Discounted Cashflow Valuation: Basis for Approach

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

where \( \text{CF}_t \) 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.
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 the entire firm
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.

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

where,

- \( \text{CF to Equity}_t \) = Expected Cashflow to Equity in period \( t \)
- \( \text{ke} \) = Cost of Equity

The dividend discount model is a specialized case of equity valuation, and the value of a stock is the present value of expected future dividends. 

I.Equity Valuation
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,

- \( \text{CF to Firm}_t \) = Expected Cashflow to Firm in period \( t \)
- \( \text{WACC} \) = Weighted Average Cost of Capital
To get from firm value to equity value, which of the following would you need to do?

- Subtract out the value of long term debt
- Subtract out the value of all debt
- Subtract the value of all non-equity claims in the firm, that are included in the cost of capital calculation
- Subtract the value of all non-equity claims in the firm

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

Firm Value and Equity Value
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 (1-t)</th>
<th>CF to Firm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$50</td>
<td>($40*0.50)</td>
<td>$90</td>
</tr>
<tr>
<td>2</td>
<td>$60</td>
<td>($40*0.50)</td>
<td>$100</td>
</tr>
<tr>
<td>3</td>
<td>$68</td>
<td>($40*0.50)</td>
<td>$108</td>
</tr>
<tr>
<td>4</td>
<td>$76.2</td>
<td>($40*0.50)</td>
<td>$116.2</td>
</tr>
<tr>
<td>5</td>
<td>$83.49</td>
<td>($40*0.50)</td>
<td>$123.49</td>
</tr>
</tbody>
</table>

Terminal Value $160.30,008

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.

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

\[ \text{WACC} = 13.625\% \times \frac{1873}{1873} + 5\% \times \frac{800}{1873} = 9.44\% \]

\[ \text{Cost of Debt} = \text{Pre-tax rate} \times (1 - \text{Tax Rate}) = 10\% \times (1 - .5) = 5\% \]

\[ \text{PV of Firm} = \frac{90}{1.0994} + \frac{100}{1.0994^2} + \frac{108}{1.0994^3} + \frac{116.2}{1.0994^4} + \frac{123.49 + 2363}{1.0994^5} = \$1873 \]

\[ \text{PV of Equity} = \text{PV of Firm} - \text{Market Value of Debt} = \$1873 - \$800 = \$1073 \]
Never mix and match cash flows and discount rates.

The key error to avoid is mismatching cash flows and discount rates.

The first principle of valuation is:

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

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

PV 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

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

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

Value of Equity = $1613

Value of Equity is overstated by $540.
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 future 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

Discounted Cash Flow Valuation: The Steps
Generic DCF Valuation Model

Expected Growth

Firm: Growth in Operating Earnings
Equity: Growth in Net Income/EPS

CF1 CF2 CF3 CF4 CF5 Forever

Terminal Value

Expected Growth

Firm is in stable growth:
Grows at constant rate forever

Terminal Value

Length of Period of High Growth

Cash Flows

Firm: Pre-debt cash flow
Equity: After debt flow

Discount Rate

Firm: Cost of Capital
Equity: Cost of Equity

Value

Firm: Value of Firm
Equity: Value of Equity

DISCOUNTED CASHFLOW VALUATION

Length of Period of High Growth

Expected Growth

Firm is in stable growth:
Grows at constant rate forever

Terminal Value

Cash Flows

Firm: Pre-debt cash flow
Equity: After debt flow

Discount Rate

Firm: Cost of Capital
Equity: Cost of Equity

Value

Firm: Value of Firm
Equity: Value of Equity
Equity Valuation with Dividends

Firm is in stable growth:
- Return on Equity
  * Retention Ratio
  * Expected Growth

Dividends = Net Income * Payment Ratio

Terminal Value = Dividend_{n+1} / (r - g)

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

Discount at Cost of Equity

Value of Equity

Risk-Free Rate:
- No default risk
- In same currency and terms (real or nominal)
- No reinvestment risk
- No default risk
Cashflow to Equity

Net Income - (Cap Ex - Depr) (1- DR) - Change in WC = FCFE

Expected Growth
Retention Ratio * Return on Equity

FCFE 1 FCFE 2 FCFE 3 FCFE 4 FCFE 5

Forever

Termial Value = FCFEn + 1 / (ke - gn)

Firm is in stable growth:

