straight Debt Portion of Convertible Debt = $6.6125 million.
- Annuity, 7.5%, 8 years = $115 million / 1.075^8 = $103.21 million.
- Value of Straight Debt Portion = $103 - $6.6125 = $96.3875 million.
- Number of Warrants = $1.8 million
- Warrant Price = $30
- Value of Warrants = $54 million.


Equity:


- Coupon on Convertible Debt = 0.75% of $115 million = $0.8625 million.
- Bond Rating is A-; Interest rate on comparable debt = 7.50%.
- 115 million; coupon rate of 5.75%; expires in 8 years;
- Convertible Debt has market value of $175 million; face value of $115 million; coupon rate of 5.75%; expires in 8 years.
- Convertible Debt has market value of $175 million; face value of $115 million; coupon rate of 5.75%; expires in 8 years.

Value of Warrants = Number of Warrants * Warrant Price = 1.8 million warrants * $30 = $54 million.
<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value of Equity in Common Stock</td>
<td>$1,910 million</td>
</tr>
<tr>
<td>Value of Equity in Warrants</td>
<td>$54 million</td>
</tr>
<tr>
<td>Value of Equity in Convertible Debt</td>
<td>$72 million</td>
</tr>
<tr>
<td>Value of Equity in Convertible Debt</td>
<td>$7,036 million</td>
</tr>
<tr>
<td>Value Per Share</td>
<td>$74.90</td>
</tr>
</tbody>
</table>
A Comparison to Other Approaches

The Conservative Approach: Estimate the total number of shares outstanding, including those in the options.

Value of Equity per share = Value of Equity / Fully diluted # of shares

(2,036 + 115 + 1.8*55)/(25.5 + 2.3 + 1.8) = $76.01

The Treasury Stock Approach: Add the expected proceeds from exercise to the numerator before dividing by the number of shares outstanding.

Value of Equity per share = (Value of Equity + Proceeds from Exercise) / Fully diluted number of shares

(2,036 + 115 + 19.5 + 2.3 + 1.8) = $68.78

The Conservative Approach: Estimate the total number of shares outstanding; including those in the options.

Value of Equity per share = Value of Equity / Fully diluted # of shares

(2,036 + 115 + 1.8*55)/(25.5 + 2.3 + 1.8) = $76.01
<table>
<thead>
<tr>
<th>Company</th>
<th>Estimated Earnings</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Con Ed Stable</td>
<td>Dividends=FCFE, Stable D/E, Low g</td>
<td>ABN Amro 2-Stage DDM</td>
</tr>
<tr>
<td>ABN Amro</td>
<td>Dividends=FCFE, Stable D/E, Low g</td>
<td>Con Ed Company Stable FCFE</td>
</tr>
<tr>
<td>S&amp;P 500</td>
<td>Collectively, market is an investment</td>
<td>Sony Stable FCFE</td>
</tr>
<tr>
<td>Tsingtao</td>
<td>Dividends=FCFE, Stable D/E, High g</td>
<td>DaimlerChrysler Stable FCFE</td>
</tr>
<tr>
<td>DaimlerChrysler</td>
<td>Dividends=FCFE, Stable D/E, High g</td>
<td>Global Crossing 2-stage FCFE</td>
</tr>
<tr>
<td>The Home Depot</td>
<td>Capitalizing Operating Leases</td>
<td>The Home Depot 2-stage FCFE</td>
</tr>
<tr>
<td>Amazon.com</td>
<td>Normalized Earnings, Stable Sector</td>
<td>The Home Depot 2-stage FCFE</td>
</tr>
<tr>
<td>Global Crossing</td>
<td>FCFE≠, Regulated D/E, &lt; Stable FCFE</td>
<td>Global Crossing 2-stage FCFE</td>
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<tr>
<td>Sony</td>
<td>Model Used</td>
<td>Sony Stable FCFE</td>
</tr>
<tr>
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<td>Dividends=FCFE, Stable D/E, High g</td>
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</tr>
</tbody>
</table>
The risk premium that I will be using in the latest valuations for mature equity markets is 4.5%. This is the average implied equity risk premium from 1960 to 2002.

For the valuations from 1998 and earlier, I use a risk premium of 5.5%.

General Information
Con Ed: Rationale for Model

- The firm pays out dividends that are roughly equal to FCFE.
- The firm is in stable leverage.
- The beta is 0.80 and has been stable over time.
- Firm characteristics are consistent with stable, DDM model firm.
- Dividends as % of FCFE = 99%.

- Average annual dividends between 1997 and 2002 = $577 million
- Average annual FCFE between 1997 and 2002 = $585 million

Firm characteristics allow profits to grow at extraordinary rates. It is unlikely that the regulators will allow profits to grow at extraordinary rates. It is unlikely that the regulators will serve. Its rates are also regulated.
Aswath Damodaran

The stock was trading at $ 42.90 on December 31, 2002.

Value of Equity per Share = $2.22 / (1.03 / 0.72 - 0.03) = $ 53.80

Con Ed Beta = 0.80 (Bottom-up beta estimate)

Expected Growth Rate in Earnings and Dividends = 3%

Dividends per Share for 2002 = $2.22

Dividend Payout Ratio over 2002 = 71.61%

Earnings per Share for 2002 = $ 3.10 (Fourth quarter estimate used)

2002

Con Ed: A Stable Growth DDM: December 31,
Expected Growth Rate

Value per share

Break even point: Value = Price

Con Ed: Break Even Growth Rates
To estimate the implied growth rate in Con Ed’s current stock price, we set the market price equal to the value, and solve for the growth rate:

\[
\text{Estimating Implied Growth Rate}
\]

\[
\text{Implied Growth Rate} = \frac{\text{Price per share}}{\text{Retention ratio}} = \frac{\$42.90}{0.2839} = 150.39
\]

• Given its retention ratio of 28.39% and its return on equity in 2002 of 11%, the fundamental growth rate for Con Ed is:

\[
\text{Fundamental Growth Rate} = (0.2839 \times 0.11) = 3.12\%
\]

\[
\text{Break even Return on Equity} = \frac{\text{Growth Rate}}{\text{Retention Ratio}} = \frac{0.0196}{0.2839} = 6.91\%
\]

You could also frame the question in terms of a break-even return on equity:

\[
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\text{Break even Return on Equity} = \frac{\text{Growth Rate}}{\text{Retention Ratio}} = \frac{0.0196}{0.2839} = 6.91\%
\]
When you do any valuation, there are three possibilities. The first is that you are right and the market is wrong. The second is that you are right and the market is wrong. The third is that you are both wrong. In an efficient market, which is the most likely scenario?
As a financial service institution, estimating FCFE or FCFF is very difficult. A stable growth rate (roughly 4% in Euros) would be a stable growth rate based upon the current return on equity of 16% and a retention ratio of 42% is 6.7%. This is higher than what is very
### Long Term Riskfree Rate (in Euros)
- **4.95%**

### Risk Premium
- **4%** (U.S. premium : Netherlands is AAA rated)

### Current Earnings Per Share
- **1.54 EUR**

### Current DPS
- **0.90 EUR**

<table>
<thead>
<tr>
<th>Phase</th>
<th>Length</th>
<th>Return on Equity</th>
<th>Payout Ratio</th>
<th>Retention Ratio</th>
<th>Beta</th>
<th>Expected Growth</th>
<th>Cost of Equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable Growth Phase</td>
<td>5 years</td>
<td>8.95%</td>
<td>58.44%</td>
<td>41.56%</td>
<td>0.95</td>
<td>4.1%</td>
<td>8.75%</td>
</tr>
<tr>
<td>High Growth Phase</td>
<td>Forever after yr 5</td>
<td>16%</td>
<td>55.31%</td>
<td>44.69%</td>
<td>1.00</td>
<td>4%</td>
<td>8.95%</td>
</tr>
</tbody>
</table>

### Market Inputs
- **4.95%** + 0.95(4%) = **8.75%**
- **4.95%** + 1.00(4%) = **8.95%**

### ABN Amro: Summarizing the Inputs

- **Market Inputs**
  - **4%** (U.S. premium : Netherlands is AAA rated)
  - **Long Term Riskfree Rate (in Euros) = 4.95%**

- **Expected Growth**
  - **1%**

- **Beta**
  - **0.95**

- **Return on Equity**
  - **16%**

- **Payout Ratio**
  - **58.44%**

- **Retention Ratio**
  - **41.56%**

- **Variable Growth Phase**
  - **Expected Growth = 1.54 EUR; Current DPS = 0.90 EUR**

- **High Growth Phase**
  - **Return on Equity = 16%**

- **Retention Ratio = 41.56%**

- **Payout Ratio = 58.44%**

- **Beta = 0.95**

- **Expected Growth = 1%**

- **Market Inputs**
  - **4.95%**
  - **1.00(4%) = 4.95%**
  - **4%**
The stock was trading at 15.99 Euros on December 31, 2002.