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

Beta

Risk Premium
- Premium for average risk investment

Type of Business
Operating Leverage
Financial Leverage

Discount at Cost of Equity

Value of Equity

Equity Valuation with FCFE
VALUING A FIRM

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

Expected Growth
Reinvestment Rate * Return on Capital

FCFF1/FCFF2/FCFF3/FCFF4/FCFF5

Forever
Firm is in stable growth: Grows at constant rate forever

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

Cost of Equity Cost of Debt
(Riskfree Rate + Default Spread) (1-t)

Weights
Based on Market Value

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 = Value of Equity

Riskfree Rate:
- No default risk
- No reinvestment risk
- No currency risk

Beta:
- Measures market risk

Risk Premium:
- Premium for average risk investment

Type of Business
Operating
Financial

Leverage
Base Equity
Premium
Country Risk
Premium
Risk Investment
Risk Premium
Leverage
Expected Growth
Reinvestment Rate * Return on Capital

Country Risk
Premium

Premium
Discounted Cash Flow Valuation: The Inputs

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

- Equity versus Firm: If the cash flows being discounted are equity cash flows, the appropriate discount rate is a cost of equity. If the cash flows are being discounted at the firm level, the appropriate discount rate is the cost of capital.

- Currency: The currency in which the cash flows are estimated should also be the currency in which the discount rate is estimated.

- Nominal versus Real: If the cash flows being discounted are nominal cash flows (i.e., reflect expected inflation), the discount rate should be nominal.
The cost of equity should be higher for riskier investments and lower for safer investments. While risk is usually defined in terms of the variance of actual returns, risk and return models in finance also assume that the marginal investor perceives in an investment is risk that cannot be diversified away (i.e., market or non-diversifiable risk).

Most risk and return models in finance assume that the only risk that he or she perceives is well diversified, and that the only risk that he or she should be rewarded (and thus built into the discount rate) in valuation should be the risk perceived by the marginal investor around an expected return. Risk and return models in finance assume that the risk that should be rewarded (and thus built into the discount rate) in valuation should be the risk perceived by the marginal investor.
<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 (\bar{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 (\bar{R}_j - R_f) )</td>
<td>Riskfree Rate, Beta relative to each factor, Factor risk premiums, Macro factors</td>
</tr>
<tr>
<td>Proxy</td>
<td>( E(R) = a + \sum_{j=1}^{N} b_j Y_j )</td>
<td>Proxy Regression coefficients, Proxies</td>
</tr>
</tbody>
</table>

The Cost of Equity: Competing Models
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,

- \( R_f \): Riskfree rate
- \( E(R_m) \): Expected Return on the Market Index (Diversified Portfolio)
- \( \beta \): Equity Beta

In practice,

- Short term government security rates 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

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

On a riskfree asset, the actual return is equal to the expected return. Therefore, there is no variance around the expected return.

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

Thus, the riskfree rates in valuation will depend upon when the cash flow is expected to occur and will vary across time.

Therefore, there is no variance around the expected return.

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

In emerging markets, there are two problems:
- The government might not be viewed as riskfree (Brazil, Indonesia)
- The government might be no market-based long term government rate (China)

A simpler approach is to match the duration of the analysis (generally long term) to the duration of the riskfree rate (also long term).
Estimating a Riskfree Rate

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

- Set equal, approximately, to the long term real growth rate of the economy.
- Use forward rates and the riskless rate in an index currency.
- Use inflation-indexed government bond, if one exists.

Do the analysis in real terms rather than nominal terms (using a real riskfree rate, which can be obtained in one of two ways):

- Approach 1: Subtract default spread from local government bond rate.
- Approach 2: Use forward rates and the riskless rate in an index currency.

Government bond rate in local currency - Default spread for
Government bond rate in local currency terms - Default spread for

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. dollar denominated Brazilian Brady bond (which is partially backed by the U.S. Government). The interest rate on a U.S. dollar denominated Brazilian long-term bond (C-bond) also could be used. The interest rate on a Brazilian real denominated long-term government bond could be used as well. The risk-free rate on a U.S. treasury bond would also be acceptable. A simple test...
### The Historical Premium

The historical premium is the premium that stocks have historically earned over riskless securities. Practitioners never seem to agree on the premium; it is sensitive to:

- How far back you go in history...
- Whether you use geometric or arithmetic averages.
- Whether you use T-bill rates or T-bond rates.
- Over riskless securities.

For instance, looking at the US:

<table>
<thead>
<tr>
<th>Historical Period</th>
<th>Arithmetic Average</th>
<th>Geometric Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1928-2002</td>
<td>6.32%</td>
<td>5.17%</td>
</tr>
<tr>
<td>1962-2002</td>
<td>7.76%</td>
<td>6.25%</td>
</tr>
<tr>
<td>1992-2002</td>
<td>8.61%</td>
<td>7.67%</td>
</tr>
</tbody>
</table>

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

Everyone uses historical premiums, but...
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 = \( \frac{25\%}{\sqrt{25}} = 25\%/5 = 5\% \)

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
Incorporates both the country bond spread and equity market volatility. The country risk premium is 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. For such markets, we can estimate a modified historical premium.

Country Risk Premiums

**Combined approach:** In this approach, the country risk premium is based upon the default spread of the bond issued by the country.

Country Risk Premium = Risk Premium_{US} + Country bond default spread

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

Country Risk Premium = Risk Premium_{US} \times \frac{\sigma_{Country Equity}}{\sigma_{US Equity}}

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

Country Risk Premium = Risk Premium_{US} + Country bond default spread

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

Country Risk Premium = Risk Premium_{US} + Country bond default spread

Country Risk Premium = Risk Premium_{US} + Country bond default spread

Country Risk Premiums

<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>450</td>
<td>551</td>
</tr>
<tr>
<td>Brazil</td>
<td>B1</td>
<td>450</td>
<td>537</td>
</tr>
<tr>
<td>Colombia</td>
<td>Ba2</td>
<td>300</td>
<td>331</td>
</tr>
<tr>
<td>Ecuador</td>
<td>Caa2</td>
<td>750</td>
<td>787</td>
</tr>
<tr>
<td>Guatemala</td>
<td>Ba2</td>
<td>300</td>
<td>361</td>
</tr>
<tr>
<td>Honduras</td>
<td>B2</td>
<td>550</td>
<td>581</td>
</tr>
<tr>
<td>Mexico</td>
<td>Baa3</td>
<td>145</td>
<td>235</td>
</tr>
<tr>
<td>Paraguay</td>
<td>B2</td>
<td>550</td>
<td>601</td>
</tr>
<tr>
<td>Peru</td>
<td>Ba3</td>
<td>400</td>
<td>455</td>
</tr>
<tr>
<td>Uruguay</td>
<td>Baa3</td>
<td>145</td>
<td>193</td>
</tr>
<tr>
<td>Venezuela</td>
<td>B2</td>
<td>550</td>
<td>631</td>
</tr>
</tbody>
</table>
Step 2: From Bond Default Spreads to Equity

Spreads

Ratings agencies make mistakes. They are often late in recognizing

and building in risk.

Ratings agencies make mistakes. They are often late in recognizing

and building in risk.

Another is to multiply the bond spread by the relative volatility of stock

and bond prices in that market. For example,

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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>A3</td>
<td>60</td>
<td>30</td>
</tr>
<tr>
<td>Hungary</td>
<td>Aa2</td>
<td>65</td>
<td>35</td>
</tr>
<tr>
<td>Ireland</td>
<td>Aa3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Italy</td>
<td>Aaa</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>Aaa</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Aaa</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Norway</td>
<td>Aaa</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Portugal</td>
<td>Aa3</td>
<td>60</td>
<td>30</td>
</tr>
<tr>
<td>Spain</td>
<td>Aa2</td>
<td>65</td>
<td>30</td>
</tr>
<tr>
<td>Sweden</td>
<td>Aa1</td>
<td>60</td>
<td>25</td>
</tr>
<tr>
<td>Switzerland</td>
<td>Aaa</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Greek Country Risk Premium

Country risk measures default risk. They are often late in recognizing

Ratings agencies make mistakes. They are often late in recognizing

- Adjusted Equity Spread = 0.95\% (4.5\%/26.1\%) = 1.59\%
- Standard Deviation in Greek CDS Bond = 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,

- Standard Deviation in Greek CDS Bond = 26.1\%
- Standard Deviation in Greek ASE (Equity) = 40.5\%

One way to adjust the country spread upwars is to use information from

the default spread on junk bonds.

and building in risk.

Spreads to be higher than debt spreads.