Valuation:

Value Per Share = 0.88 + 0.87 + 0.85 + 0.83 + 0.82 + 16.23 = 20.48 EUR

Expected EPS in year 6 = 2.12(1.04) = 2.21 EUR

Expected DPS in year 6 = 2.21*0.5531 = 1.22 EUR

Terminal Price (in year 5) = 1.22/(0.0895 - 0.04) = 24.69 EUR

PV of Terminal Price = 24.69/(1.0875)^5 = 16.23 EUR

Terminal Price (in year 5) = 1.22/(0.0895 - 0.04) = 24.69 EUR

The stock was trading at 15.99 Euros on December 31, 2002.
Dividends

\[ \text{EPS} = 1.54 \text{ Eur} \times \text{Payout Ratio 58.44\%} \]

\[ \text{DPS} = 0.90 \text{ Eur} \]

Expected Growth

\[ 41.56\% \times 16\% = 6.65\% \]

Discoun\text{a}n\text{t}\text{ed}\text{ at\ Cost\ of\ Equity}\text{ per Share} = 20.48 \text{ Eur}

Cost of Equity

\[ 4.95\% + 0.95(4\%) = 8.75\% \]

Risk-free Rate: Long-term bond rate in Euros

\[ 4.95\% \]

Retained Ratio = 41.56\%

\[ \text{ROE} = 16\% \]

Figure 1: VALUING ABN AMRO
The Value of Growth

In any valuation model, it is possible to extract the portion of the value that can be attributed to growth, and to break this down further into the portion attributable to "high growth" and the portion attributable to "stable growth". In the case of the 2-stage DDM, this can be accomplished as follows:

In the case of the 2-stage DDM, this can be accomplished as follows: to "stable growth". In the case of the 2-stage DDM, this can be attributed to "high growth" and the portion attributable to "stable growth". In any valuation model, it is possible to extract the portion of the value attributable to "high growth" and the portion attributable to "stable growth".
Value of Assets in Place = Current DPS/Cost of Equity
= 0.90 Euros/0.0895
= 10.06 Euros

Value of Stable Growth = 0.90 (1.04)/(0.0895 - 0.04) - 10.06 Euros
= 8.85 Euros

Value of High Growth = Total Value - (10.06 + 8.85)
= 20.48 - (10.06 + 8.85)
= 1.57 Euros

A more precise estimate would have required us to use the stable growth payout ratio to re-estimate dividends.
While markets overall generally do not grow faster than the economies in which they operate, there is reason to believe that the earnings of U.S. companies (which have outpaced nominal GDP growth over the last 5 years) will continue to do so in the next 5 years. The consensus estimate of growth in earnings (from Zacks) is roughly 8% with top-down estimates (from Gartner) of roughly 8%.

Though it is possible to estimate FCFE for many of the firms in the S&P 500, it is not feasible for several (financial, service firms). The consensus estimate of earnings growth (from Zacks) is roughly 8% (with top-down estimates (from Gartner) of roughly 8%).

Buying the index, conservative estimates of the cash flows to equity investors from dividends during the year should provide a reasonable (albeit conservative) estimate of cash flows to equity investors from buying the index.
### General Inputs
- Long Term Government Bond Rate = 4.05%
- Risk Premium for U.S. Equities = 4%
- Current level of the Index = 879.82
- Long Term Government Bond Rate = 4.05%

### Inputs for the Valuation

<table>
<thead>
<tr>
<th>Phase</th>
<th>Length</th>
<th>Dividend Yield</th>
<th>Expected Growth</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Growth Phase</td>
<td>5 years</td>
<td>1.81%</td>
<td>8%</td>
<td>1.00</td>
</tr>
<tr>
<td>Stable Growth Phase</td>
<td>Forever</td>
<td>1.81%</td>
<td>4%</td>
<td>1.00</td>
</tr>
</tbody>
</table>

### Diagram
- Inputs for the Valuation
- Current level of the Index = 879.82
- Risk Premium for U.S. Equities = 4%
- Long Term Government Bond Rate = 4.05%
- General Inputs
Cost of Equity = 4.05% + 1(4%) = 8.05%

Terminal Value = 23.45 * 1.0405 / (0.0805 - 0.0405) = 610.01

Expected Dividends: $17.24 $18.62 $20.11 $21.71 $23.45

Expected Terminal Value: $610.01

Present Value: $15.95 $15.95 $15.94 $15.93 $430.12

Intrinsic Value of Index: $493.89
Aswath Damodaran

Explaining the Difference

The index is at 880, while the model valuation comes in at 494. This indicates that one or more of the following has to be true.

• The dividend is overvalued.
• The risk premium used in the valuation (4%) is too high.
• The expected growth in earnings over the next 5 years will be much higher than 8%.
• The expected growth in earnings over the next 5 years will be much less than FCFE.
• The dividend discount model understates the value because dividends are less than FCFE.

This indicates that one or more of the following has to be true.
At a level of 880, the market is overvalued by about 3.7%.

<table>
<thead>
<tr>
<th>Expected Dividends</th>
<th>Expected Terminal Value</th>
<th>Present Value</th>
<th>Intrinsic Value of Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>$27.77</td>
<td>$27.69</td>
<td>$27.68</td>
<td>$27.66</td>
</tr>
<tr>
<td>$31.09</td>
<td>$34.91</td>
<td>$33.33</td>
<td>$29.93</td>
</tr>
<tr>
<td>$37.71</td>
<td>$34.91</td>
<td>$33.33</td>
<td>$29.93</td>
</tr>
<tr>
<td>$40.72</td>
<td>$34.91</td>
<td>$33.33</td>
<td>$29.93</td>
</tr>
<tr>
<td>$27.72</td>
<td>$27.69</td>
<td>$27.68</td>
<td>$27.66</td>
</tr>
</tbody>
</table>

With these inputs in the model:

- The average implied risk premium between 1960 and 2002 of 4% is used.
- The average excess yield for the index was about 3.15% in 2001.
- We estimated the free cashflows to equity for each firm in the index and averaged the free cashflow to equity as a percent of market cap. The average FCFE yield for the index was about 3.15% in 2001.

A More Realistic Valuation of the Index
Japanese firms have proved to be among the most difficult to value for several reasons:

- The earnings in 2001 for most Japanese firms was depressed relative to earnings earlier in the decade and in the 1980s, reflecting the Japanese economy.
- Japanese accounting standards tend to understate earnings and overstated book value of equity, as firms are allowed to set aside provisions for unspecified expenses.
- The earnings of many export-oriented Japanese firms tend to be heavily influenced by exchange rate movements.
- The cross holdings that Japanese firms have in other firms, and the lack of transparency in these holdings, makes it difficult to value these holdings.
- Several reasons: Japanese firms have proved to be among the most difficult to value for

Sony: Background on Japanese Firms
Valuing Sony: August 2000


Capital expenditures in 1999 amounted to 103 billion JPY, whereas depreciation is 76 billion JPY.

Non-cash working capital at Sony in 1999 was 220 billion JPY on revenues of 2,593 billion yen, yielding a non-cash working capital to revenue ratio of 8.48%.

The long term government bond rate in Japan was 2% at the time of this valuation.

The long term government bond rate in Japan was 2% at the time of this valuation.
We will normalize earnings to reflect the fact that current earnings are depressed. To normalize earnings, we will use the return on equity of 5.25%, which is the return on equity that Sony had last year and is close to return on equity for other firms. We will not use the return on equity of 3.5% which is the return on normalized earnings. We will normalize to reflect the fact that current earnings are depressed.

Sony’s current book debt to capital ratio is 25.8%; we will assume that they will finance non-cash working capital with 8.48% of revenues. We will assume that the net capital expenditures will grow at the same rate and that Sony’s market value is relatively close to equity. We will assume that the unlevered beta of Sony is 1.10, to reflect the unlevered beta of electronic firms (globally) which is higher than the Japanese economy due to global exposure. Over the last 5 years, the growth rate in revenues has been 3.5%. We will assume that the firm’s dominant market share will keep it from posting high growth. Sony’s current book debt to capital ratio is 25.8%; we will assume that they will finance reinvestment with this ratio (rather than the market value).
Estimating the Inputs

Book Value of Equity = 25.8% 

Cost of Equity = 2% + 1.10 (4%) = 6.40% 

Book Value Debt Ratio = 25.8% 

Normalized Earnings: 
- Book Value of Equity (3/1999) = 1795 billion JPY 
- Estimated Return on Equity = 5.25% 
- Normalized Net Income next year = 1795 billion * 0.0525 = 94.24 billion JPY 

Reinvestment Needs: 
- Expected Change in non-cash Working Capital = (2671 - 2593) * 0.0848 = 6.60 billion JPY 
- Expected Revenues next year = 2593 * 1.03 = 2671 billion JPY 
- Current Revenues = 2593 billion JPY 
- Expected Net Capital Expenditures = 27 billion (1.03) = 27.81 billion JPY 
- Current Net Capital Expenditures = 27 billion JPY 

Normalized Earnings: 
- Estimated Return on Equity = 5.25% 
- Normalized Earnings = 1795 billion JPY (3/1999)
Aswath Damodaran

The Valuation

Expected FCFE next year

Expected Net Income = 94.24 billion

\[
\text{Net Income} = 94.24 \text{ billion} - (\text{Net Cap Ex}) (1 - \text{Debt Ratio}) = 27.81 (1 - 0.258) = 20.64
\]

\[
\Delta \text{Non-cash WC} (1 - \text{Debt Ratio}) = 6.6 (1 - 0.258) = 4.89
\]

\[
\text{FCFE} = 68.71 \text{ billion JPY}
\]

Cost of Equity = 6.4%; Stable growth rate = 3%

\[
\text{Value of Equity} = \frac{68.71 \text{ billion}}{0.064 - 0.03} = 2021 \text{ billion JPY}
\]

Sony was trading at a market value of equity of 7146 billion JPY

\[
\text{Value of Equity} = 68.71 \text{ billion} / (0.064 - 0.03) = 2021 \text{ billion JPY}
\]

\[
\text{Cost of Equity} = 6.4\%; \text{ Stable growth rate} = 3\%
\]

\[
\text{Value of Equity} = \frac{68.71 \text{ billion}}{0.064 - 0.03} = 2021 \text{ billion JPY}
\]

The Valuation
When firms have minority passive holdings in other companies, they report only the dividends they receive from these holdings as part of net income. Consequently, we tend to underestimate the value of these crossholdings net income.