Country risk measures default risk. While default risk premia and

equity risk premia are highly correlated, one would expect equity

The equity risk premium has been roughly twice

the US market. In the US, the equity risk premium has been roughly twice

in the US market. In the US, the equity risk premium has been roughly twice

Another is to multiply the bond spread by the relative volatility of stock

and bond prices in that market. For example,
Approach 1: Assume that every company in the country is equally exposed to country risk. In this case,
$$E(\text{Return}) = \text{Riskfree Rate} + \beta (\text{US premium}) + \gamma \text{ (Country Spread)}$$
the proportion of their revenues come from non-domestic sales.

Approach 2: Assume that a company's exposure to country risk is similar to its exposure to other market risk.
$$E(\text{Return}) = \text{Riskfree Rate} + \beta \text{ (US premium + Country Spread)}$$

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 from non-domestic sales.)
$$E(\text{Return}) = \text{Riskfree Rate} + \beta \text{ (US premium + Country Spread)}$$

Impliedly, this is what you are assuming when you use the local government's dollar borrowing rate as your riskfree rate. In this case, every company in the country is equally exposed to country risk.
Estimating Company Exposure to Country Risk

Firms might be able to actively manage their country risk exposures where it is localized.

A company’s risk exposure is determined by where it does business and not by

There are two implications

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

\[
\lambda = \frac{\% \text{ of revenues domestically firm}}{\% \text{ of revenues domestically avg firm}} = \frac{35\%}{70\%} = 0.5
\]

For instance, if a firm gets 35% of its revenues domestically while the average firm in that market gets 70% of its revenues domestically, the factor \(\lambda\) measures the relative exposure of a firm to country risk. One simplistic solution would be to do the following:

The Texar factor \(\cdot\) measures the relative exposure of a firm to country risk. One simplistic solution would be to do the following:

- United Airlines should be less exposed to country risk in Brazil than one that
- Generates all its business within Brazil.
- Firms might be able to actively manage their country risk exposures where it is localized.

Different companies should be exposed to different degrees to country risk.
Estimating $E(\text{Return})$ for Embraer

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

$E(\text{Return}) = 4.5\% + 0.88(5.51\%) + 0.50(10.24\%) = 14.47\%$

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) have different exposures to country risk. In this case, $E(\text{Return}) = 4.5\% + 0.88(5.51\%) + 10.24\% = 18.36\%$

Approach 2: Assume that a company's exposure to country risk is similar to its exposure to other market risk. In this case, $E(\text{Return}) = 4.5\% + 10.24\% + 0.88(5.51\%) = 19.99\%$

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). Assuming that the beta for Embraer is 0.88, and that the risk-free rate used is 4.5%, (Real Risk-free Rate) Embraer is less exposed to country risk than the typical Brazilian firm since much of its business is overseas.
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:

\[
\text{Value} = \frac{\text{Expected Dividends next year}}{\text{Required Returns on Stocks} - \text{Expected Growth Rate}}
\]

The implied risk premium is then calculated by subtracting the risk-free rate from the required return on stocks.

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.

Dividends can be extended to include expected stock buybacks, and expected growth rates.

The Gordon Growth Model:

\[
\text{Value} = \frac{\text{Expected Dividends next year}}{\text{Required Returns on Stocks} - \text{Expected Growth Rate}}
\]
Estimating Implied Premium for U.S. Market:

Jan 1, 2003

Implied risk premium = 7.91% - 3.81% = 4.10%

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

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

Expected dividends = $31.25

Year 1 Year 2 Year 3 Year 4 Year 5

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%

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

Treasury bond rate = 3.81%

Level of the index = 879.82

Implied Equity Risk Premium: Monthly - January 2000 to January 2003

- Implied Equity Risk Premium
- S&P 500 Index
Implied Equity Premium = 11.16% - 4.5% = 6.66%

Expected return on Equity = 11.16%

Solving for the expected return:

Expected Growth

After year 5 = 4.5% (real growth rate in long term)
After 5 years = 13.5% (used expected real growth rate in Earnings)

Expected Growth

Risk free Rate = 4.5% (real risk free rate)

Other Parameters

Dividends on the Index = 4.40% of (Used weighted yield)
Level of the Index = 16417

Implied Premium for Brazilian Market: March 1, 2001
The Effect of Using Implied Equity Premiums on Value

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 + country risk adjustment) = 11.22 BR
Estimating Beta

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:
  - It has high standard error.
  - It reflects the firm’s business mix over the period of the regression, not the current mix.
  - 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

\[ R^\text{f} = a + b R^\text{m} \]

\( R^\text{f} \) against market returns \( R^\text{m} \).