To value them right, we have to estimate the value of the companies in which these holdings are. and then take the percentage of the value of these crossholdings which these holdings are, and then take the percentage of the value of the companies in which these holdings are owned by the firm you are valuing.

The Effect of Cross-holdings
Earnings per share at the firm has grown about 5% a year for the last 5 years, but the fundamentals at the firm suggest growth in EPS of about 12% a year for the next 5 years. Analysts are also forecasting a growth rate of 12% a year for the firm. Nestle has paid less in dividends than it has available in FCFE. Like many large European firms, Nestle has paid less in dividends than making an assumption. How do I know? I do not. I am just change that leverage materially. How do I know? I do not. I am just likely to Nestle has a debt to capital ratio of about 37.6% and is unlikely to}
General Inputs

- Long Term Government Bond Rate (Sfr) = 4%
- Current EPS = 108.88 Sfr; Current Revenue/Share = 1,820 Sfr
- Capital Expenditures/Share = 114.2 Sfr; Depreciation/Share = 73.8 Sfr
- Capital Expnditures/Share = 65.10% (Current) - 35.80% (Existing)
- Current Debt Ratio = 37.60%
- WC/Revenues = 15.38%
- Expected Growth = 15.38% - 5.00%
- Retention Ratio = 65.10% (Current) - NA
- Return on Equity = 23.63% - 16%
- Beta = 0.85
- Length - 5 years

High Growth

- Growth Rate = 5.00%
- Capital Expnditures/Share = 114.2 Sfr; Depreciation/Share = 73.8 Sfr
- Current EPS = 108.88 Sfr; Current Revenue/Share = 1,820 Sfr
- Long Term Government Bond Rate (Sfr) = 4%

Nestle: Summarizing the Inputs
<table>
<thead>
<tr>
<th>Region</th>
<th>Revenues</th>
<th>Risk Premium</th>
<th>Weight</th>
<th>Cost of Equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>17.5</td>
<td>4.00%</td>
<td>4.00%</td>
<td>8.47%</td>
</tr>
<tr>
<td>South America</td>
<td>4.3</td>
<td>6.10%</td>
<td>12.00%</td>
<td>10.70%</td>
</tr>
<tr>
<td>Switzerland</td>
<td>1.1</td>
<td>1.56%</td>
<td>4.00%</td>
<td>5.66%</td>
</tr>
<tr>
<td>Germany/France/UK</td>
<td>18.4</td>
<td>26.10%</td>
<td>1.00%</td>
<td>27.45%</td>
</tr>
<tr>
<td>Italy/Spain</td>
<td>6.4</td>
<td>9.08%</td>
<td>4.50%</td>
<td>13.58%</td>
</tr>
<tr>
<td>Asia</td>
<td>5.8</td>
<td>8.83%</td>
<td>9.00%</td>
<td>17.83%</td>
</tr>
<tr>
<td>Eastern Europe</td>
<td>4</td>
<td>5.67%</td>
<td>8.00%</td>
<td>13.67%</td>
</tr>
<tr>
<td>Rest of W. Europe</td>
<td>13</td>
<td>18.44%</td>
<td>1.00%</td>
<td>19.44%</td>
</tr>
<tr>
<td>Total</td>
<td>70.5</td>
<td>100.00%</td>
<td>5.26%</td>
<td>8.47%</td>
</tr>
</tbody>
</table>

The risk premium that we will use in the valuation is 5.26%.

Cost of Equity = 4% + 0.85(5.26%) = 8.47%
Nestlé: Valuation

The stock was trading $29.05 on December 31, 1999.

Earnings $125.63 $144.95 $167.25 $192.98 $222.66
-(Net CpEX)*(1-DR) $29.07 $33.54 $38.70 $44.65 $51.52
-∆WC*(1-DR)$16.25 $18.75 $21.63 $24.96 $28.79
Free Cashflow to Equity $80.31 $92.67 $106.92 $123.37 $142.35
Present Value $74.04 $78.76 $83.78 $89.12 $94.71

Earnings per Share in year 6 = 222.66(1.05) = 231.57
Net Capital Ex 6 = Depreciun 6 * 0.50 = 73.8(1.1538)(1.05) = 78.5

Terminal Value per Share = Earnings per Share in year 6 / (r - g)

Terminal Value per Share = 231.57 / (0.0847 - 0.05) = 3011.57

Free Cashflow to Equity = Earnings 6 - AWC 6*(1-DR) - (Net CpEX 6)*(1-DR)

<table>
<thead>
<tr>
<th>Year</th>
<th>Earnings</th>
<th>AWC</th>
<th>Net CpEX</th>
<th>Free Cashflow to Equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$125.63</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>$144.95</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>$167.25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>$192.98</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>$222.66</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In our valuation of Nestle, we assumed that cap ex would be 150% of depreciation in steady state. If, instead, we had assumed that net cap ex was zero, as many analysts do, the terminal value would have been:

\[
\text{Terminal Value per Share} = \frac{\text{FCFE}_6}{(\frac{0.0847}{1.0847}) - 0.05} = 498.62 \text{ Sfr}
\]

\[
\text{Value} = 74.04 + 78.76 + 83.78 + 89.12 + 94.70 + \frac{498.62}{(1.0847)^5} = 3740.91 \text{ Sfr}
\]

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\[
\text{Terminal Value per Share} = \frac{\text{FCFE}_6}{(\frac{0.0847}{1.0847}) - 0.05} = 498.62 \text{ Sfr}
\]

\[
\text{Value} = 74.04 + 78.76 + 83.78 + 89.12 + 94.70 + \frac{498.62}{(1.0847)^5} = 3740.91 \text{ Sfr}
\]
A VALUATION OF Nestlé (PER SHARE)
No valuation is timeless. Each of the inputs to the model are susceptible to change as new information comes out about the firm, its competitors and the overall economy.

The Effects of New Information on Value
Nestle: Effects of an Earnings Announcement

Assume that Nestle makes an earnings announcement which includes two pieces of news:

1. The earnings per share come in lower than expected. The base year earnings per share will be 105.5 Sfr instead of 108.8 Sfr.
2. Increased competition in its markets is putting downward pressure on the net profit margin. The after-tax margin, which was 5.98% in the previous year, is expected to shrink to 5.79%.

There are two effects on value:

1. The drop in earnings per share will be 105.5 Sfr instead of 108.8 Sfr.
2. The earnings per share will be lower than expected.
3. Increased competition is putting downward pressure on the net profit margin.
4. The drop in earnings per share will make the projected earnings and cash flows lower, even if the growth rate remains the same.
5. The drop in net margin will make the return on equity lower (assuming turnover remains unchanged). This will reduce expected growth.

6. The drop in net margin will make the return on equity lower (assuming turnover remains unchanged). This will reduce expected growth.
A RE-VALUATION OF NESTLE (PER SHARE)

Terminal Value = 164.84 / (0.0847 - 0.05) = 3687

Cashflow to Equity = Net Income - (Cap Ex - Dep) (1 - DR) - Change in WC

Expected Growth = 0.85 x Return on Equity x Retention Ratio

Risk Free Rate

Risk Premium

Cost of Equity = 4% + 0.85(5.26%) = 8.47%

Equity Value per Share = 2854 Sfr

Debt Ratio = 37.6%

Debt Ratio stays = 37.6%

Cost of Equity

Bottom-up beta = 0.79

Country Risk Premium = 1.26%

Base Equity Risk Premium = 4%

4% + 1.26% = 5.26%

Risk Premium

Debt Ratio stays = 37.6%

Cap Ex/Deprec = 150%

Risk Free Rate

Swiss Franc Rate = 4%

Beta = 0.85

Risk Premium

Country Risk Premium = 1.26%

Base Equity Risk Premium = 4%

Debt Ratio stays = 37.6%

Risk Free Rate

Swiss Franc Rate = 4%

Beta = 0.85

Country Risk Premium = 1.26%

Base Equity Risk Premium = 4%

Debt Ratio stays = 37.6%

Risk Free Rate

Swiss Franc Rate = 4%

Beta = 0.85

Country Risk Premium = 1.26%

Base Equity Risk Premium = 4%

Debt Ratio stays = 37.6%

Risk Free Rate

Swiss Franc Rate = 4%

Beta = 0.85

Country Risk Premium = 1.26%

Base Equity Risk Premium = 4%

Debt Ratio stays = 37.6%

Risk Free Rate

Swiss Franc Rate = 4%

Beta = 0.85

Country Risk Premium = 1.26%

Base Equity Risk Premium = 4%

Debt Ratio stays = 37.6%

Risk Free Rate

Swiss Franc Rate = 4%

Beta = 0.85

Country Risk Premium = 1.26%

Base Equity Risk Premium = 4%

Debt Ratio stays = 37.6%
Aswath Damodaran

Tsingtao Breweries: Rationale for Using Model:

June 2001

Why three stage?

Tsingtao is a small firm serving a huge and growing market – China, in particular, and the rest of Asia, in general. The firm's current return on equity is low, and we anticipate that it will improve over the next 5 years. As it increases, earnings growth will be pushed up.

Why FCFE?

Corporate governance in China tends to be weak and new debt issues.

Tsingtao consistently funds a portion of its reinvestment needs with dividends are unlikely to reflect free cash flow to equity. In addition, dividends are unlikely to reflect free cash flow to equity. In addition,

new debt issues.

Corporate governance in China tends to be weak and
In 2000, Tsingtao Breweries earned 72.36 million CY (Chinese Yuan) in net income on a book value of equity of 2,588 million CY, giving it a return on equity of 2.80%.
The firm had capital expenditures of 335 million CY and depreciation of 204 million CY during the year.
The working capital changes over the last 4 years have been volatile, and we normalize the change using non-cash working capital as a percent of revenues in 2000:

\[
\text{Normalized change in non-cash working capital} = \frac{\text{Non-cash working capital}_{2000}}{\text{Revenues}_{2000}} - \frac{\text{Revenues}_{1999}}{\text{Revenues}_{1999}} = \frac{180}{2253} \times (2253 - 1598) = 52.3 \text{ million CY}
\]

Normalized Reinvestment
= Capital expenditures – Depreciation + Normalized Change in non-cash working capital
= 335 - 204 + 52.3 = 183.3 million CY

As with working capital, debt issues have been volatile. We estimate the firm’s book debt to capital ratio of 40.94% at the end of 1999 and use it to estimate the normalized equity reinvestment in 2000.
Inputs for the 3 Stages

High Growth Transition Phase Stable Growth

Length 5 years 5 years Forever after yr 10

Beta 0.75 Moves to 0.80 0.80

Risk Premium 4%+2.28% --> 4%+0.95% ROE 2.8%->12% 12%->20% 20%

Equity Reinv. 149.97% Moves to 50% 50%

Expected Growth 44.91% Moves to 10% 10%

We will assume that

Equity Reinvestment Ratio = Reinvestment (1- Debt Ratio) / Net Income

Expected growth rate next 5 years = Equity reinvestment rate * ROE

New [1+(ROE5-ROEtoday)/ROEtoday]1/5-1

= = 183.3 (1-.4094) / 72.36 = 149.97%

Equity Reinvestment Ratio = Reinvestment (1- Debt Ratio) / Net Income

% 10% 50% 20% < 4+ 0.95%

% Moves to 10% Moves to 50% 12%-20% < 4%+ 2.8%

% 44.91% 149.97% 2.8%-12% 4%+2.8%

% New 

0.80 Moves to 0.80 5 years

Forever after yr 10 Stable Growth

Transition Phase High Growth
<table>
<thead>
<tr>
<th>Year</th>
<th>Expected Growth</th>
<th>Net Income</th>
<th>Equity</th>
<th>Reinvestment Rate</th>
<th>FCFE</th>
<th>Cost of Equity</th>
<th>Present Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CY1</td>
<td>14.95%</td>
<td>149.95%</td>
<td>96.94%</td>
<td>CY1,313.81</td>
<td>10.00%</td>
<td>312.86</td>
<td>75,395</td>
</tr>
<tr>
<td>CY2</td>
<td>14.71%</td>
<td>149.91%</td>
<td>96.92%</td>
<td>CY1,370.14</td>
<td>9.88%</td>
<td>129.95</td>
<td>21,420</td>
</tr>
<tr>
<td>CY3</td>
<td>14.71%</td>
<td>149.84%</td>
<td>96.92%</td>
<td>CY1,426.06</td>
<td>9.71%</td>
<td>139.98</td>
<td>14,649</td>
</tr>
<tr>
<td>CY4</td>
<td>14.71%</td>
<td>149.78%</td>
<td>96.89%</td>
<td>CY1,520.29</td>
<td>9.56%</td>
<td>159.98</td>
<td>10,760</td>
</tr>
<tr>
<td>CY5</td>
<td>14.71%</td>
<td>149.73%</td>
<td>96.87%</td>
<td>CY1,615.07</td>
<td>9.41%</td>
<td>184.99</td>
<td>7,580</td>
</tr>
<tr>
<td>CY6</td>
<td>14.71%</td>
<td>149.69%</td>
<td>96.84%</td>
<td>CY1,715.35</td>
<td>9.26%</td>
<td>214.99</td>
<td>5,200</td>
</tr>
<tr>
<td>CY7</td>
<td>14.71%</td>
<td>149.65%</td>
<td>96.81%</td>
<td>CY1,816.10</td>
<td>9.11%</td>
<td>249.99</td>
<td>3,420</td>
</tr>
<tr>
<td>CY8</td>
<td>14.71%</td>
<td>149.61%</td>
<td>96.78%</td>
<td>CY1,918.23</td>
<td>8.96%</td>
<td>289.99</td>
<td>2,200</td>
</tr>
<tr>
<td>CY9</td>
<td>14.71%</td>
<td>149.57%</td>
<td>96.74%</td>
<td>CY2,021.87</td>
<td>8.81%</td>
<td>334.99</td>
<td>1,520</td>
</tr>
<tr>
<td>CY10</td>
<td>14.71%</td>
<td>149.53%</td>
<td>96.70%</td>
<td>CY2,126.91</td>
<td>8.66%</td>
<td>384.99</td>
<td>1,100</td>
</tr>
</tbody>
</table>

Sum of the present values of FCFE during high growth = $186,659.
Tsingtao: Terminal Value

Expected stable growth rate = 10%

Equity reinvestment rate in stable growth = 50%

Cost of equity in stable growth = 13.96%

Expected FCFE in year 11

Net Income11 * (1 - Stable period equity reinvestment rate) = CY 1331.81 (1.10)(1-.5) = CY 732.50 million

Terminal Value of equity in Tsingtao Breweries = FCFE11 / (Stable period cost of equity – Stable growth rate) = CY 1331.81 (1.10)(1-.5) = CY 732.50 million / (.1396 - .10) = CY 18,497 million
The stock was trading at 10.10 Yuan per share, which would make it overvalued, based upon this valuation.

Value of Equity per share = Value of Equity / Number of Shares

Value of Equity

= CV $4,596 million
= CV $1,818.65 + CV $1,8,497 / (1.14715 * 1.1456 * 1.1441 * 1.1426 * 1.1411 * 1.1396)

PV of FCF during the high growth period + PV of terminal value

TSingtao: Valuation
DaimlerChrysler: Rationale for Model

June 2000

DaimlerChrysler is a mature firm in a mature industry. We will use the FCFF model. Probably change over time. Hence, we will use the FCFF model.

Since this is a relatively new organization, with two different cultures, therefore assume that the firm is in stable growth.

DaimlerChrysler has traditionally been more conservative in its use of debt than Chrysler, the debt ratio will probably change over time. Hence, we will use the FCFF model.
In 1999, Daimler Chrysler had earnings before interest and taxes of 9,324 million DM and had an effective tax rate of 46.94%. Based upon this operating income and the book values of debt and equity as of 1998, Daimler Chrysler had an after-tax return on capital of 7.15%. The long term German bond rate is 4.87% (in DM) and the mature market premium of 4% is used. The bottom-up unlevered beta for automobile firms is 0.61, and Daimler is AAA rated. The market value of equity is 62.3 billion DM, while the estimated market value of debt is 64.5 billion DM. We will assume that the firm will maintain a long term growth rate of 3%.

Daimler Chrysler: Inputs to the Model
Expected Reinvestment Rate = \sqrt[\text{capital}]{\text{ROE}} = 3\% \times 1.15 = 41.98\% 

Cost of Capital = 5.62\% = 8.65\% \times \frac{62.3}{62.3+64.5} + 2.69\% \times \left(\frac{64.5}{62.3+64.5}\right) 

After-tax Cost of Debt = (4.87\% + 0.20\% \times 1-0.4694) \times 8.65\% = 0.945\% 

Cost of Equity = 4.87\% + 0.945 (4\%) = 8.65\% 

Bottom-up Levered Beta = 0.61 (1+1.4694(64.5/62.3)) = 0.945 

Daimler/Chrysler: Analyzing the Inputs
Daimler Chrysler Valuation

- **Estimating FCFF**
  
  Expected EBIT (1-t) = 9324 (1.03) (1-.4694) = 5,096 mil DM  
  Expected Reinvestment needs = 5,096(.42) = 2,139 mil DM  
  Expected FCFF next year = 2,957 mil DM

- **Valuation of Firm**
  
  Value of operating assets = 2957 / (.056-.03) = 112,847 mil DM  
  + Cash + Marketable Securities = 18,068 mil DM  
  Value of Firm = 130,915 mil DM  
  - Debt Outstanding = 64,488 mil DM  
  Value of Equity = 66,427 mil DM

Value per Share = 72.7 DM per share  
Stock was trading at 62.2 DM per share on June 1, 2000
Aswath Damodaran

Circular Reasoning in FCFF Valuation

Q

In discounting FCFF, we use the cost of capital, which is calculated using the market values of equity and debt. We then use the present value of the FCFF as our value for the firm and derive an estimated value for equity. Is there circular reasoning here?