The standard procedure for estimating betas is to regress stock returns.
Beta Estimation: The Noise Problem
Beta Estimation: The Index Effect
Determinants of Betas

Aswath Damodaran

Aswath Damodaran

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.

Cyclical companies have higher betas than non-cyclical firms.

Financial Leverage: The greater the proportion of fixed costs in the cost structure of a business, the higher the beta will be of that business. This is because higher fixed costs increase your exposure to all risk, including market risk.

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

Involving market risk.

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Involving market risk.
The beta of equity alone can be written as a function of the unlevered beta and the debt-equity ratio:

\[ \beta_L = \beta_u (1+ ((1-t)D/E)) \]

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:

\[ \beta_L = \beta_u (1+ ((1-t)D/E)) - \beta_{debt} (1-t) (D/E) \]

where:
- \( E \) = Market Value of Equity
- \( D \) = Market Value of Debt
- \( t \) = Corporate marginal tax rate
- \( \beta_u \) = Unlevered Beta (Asset Beta)
- \( \beta_L \) = Levered or Equity Beta
- \( \beta_{debt} \) = Beta 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 using:
  - the standard deviation in stock prices instead of a regression against an index.
  - accounting earnings or revenues, which are less noisy than market prices.

- Estimate the beta for the firm using fundamentals of the company
  - adjusting the regression beta estimate by bringing in information about the firm

- Modify the regression beta by
  - changing the index used to estimate the beta
The bottom up beta can be estimated by:

$$\beta_{levered} = \beta_{unlevered} \cdot \left(1 + \frac{\text{Current Debt/Equity Ratio}}{1 - \text{tax rate}}\right)$$

When:

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

The bottom up beta will give you a better estimate of the true beta (unlevered beta of a business can be estimated by looking at other firms in the same business)

Lever up using the firm's debt/equity ratio

When:

- Taking a weighted (by sales or operating income) average of the unlevered betas of the different businesses a firm is in.
### Bottom-up Beta: Firm in Multiple Businesses

**Boeing in 1998**

<table>
<thead>
<tr>
<th>Segment</th>
<th>Estimated Value</th>
<th>Unlevered Beta</th>
<th>Weight (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial Aircraft</td>
<td>30,160.48</td>
<td>0.91</td>
<td>70.39%</td>
</tr>
<tr>
<td>Defense</td>
<td>12,687.50</td>
<td>0.80</td>
<td>29.61%</td>
</tr>
</tbody>
</table>

Estimated Value = Revenues of division * Enterprise Value/Sales

Unlevered Beta of Firm = 0.88 (0.7039) + 0.80 (0.2961) = 0.88

Levered Beta Calculation

Market Value of Equity = $33,401
Market Value of Debt = $8,143
Market Debt/Equity Ratio = 24.38%
Tax Rate = 35%

Levered Beta for Boeing = 0.88 (1 + (1 - .35) (.2438)) = 1.02

---

Aswath Damodaran
Siderar is an Argentine steel company. Business Unlevered D/E Ratio Levered

<table>
<thead>
<tr>
<th>Steel</th>
<th>Beta</th>
<th>Unlevered D/E Ratio Levered</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.68</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5.97%</td>
<td></td>
</tr>
</tbody>
</table>

Proportion of operating income from steel = 100%

Levered 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, leverage, business, and firm's own financial based upon other firms in the business.

Historical Premium

1. Mature Equity Market Premium
   - Average premium earned by stocks over T. Bonds in U.S.

2. Country Default Spread (Equity/Country bond)

Country Default Spread

Country Risk Premium = Country Default Spread * (σ Equity/σ Country bond)

Implied Premium

Based on how equity market is priced today and a simple valuation model.

or

Based on historical data and a simple valuation model.
Estimating the Cost of Debt

The cost of debt is the rate at which you can borrow at currently, it will reflect not only your default risk but also the level of interest rates. When in trouble (either because you have no ratings or multiple ratings for a firm), estimate a synthetic rating for your firm and the cost of debt based upon that rating.

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

• 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 can have different ratings. You have to use a median rating.

• Synthetically rated straight bonds are liquid and widely traded. The limitation of this approach is that very few firms have long-term straight bonds outstanding from the market.