R

Yes

Q

If there is, can you think of a way around this problem?
Tube Investments is a diversified manufacturing firm in India. While its growth rate has been anemic, there is potential for high growth over the next 5 years. The firm’s financing policy is also in a state of flux as the family reassesses its policy of funding the firm.
Current Cashflow to Firm

\[
\text{EBIT}(1-t) : \text{Nt CpX} \quad \text{Chg WC} \quad = \text{FCFF} \quad - 568
\]

Reinvestment Rate = 112.82%

Expected Growth in EBIT (1-t)

\[
0.60 \times 0.092 = 0.0552 \quad 5.52\%
\]

Stable Growth = 5%; Beta = 1.00; Debt ratio = 44.2%

\[
\text{Country Premium} = 3\% \quad \text{ROC} = 9.22\%
\]

\[
\text{Reinvestment Rate} = 54.35\%
\]

Terminal Value = \[
\frac{2775}{0.1478 - 0.05} = 28,378
\]

\[
\text{Cost of Equity} = 22.80\%
\]

\[
\text{Cost of Debt} = (12\% + 1.50\%)(1 - 0.30) = 9.45\%
\]

\[
\text{Weights}\quad \text{E} = 55.8\% \quad \text{D} = 44.2\%
\]

\[
\text{Discount at Cost of Capital (WACC)} = 22.8\% \text{WACC} = 0.558 \times 22.8\% + 0.442 \times 9.45\% = 16.90\%
\]

\[
\text{Firm Value} = 19,578 + \text{Cash} = 13,653 - \text{Debt} = 18,073 = \text{Equity} = 15,158 - \text{Options} = 0
\]

Value/Share = 61.57

Riskfree Rate:

\[
\text{Real riskfree rate} = 12\% + 1.17 \times \text{Risk Premium} = 9.23\%
\]

\[
\text{Firm's D/E Ratio} = 79\%
\]

\[
\text{Mature risk premium} = 4\%
\]

\[
\text{Country Risk Premium} = 2.23\%
\]

Tube Investments: Status Quo (in Rs)

\[
\text{Terminal Value} = 19,578
\]

\[
\text{Terminal Value} = 5 \times 2775(1.1478 - 0.05) = 28,378
\]

\[
\text{Return on Capital} = 9.22\%
\]

\[
\text{Debt ratio} = 44.2\%
\]

\[
\text{Beta} = 1.00
\]

\[
\text{Expected Growth} = 60.092 = 0.052
\]

\[
\text{Return on Capital} = 9.22\%
\]

\[
\text{Current Cashflow to Firm}
\]

\[
\text{WACC} = 0.558 \times 22.8\% + 0.442 \times 9.45\% = 16.90\%
\]

\[
\text{WACC} = 0.558 \times 22.8\% + 0.442 \times 9.45\% = 16.90\%
\]

\[
\text{WACC} = 0.558 \times 22.8\% + 0.442 \times 9.45\% = 16.90\%
\]

\[
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\]

\[
\text{WACC} = 0.558 \times 22.8\% + 0.442 \times 9.45\% = 16.90\%
\]

\[
\text{WACC} = 0.558 \times 22.8\% + 0.442 \times 9.45\% = 16.90\%
\]
In estimating terminal value for Tube Investments, I used a stable growth rate of 5%. If I used a 7% stable growth rate instead, what would my terminal value be? (Assume that the cost of capital and return on capital remain unchanged.)
The firm is considering changes in the way in which it invests, which management believes will increase the return on capital to 12.20% on just new investments (and not on existing investments) over the next 5 years. The value of the firm will be higher, because of higher expected growth.
Current Cashflow to Firm

EBIT(1-t) : 4,425 - Nt CpX                 843 - Chg WC           4,150
= FCFF                 - 568

Reinvestment Rate = 112.82%

Expected Growth in EBIT (1-t)

.60*.122 = .0732
7.32 %

Stable Growth = 5%;  Beta = 1.00;
Debt ratio = 44.2%
Country Premium = 3%;  ROC = 12.20%
Debt ratio = 4.2%

Cost of Equity = 22.80%

Cost of Debt = (12% + 1.50%) (1-.30) = 9.45%

Weigths

E = 55.8% D = 44.2%

Discovt at Cost of Capital (WACC) = 22.8% (.558 + .45% (0.442)) = 16.90%

Firm Value: 25,185 + Cash: 13,653
- Debt: 18,073
= Equity          20,765 - Options           0
Value/Share     84.34

Riskfree Rate:

Real Riskfree rate = 12% + 1.17 X Risk Premium = 9.23%

Unlevered Beta for Sectors: 0.75
Firm's D/E Ratio: 79%
Mature risk premium = 4%
Country Risk Premium = 2.23%

Tube Investments: Higher Marginal Return (in Rs)

Term Yr  6,615 2,711 3,904
FF $4,749 $5,097 $5,470 $5,871 $6,300
- Reinvestment $3,850 $3,058 $3,282 $3,522 $3,780
FCFF $1,900 $2,039 $2,188 $2,348 $2,520

Terminal Value = 3904/(.1424-0.05) = 39.921

% Reinvestment Rate = 60% 1.22% = 0.732
In EBIT (1-t) 7.32%
Expected growth = 60%
60% Reinvestment Rate
12.2% Return on Capital
Higher Marginal Return (in Rs)
Return Improvements on Existing Assets

If Tube Investments is also able to increase the return on capital on existing assets to 12.20% from 9.20%, its value will increase even more. The expected growth rate over the next 5 years will then have a second component arising from improving returns on existing assets:

\[
\text{Expected Growth Rate} = 0.122 \times 0.60 + \left\{ 1 + (0.122 - 0.092)/0.092 \right\}^{1/5} - 1
\]

= 13.13% or 13.13%

= 13.13%
Current Cashflow to Firm

EBIT(1-t) : 4,425 - Nt CpX : 843 = FCFF : -568

Reinvestment Rate = 112.82%

Expected Growth

60% * 12.2% + 0.0581 = 13.13%

Stable Growth = 5%; Beta = 1.00;
Debt ratio = 44.2%
Country Premium = 3%
ROC = 12.22%
Reinvestment Rate = 40.98%

Terminal Value = 5081 / (0.1478 - 0.05) = 51,956

Cost of Equity

22.80%

Cost of Debt

(12% + 1.50%)(1 - 0.30) = 9.45%

Weights

E = 55.8%; D = 44.2%

Discount at Cost of Capital (WACC) = 22.8% (55.8) + 9.45% (0.442) = 16.90%

Firm Value: 31,829 + Cash: 13,653 - Debt: 18,073 = Equity: 27,409 - Options: 0

Value/Share: 111.3

Real riskfree rate = 12% + Beta * 9.23% = 11.97%

Unlevered Beta for Sectors: 0.75
Firm’s D/E Ratio: 79%
Mature risk premium: 4%
Country Risk Premium: 23%

Risk-free Rate

Tube Investments: Higher Average Return (in Rs)

Improvement on existing assets

{1 + (0.122 - 0.092)/0.092}^(1/5) - 1 = 51.966

Terminal Value = 5081 / (1.1478 - 0.05) = 51.966

Retained cash flow = FCFF - Reinvestment

Retained cash flow = 60.122 + 13.13% of EBIT(1-t)

Terminal rate = 12.28%

Return on Capital = 588 - Ctg WC * 4.75 + CN CPX * 8.43 - Net CPs * 4.25

Current Cashflow to Firm (Exceeding Growth)
Tube Investments and Tsingtao: Should there be a corporate governance discount?

Stockholders in Asian, Latin American and many European companies have little or no power over the managers of the firm. In many cases, insiders own voting shares and control the firm and the potential for conflict of interests is huge. Would you discount the value that you estimated to allow for this absence of stockholder power?

Yes □
No. □
Dealing with Operating Leases: A Valuation of the Home Depot

The Home Depot does not carry much in terms of traditional debt on its balance sheet. However, it does have significant operating leases. When doing firm valuation, these operating leases have to be treated as debt. This, in turn, will mean that operating income has to get restated.
The pre-tax cost of debt at the Home Depot is 5.80%.

<table>
<thead>
<tr>
<th>Year</th>
<th>Commitment</th>
<th>Present Value</th>
<th>Debt Value of Leases =</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$2,277.88</td>
<td>$1,188.03</td>
<td>$2,647.70</td>
</tr>
<tr>
<td>2</td>
<td>$2,222.92</td>
<td>$1,195.53</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>$2,259.97</td>
<td>$1,245.00</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>$2,264.00</td>
<td>$1,245.00</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>$2,360.00</td>
<td>$1,236.00</td>
<td></td>
</tr>
<tr>
<td>6 and beyond</td>
<td>$2,700.00</td>
<td>$1,513.37</td>
<td></td>
</tr>
</tbody>
</table>

The pre-tax cost of debt at the Home Depot is 5.80%.
<table>
<thead>
<tr>
<th></th>
<th>Operating Leases</th>
<th>Operating Leases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EB1T</td>
<td>$2,661 mil</td>
<td>$2,815 mil</td>
</tr>
<tr>
<td>EB1T (1-t)</td>
<td>$1,730 mil</td>
<td>$1,829 mil</td>
</tr>
<tr>
<td>Debt</td>
<td>$1,433 mil</td>
<td>$4,081 mil</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Dealing with Distress

The same business also in distress.

and this value will be lower if the economy is doing badly and there are other firms in

The distress sale value of equity is usually best estimated as a percent of book value

Estimate the probability of distress by looking at market value of bonds.

Estimate the probability of distress with a probit

Use the bond ratings to estimate the cumulative probability of distress over 10 years

There are three ways in which we can estimate the probability of distress:

Value of Equity = DCF value of equity (1 - Probability of distress) + Distress sale value of equity (Probability of distress)

Valuations will underestimate the value of the firm.

A DCF valuation values a firm as a going concern. If there is a significant likelihood of
Aswath Damodaran

### Terminal Value

\[ \text{Terminal Value} = 677 \times (0.93^7) = 28,683 \]

### Cost of Equity

- **Weighted Cost of Equity**: 16.80%
- **Cost of Debt**: 4.8% + 8.0% = 12.8%
- **Tax Rate**: 0% → 35%

### Weights

- **Debt**: 74.91% → 40%

### Value of Firm

\[ \text{Value of Firm} = \text{Value of Op Assets} + \text{Cash & Non-op} = 5,530 + 2,260 = 7,790 \]

\[ \text{Value of Equity} = \text{Value of Firm} - \text{Value of Debt} = 7,790 - 4,923 = 2,867 \]

\[ \text{Value per share} = \frac{2,867}{14} \]

### Riskfree Rate

- **T. Bond rate**: 4.8%

### Beta

- **Beta**: 3.00

### Risk Premium

- **4%**

### Internet/Retail

#### Operating Leverage

- **Current D/E**: 441%

### Current Revenue

\[ \text{Revenue} = 3,804 \]

### Current Margin

- **-49.82%**

### Revenue Growth

- **13.33%**

### Stable Growth

- **5%**

### Stable Revenue Growth

### Average Stable Growth

- **49.82%**

### Reinvest

- **67.93%**

### NOL

- **2,076m**

### Stock Price = $1.86

### Global Crossing

- **November 2001**

### Capex growth slows and net cap ex decreases

### Beta

- **Beta**: 3.00, 2.60, 2.20, 1.80, 1.40, 1.00

### Cost of Equity

- **Cost of Equity**: 16.80%, 15.20%, 13.60%, 12.00%, 10.40%, 8.80%

### Cost of Debt

- **Cost of Debt**: 12.80%, 11.84%, 10.88%, 9.92%, 8.96%, 6.76%

### Debt Ratio

- **Debt Ratio**: 74.91%, 67.93%, 60.95%, 53.96%, 46.98%, 40.00%

### Cost of Capital

- **Cost of Capital**: 13.80%, 12.92%, 11.94%, 10.88%, 9.72%, 7.98%

### Revenues

\[ \text{Revenues} = \text{Revenues} = 3,804, 5,326, 6,923, 8,308, 9,139, 10,053, 11,058, 11,942, 12,659, 13,292 \]

### EBITDA

\[ \text{EBITDA} = \text{EBITDA} = -95, 0, 346, 831, 1,371, 1,809, 2,322, 2,508, 3,038, 3,589 \]

### EBIT

\[ \text{EBIT} = \text{EBIT} = -1,675, -1,738, -1,565, -1,272, 320, 1,074, 1,550, 1,697, 2,186, 2,694 \]

### EBIT (1-t)

\[ \text{EBIT (1-t)} = \text{EBIT (1-t)} = -1,675, -1,738, -1,565, -1,272, 320, 1,074, 1,550, 1,697, 2,186, 2,276 \]

### + Depreciation

\[ + \text{Depreciation} = 1,580, 1,738, 1,911, 2,102, 1,051, 736, 773, 811, 852, 894 \]

### - Cap Ex

\[ - \text{Cap Ex} = 3,431, 1,716, 1,201, 1,261, 1,324, 1,390, 1,460, 1,533, 1,609, 1,690 \]

### - Chg WC

\[ - \text{Chg WC} = 0, 46, 48, 42, 25, 27, 30, 27, 21, 19 \]

### FCFF

\[ \text{FCFF} = \text{FCFF} = -3,526, -1,761, -903, -472, 22, 392, 832, 949, 1,407, 1,461 \]

### Cap Ex growth slows and net cap ex decreases
Valuing Global Crossing with Distress

- Probability of distress = 13.53% a year

- Cumulative probability of survival over 10 years = (1 - 0.1353)^10 = 23.37%

- Book value of capital = $14,531 million

- Distress sale value of equity = 15% of book value = 0.15 * 14,531 = $2,180 million

- Book value of debt = $7,647 million

- Distress sale value of equity = $0 million

- Price of 8 year, 12% bond issued by Global Crossing = $653

- Value of Global Crossing = $3.22 * (1 - 0.1353) + $0.00 = $0.75

- Distress adjusted value of equity = $0 million
Dealing with R&D: Bristol Myers

Bristol Myers, like most pharmaceutical firms, has a significant amount of research and development expenses. These expenses, though treated as operating expenditures by accountants, are really capital expenditures. By reclassifying these expenses as capital expenditures, there is a ripple effect on the following:

- Operating income
- Capital expenditures
- Depreciation and amortization
- Capital expenditures
- Reinvestment Ratios
- Return on Capital

When R&D expenses are reclassified as capital expenditures, there is a ripple effect on the following:
### Converting R&D Expenses to Capital Expenses

<table>
<thead>
<tr>
<th>Year</th>
<th>R&amp;D Expense</th>
<th>Unamortized portion</th>
<th>Amortization this year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>1939.00</td>
<td>1.00</td>
<td>1939.00</td>
</tr>
<tr>
<td>-1</td>
<td>1759.00</td>
<td>0.90</td>
<td>1583.10</td>
</tr>
<tr>
<td>-2</td>
<td>1577.00</td>
<td>0.80</td>
<td>1261.60</td>
</tr>
<tr>
<td>-3</td>
<td>1385.00</td>
<td>0.70</td>
<td>969.50</td>
</tr>
<tr>
<td>-4</td>
<td>1276.00</td>
<td>0.60</td>
<td>765.60</td>
</tr>
<tr>
<td>-5</td>
<td>1199.00</td>
<td>0.50</td>
<td>599.50</td>
</tr>
<tr>
<td>-6</td>
<td>1108.00</td>
<td>0.40</td>
<td>443.20</td>
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<tr>
<td>-7</td>
<td>1128.00</td>
<td>0.30</td>
<td>338.40</td>
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<tr>
<td>-8</td>
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<td>0.20</td>
<td>216.60</td>
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<tr>
<td>-9</td>
<td>983.00</td>
<td>0.10</td>
<td>98.30</td>
</tr>
<tr>
<td>-10</td>
<td>881.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

**Value of Research Asset =** $8,214.80

**Amortization this year =** $1,237.90
Amortization of asset for current year = $1,238 million

Additional tax benefit of expensing = (1939 - 1238)(.35) = $245 million

This creates a tax benefit that can be computed as follows:

Just the amortization of $1,238 million

The entire R&D expense of $1,939 million is tax-deductible, rather than

Tax Effect of R&D Expensing

Increase in Operating Income

Subtract out the amortization

Add back the R&D Expenses

Adjustment to Operating Income:

Amortization of asset for current year = $1,238 million

The Consequences of a Research Asset
Capitalizing R&D: The Effects

<table>
<thead>
<tr>
<th>R&amp;D Expensed</th>
<th>R&amp;D Capitalized</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>$18,320 mil</td>
<td>$10,105 mil</td>
<td>$8,195 mil</td>
</tr>
<tr>
<td>$79 mil</td>
<td>$79 mil</td>
<td>Unchanged</td>
</tr>
<tr>
<td>$1,405 mil</td>
<td>$810 mil</td>
<td>Increase $655 mil</td>
</tr>
<tr>
<td>$2,039 mil</td>
<td>$704 mil</td>
<td>Increase $1,335 mil</td>
</tr>
</tbody>
</table>

EBIT = $6,009 mil
EBIT (1-t) = $3,906 mil

Net Cap Ex = $79 mil
Capital Spending = $607 mil
Non-cash WC Chg = $79 mil
Reinvestment Rate = 20.04%
ROE = 38.65%

BV of Equity = $18,320 mil

Increase $701
Increase $1,335 mil
Increase $2,704 mil
Increase $3,607 mil
Increase $6,007 mil
Increase $9,132 mil
Increase $11,840 mil
Increase $14,359 mil
Increase $16,682 mil
Increase $19,013 mil
Increase $20,714 mil
Increase $21,214 mil
Increase $21,814 mil
Increase $22,414 mil
Increase $22,814 mil
Increase $23,314 mil
Increase $23,814 mil
Increase $24,314 mil
Increase $24,814 mil
Increase $25,314 mil
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Increase $97,314 mil
Increase $97,814 mil
Increase $98,314 mil
Increase $98,814 mil
Increase $99,314 mil
Increase $99,814 mil
Increase $100,314 mil
Increase $100,814 mil

DEESEM B: The Effects
### Current Cashflow to Firm

<table>
<thead>
<tr>
<th>EBIT(1-t)</th>
<th>Nt CpX</th>
<th>Chg WC</th>
<th>FCFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>4,607</td>
<td>-1,405</td>
<td>79</td>
<td>3,123</td>
</tr>
</tbody>
</table>

Reinvestment Rate = 32.21%

### Expected Growth in EBIT (1-t)

\[0.3221 \times 0.3215 = 0.10\]

8.10%

### Stable Growth
- \( g = 5\% \)
- \( \beta = 0.90 \)
- ROC = 15%
- Reinvestment Rate = 33.33%

### Terminal Value

\[\frac{476}{0.0861 - 0.05} = 131,716\]

### Cost of Equity

\[8.42\%\]

### Cost of Debt

\[(5.1\% + 0.75\%) \times (1 - 0.35) = 3.80\%\]

### Weights
- E = 98.34%
- D = 1.66%

### Discount at Cost of Capital (WACC)

\[0.9834 \times 8.42\% + 0.0166 \times 3.80\% = 8.34\%\]

### Operating Assets

103,742 + Cash 3,385 - Debt 1,885 = Equity 105,241 - Options 2,300

### Value/Share

\[\$52.97\]

### Riskfree Rate

Riskfree rate = \(5.1\% \times (10\text{-year T.Bond rate})\) + \(0.83\% \times \text{Risk Premium}\) = 8.42%

### Unlevered Beta for Sectors

0.82

### Firm's D/E Ratio

1.69%

### Riskfree Rate

Riskfree rate = 5.1%

### Beta

\[0.83 \times 4.00\% = 3.21\%\]

### Country Risk Premium

0%

### Synthetic rating = AAA

### Term Yr

1,4760 4,4760 2380 7,140

### Terminal Value = 4760 / (0.0861 - 0.05) = 131,716

### Reinvestment Rate = 33.33%

### ROE = 15%

### Stable Growth Rate = 0.90%

### Bristol Myers: Status Quo

### Current Cashflow to Firm

\[\text{Current Cashflow to Firm} = \text{EBIT} \times (1 - \text{t}) - \text{Reinvestment}\]

### Table

<table>
<thead>
<tr>
<th>Year</th>
<th>EBIT(1-t)</th>
<th>Nt CpX</th>
<th>Chg WC</th>
<th>FCFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4,980</td>
<td>4,264</td>
<td>3,945</td>
<td>4,510</td>
</tr>
<tr>
<td>2</td>
<td>5,383</td>
<td>4,647</td>
<td>4,264</td>
<td>4,930</td>
</tr>
<tr>
<td>3</td>
<td>5,819</td>
<td>5,017</td>
<td>4,545</td>
<td>5,360</td>
</tr>
<tr>
<td>4</td>
<td>6,290</td>
<td>5,383</td>
<td>4,874</td>
<td>5,800</td>
</tr>
<tr>
<td>5</td>
<td>6,800</td>
<td>5,751</td>
<td>5,219</td>
<td>6,250</td>
</tr>
</tbody>
</table>

### Notes

- E = 98.34%
- D = 1.66%
- ROC = 15%
- Reinvestment Rate = 33.33%
- Riskfree Rate = 5.1%
- Beta = 0.90
- Stable Growth = 5%
- Country Risk Premium = 0%
- Term Yr = 7140 - 4760 = 2380 - 14760
- Terminal Value = 4760 / (0.0861 - 0.05) = 131,716
- Reinvestment Rate = 33.33%
- Riskfree rate = 5.1%
- Beta = 0.83
- Risk Premium = 4.00%
- Unlevered Beta for Sectors = 0.82
- Firm's D/E Ratio = 1.69%
- Riskfree rate = 5.1%
- Beta = 0.83
- Risk Premium = 4.00%
The Dark Side of Valuation
To make our estimates, we draw our information from:

1. The firm’s current financial statement:
   - How much did the firm sell?
   - How much did it earn?

2. The firm’s financial history, usually summarized in its financial statements:
   - How fast have the firm’s revenues and earnings grown over time?
   - What can we learn about cost structure and profitability from these trends?
   - Susceptibility to macro-economic factors (recessions and cyclic firms)
   - What happens to firms as they mature? (Margins, Revenue Growth, etc.)
   - Reinvestment needs... Risk

3. The industry and comparable firm data:
   - How fast have the firm’s revenues and earnings grown over time? What can we learn about cost structure and profitability from these trends?
   - How much did it earn?
   - How much did the firm sell?
   - What happens to firms as they mature? (Margins, Revenue Growth, etc.)

We often substitute one type of information for another; for instance, in valuing Ford, we have 70 years of historical data, but not too many comparable firms. In valuing a software firm, we might not have too much historical data but we have lots of comparable firms.
Valuation is most difficult when a company

- Has negative earnings and low revenues in its current financial statements
- No comparables (or even if they exist, they are all at the same stage of the life cycle as the firm being valued)
- No history
Discounted Cash Flow Valuation: High Growth with Negative Earnings
Unlevered beta for firms in specialty retailing = 1.00
Unlevered beta for firms in internet retailing = 1.60

Amazon is a specialty retailer, but its risk currently seems to be determined by the fact that it is an online retailer. Hence we will use the beta of internet companies to begin the valuation but move the beta, after the first five years, towards the beta of the retailing business.
The rating for a firm can be estimated using the financial characteristics of the firm. In its simplest form, the rating can be estimated using the financial

\[
\text{Interest Coverage Ratio} = \frac{\text{EBIT}}{\text{Interest Expenses}}
\]

estimated from the interest coverage ratio.

Estimated Synthetic Ratings and cost of debt
Estimating the cost of debt

The synthetic rating for Amazon.com is BBB. The default spread for BBB rated bonds is 1.50%.

Pre-tax cost of debt = Riskfree Rate + Default spread

After-tax cost of debt right now = 8.00% (1 - 0) = 8.00% 

The firm is paying no taxes currently. As the firm’s tax rate changes and its cost of debt changes, the after-tax cost of debt will change as well.

<table>
<thead>
<tr>
<th>Pre-tax</th>
<th>8.00%</th>
<th>8.00%</th>
<th>8.00%</th>
<th>8.00%</th>
<th>7.80%</th>
<th>7.75%</th>
<th>7.70%</th>
<th>7.67%</th>
<th>7.50%</th>
<th>7.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tax Rate</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>16.1%</td>
<td>35%</td>
<td>35%</td>
<td>35%</td>
<td>35%</td>
<td>35%</td>
<td>35%</td>
</tr>
<tr>
<td>After-tax</td>
<td>8.00%</td>
<td>8.00%</td>
<td>8.00%</td>
<td>8.00%</td>
<td>7.80%</td>
<td>7.75%</td>
<td>7.70%</td>
<td>7.67%</td>
<td>7.50%</td>
<td>7.00%</td>
</tr>
</tbody>
</table>

= 6.50% + 1.50% = 8.00%

The synthetic rating for Amazon.com is BBB. The default spread for BBB rated bonds is 1.50%.
Estimating Cost of Capital: Amazon.com

Equity

- Cost of Equity = 6.50% + 1.60 (4.00%) = 12.90%
- Market Value of Equity = $84/share * 340.79 mil shs = $28,626 mil (98.8%) (1.2)

Debt

- Cost of Debt = 6.50% + 1.50% (default spread) = 8.00%
- Market Value of Debt = $349 mil (1.2%)

Cost of Capital = 12.9% (98.8% (1 - 0) (0.012)) = 12.84%
The operating income and revenue that we use in valuation should be updated numbers. One of the problems with using financial statements is that they are dated. As a general rule, it is better to use trailing 12-month trailing estimates for evolving and growing rapidly.

This rule becomes even more critical when valuing companies that are earning and revenue than numbers for the most recent financial year.

Aswath Damodaran
Calendar Years, Financial Years and Updated Information

<table>
<thead>
<tr>
<th>Last 10-K</th>
<th>Trailing 12-month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td>$610 million</td>
</tr>
<tr>
<td>EBIT</td>
<td>$125 million</td>
</tr>
<tr>
<td>Last 10-K</td>
<td></td>
</tr>
<tr>
<td>Revenue</td>
<td>$1,117 million</td>
</tr>
<tr>
<td>EBIT</td>
<td>$410 million</td>
</tr>
</tbody>
</table>
Are S, G & A expenses capital expenditures? Should Amazon.com's selling expenses be treated as cap exp? Many internet companies are arguing that selling and G&A expenses are the equivalent of R&D expenses for a high-technology firms and should be treated as capital expenditures which will make many of these firms profitable. If we adopt this rationale, we should be computing earnings before these expenses, which will make many of these firms profitable. It will also mean that they are reinvesting far more than we think they are. It will, however, make their cash flows less negative. Should Amazon.com's selling expenses be treated as cap exp?
Amazon.com’s Tax Rate

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBIT</td>
<td>-$373</td>
<td>-$94</td>
<td>$407</td>
<td>$1,038</td>
<td>$1,628</td>
</tr>
<tr>
<td>Taxes</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$167</td>
<td>$570</td>
</tr>
<tr>
<td>EBIT(1-t)</td>
<td>-$373</td>
<td>-$94</td>
<td>$407</td>
<td>$871</td>
<td>$1,058</td>
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<tr>
<td>Tax rate</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>16.13%</td>
<td>35%</td>
</tr>
<tr>
<td>NOL</td>
<td>$500</td>
<td>$873</td>
<td>$967</td>
<td>$560</td>
<td>$0</td>
</tr>
</tbody>
</table>

After year 5, the tax rate becomes 35%.
Estimating FCFF: Amazon.com

Q EBIT (Trailing 1999) = -$410 million
Q Tax rate used = 0% (Assumed Effective = Marginal)
Q Capital spending (Trailing 1999) = $243 million (includes acquisitions)
Q Depreciation (Trailing 1999) = $31 million
Q Non-cash Working capital Change (1999) = - $80 million
Q Change in Working Capital = - (Capital Spending - Depreciation)

Current EBIT * (1 - tax rate) = -410 * (1-0) = -$410 million

Current FCFF = - $542 million

Estimating FCFF (1999)
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>10</td>
<td>6.00%</td>
<td>$736</td>
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<td>$1,676</td>
<td>3.00%</td>
<td>10.00%</td>
<td>10.00%</td>
<td>$2,087</td>
<td>$1,96%</td>
<td>2.00%</td>
<td>3.00%</td>
<td>10.00%</td>
<td>10.00%</td>
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<td>3.00%</td>
<td>$1,96%</td>
<td>2.00%</td>
<td>$1,89%</td>
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<td>15.60%</td>
<td>$722</td>
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<td>15.60%</td>
<td>15.60%</td>
<td>$1,828</td>
<td>$1,494</td>
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<td>2.00%</td>
<td>15.60%</td>
<td>15.60%</td>
<td>$1,828</td>
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<td>2.00%</td>
<td>$1,402</td>
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<td>7</td>
<td>20.30%</td>
<td>$713</td>
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<td>$1,423</td>
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<td>20.30%</td>
<td>20.30%</td>
<td>$1,786</td>
<td>$1,456</td>
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<td>2.00%</td>
<td>20.30%</td>
<td>20.30%</td>
<td>$1,786</td>
<td>2.00%</td>
<td>$1,456</td>
<td>2.00%</td>
<td>$1,368</td>
</tr>
<tr>
<td>6</td>
<td>22.00%</td>
<td>$704</td>
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<td>$1,388</td>
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<td>22.00%</td>
<td>22.00%</td>
<td>$1,748</td>
<td>$1,424</td>
<td>2.00%</td>
<td>2.00%</td>
<td>22.00%</td>
<td>22.00%</td>
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<td>2.00%</td>
<td>$1,336</td>
</tr>
<tr>
<td>5</td>
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<td>$1,353</td>
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<td>30.00%</td>
<td>30.00%</td>
<td>$1,707</td>
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<td>2.00%</td>
<td>30.00%</td>
<td>30.00%</td>
<td>$1,707</td>
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<td>$1,308</td>
</tr>
<tr>
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<td>40.00%</td>
<td>$686</td>
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<td>$1,318</td>
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<td>40.00%</td>
<td>40.00%</td>
<td>$1,666</td>
<td>$1,356</td>
<td>2.00%</td>
<td>2.00%</td>
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<td>$1,356</td>
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<td>$1,264</td>
</tr>
<tr>
<td>3</td>
<td>50.00%</td>
<td>$677</td>
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<td>$1,283</td>
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<td>50.00%</td>
<td>50.00%</td>
<td>$1,616</td>
<td>$1,312</td>
<td>2.00%</td>
<td>2.00%</td>
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<td>50.00%</td>
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<td>2.00%</td>
<td>$1,312</td>
<td>2.00%</td>
<td>$1,220</td>
</tr>
<tr>
<td>2</td>
<td>70.00%</td>
<td>$668</td>
<td>2.00%</td>
<td>$1,248</td>
<td>2.00%</td>
<td>70.00%</td>
<td>70.00%</td>
<td>$1,547</td>
<td>$1,344</td>
<td>2.00%</td>
<td>2.00%</td>
<td>70.00%</td>
<td>70.00%</td>
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</tbody>
</table>

The sales/capital ratio of 3.00 was based on what Amazon accomplished last year and the averages for the industry.
High Growth

- Beta: 1.60, 1.00
- Debt Ratio: 1.20%, 15%
- Return on Capital: Negative, Negative
- Expected Growth Rate: N/A, 6%
- Reinvestment Rate: >100%, 30%
Estimating the Value of Equity Options

Details of options outstanding

- Average strike price of options outstanding = $13.375
- Average maturity of options outstanding = 8.4 years
- Standard deviation in ln(stock price) = 50.00%
- Annualized dividend yield on stock = 0.00%
- Treasury bond rate = 6.50%
- Number of options outstanding = 38 million
- Number of shares outstanding = 340.79 million

Value of equity options = $2,892 million

Value of options outstanding (using dilution-adjusted Black-Scholes model)

\[
\text{Value of options outstanding} = \frac{3.40 \times 79 \text{ million}}{3.00 \times 38 \text{ million}} \cdot \frac{6.50\%}{50.00\%} \cdot \frac{0.00\%}{5.00\%} \cdot \frac{8.4 \text{ years}}{13.375 \text{ years}}
\]
Amazon.com

Stock Price = $ 84

January 2000

Terminal Value = $41,346

Value of Op Assets $14,910 + Cash $26 = Value of Firm $14,936

- Value of Debt $349

= Value of Equity $14,587

- Equity Options $2,892

Value per share $34.32

Riskfree Rate:

T. Bond rate = 6.5%

+ Beta

1.60 -> 1.00

Risk Premium

4%

Internet/Retail

Operating Leverage

Current D/E: 1.21%

Base Equity

Premium

Country Risk

Premium

D/E: 1.21%

Cost of Equity

12.90%

Cost of Debt

6.5%+1.5%=8.0%

Tax rate = 0% -> 35%

Weights

Debt= 1.2% -> 15%

6.5%+1.5%=8.0%

Cost of Debt

12.90%

Cost of Equity

12.90%

Value of Equity $14,587

Riskfree Rate:

12.90% 12.90% 12.90% 12.90% 12.90% 12.90% 12.90% 12.90% 12.90% 12.90%

Cost of Debt

8.00% 8.00% 8.00% 8.00% 8.00% 8.00% 8.00% 8.00% 8.00% 8.00%

Cost of Equity

12.84% 12.84% 12.84% 12.84% 12.84% 12.84% 12.84% 12.84% 12.84% 12.84%

Current Revenue $1,117

Current Margin: -36.71%

Reinvestment:

Cap ex includes acquisitions

Working capital is 3% of revenues

Sales Turnover

3.00%

Revenue Growth: 42%

Expected Margin: -> 10.00%

Stable Revenue Growth: 6%

Stable Operating Margin: 10.00%

Stable ROC = 20%

Reinvest 30% of EBIT(1-t)

EBIT -410m

NOL: 500 m

$41,346 10.00% 35.00%

$ 2,688 $807 $1,881

Terminal Value = 1881/(.0961-.06) = 52,148

T. Bond rate = 6.5%

Riskfree Rate:

12.90% 12.90% 12.90% 12.90% 12.90% 12.90% 12.90% 12.90% 12.90% 12.90%

Cost of Debt

8.00% 8.00% 8.00% 8.00% 8.00% 8.00% 8.00% 8.00% 8.00% 8.00%

Cost of Equity

12.84% 12.84% 12.84% 12.84% 12.84% 12.84% 12.84% 12.84% 12.84% 12.84%

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EBIT -410m

NOL: 500 m

$41,346 10.00% 35.00%

$ 2,688 $807 $1,881
<table>
<thead>
<tr>
<th>Percentage</th>
<th>$1.41</th>
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What do you need to break-even at $84?
Amazon.com

January 2001

Stock Price = $14

5.1% + 4.75% = 9.85%

Value of Op Assets $7,967 + Cash & Non-op $1,263 = Value of Firm $9,230

- Value of Debt $1,890

= Value of Equity $7,340

- Equity Options $748

Value per share $18.74

Riskfree Rate

T. Bond rate = 5.1%

Risk Premium

4%

Internet/Retail

Beta 2.18

Operating Leverage

Current D/E: 37.5%

Current Margin: -34.60%

Expected Margin: 9.32%

Revenue Growth: 25.41%

Expected Margin: 9.32%

Stable Growth

Stable Revenue

Growth: 5%

Stable Operating Margin: 9.32%

Stable ROC = 16.94%

Reinvest 29.5% of EBIT(1-t)

EBIT - 853m

NOL: 1,289m

Term. Year

24 15 6 8 9 10

Debt Ratio 27.27% 27.27% 27.27% 27.27% 27.27% 24.81% 24.20% 23.18% 21.13% 15.00%

Beta 2.18 2.18 2.18 2.18 2.18 1.96 1.75 1.53 1.32 1.10

Cost of Equity 13.81% 13.81% 13.81% 13.81% 13.81% 12.95% 12.09% 11.22% 10.36% 9.50%

At cost of debt 10.00% 10.00% 10.00% 10.00% 9.06% 6.11% 6.01% 5.85% 5.53% 4.55%

Cost of Capital 12.77% 12.77% 12.77% 12.77% 12.52% 11.25% 10.62% 9.98% 9.34% 8.76%