The cost of debt is the rate at which you can borrow at currently, it will reflect not only your default risk but also the level of interest rates.
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:

\[
\text{Interest Coverage Ratio} = \frac{161,470}{48,100} = 3.33
\]

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.

\[
\text{Interest Coverage Ratio} = \frac{55,467}{4,028} = 13.77
\]

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>Interest 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>1.75 - 2.00</td>
<td>B+</td>
<td>2.50%</td>
<td>4.75%</td>
</tr>
<tr>
<td>1.50 - 1.75</td>
<td>B</td>
<td>3.25%</td>
<td>6.50%</td>
</tr>
<tr>
<td>1.25 - 1.50</td>
<td>B –</td>
<td>4.25%</td>
<td>8.00%</td>
</tr>
<tr>
<td>0.80 - 1.25</td>
<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>0.20 - 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

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

For Titan, the rating estimated of AAA in 2001 is 0.75%.

The synthetic rating for Titan is AAA. The default spread in 2001 is 6.25%.

Pre-tax Cost of Debt 1999 = US T-Bond Rate + Country Default Spread + Company Default Spread

Pre-tax Cost of Debt 0.75%

Pre-tax Cost of Debt in 1999 = 6% + 5.25% + 1.25% = 12.50%

Companies in countries with low bond ratings and high default risk might bear the burden of country default risk.
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.
Weights for the Cost of Capital Computation

- The weights used to compute the cost of capital should be the market value weights for debt and equity.
- 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 them at the beginning.
- 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 compute the cost of capital.
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 - 0.787) (0.213) = 9.33%
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% + 0.71 (4% + 10.53%) = 16.32%
- Market Value of Equity = 3.20 * 310.89 = 995 million (94.37%)

**Debt**
- Cost of Debt = 6.00% + 5.25% (Country default) + 1.25% (Company default) = 12.5%
- Market Value of Debt = 59 Mil (5.63%)

**Cost of Capital**
\[
\text{Cost of Capital} = 16.32\% \times (0.9437) + 12.50\% \times (1 - 0.3345) \times (0.0563) \\
= 16.32\% \times (0.9437) + 8.32\% \times (0.0563) \\
= 15.87\%
\]
Converting a Dollar Cost of Capital into a Peso Cost of Capital

Approach 1: Use a peso risk-free rate in all of the calculations above. For instance, if the peso risk-free 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 risk-free 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%, the cost of capital can be calculated as follows:

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

For instance, if the inflation rate in pesos is 7% and the inflation rate in the U.S. is 3%,

\[
\text{Cost of Capital} = 1.07 / 1.03 = 1.0707 - 1 = 0.0707 = 7.07\%
\]

\[
\text{Cost of Capital} = 1.1587 (1.07 / 1.03) = 1.2037 --> 20.37\%
\]

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

This approach assumes the peso risk-free rate has no country risk premium embedded in it.

Approach 1: Use a peso risk-free rate in all of the calculations above. For instance, if the peso risk-free rate was 10%, the cost of capital would be

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Dealing with Hybrids and Preferred Stock

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 outstanding, break the $125 million into straight debt and conversion option components. The conversion option is equity.

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

Cost of Capital = Cost of Equity \left(\frac{\text{Debt}}{\text{Debt} + \text{Equity}}\right) + \text{Cost of Borrowing} \cdot (1-t) \cdot \left(\frac{\text{Debt}}{\text{Debt} + \text{Equity}}\right)

Cost of Borrowing should be based upon:
1. Synthetic or actual bond rating
2. Default spread

Marginal tax rate, reflecting tax benefits of debt

Weights should be market value weights

Cost of equity based upon bottom-up

Beta based upon bottom-up
II. Estimating Cash Flows
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.
   - If the investment is not expensed, it will be categorized as capital expenditures. To the extent that depreciation provides a cash flow, it will cover some of these expenditures.
   - If looking at cash flows to equity, consider the cash flows from net debt issues (debt issued - debt repaid).

3. Estimate the current earnings of the firm
Measuring Cash Flows

Cash flows can be measured to All claimholders in the firm:

- Net Income
- (Capital Expenditures - Depreciation)
- Change in non-cash Working Capital
- (Capital Expenditures - Depreciation)
- (Principal Repaid - New Debt Issues)
- Preferred Dividends
- Stock Buybacks
- Dividends
- Preferred Dividends
- (Principal Repaid - New Debt Issues)
- Change in non-cash Working Capital
- (Capital Expenditures - Depreciation)

Free Cash Flow to Firm (FCFF) = EBIT (1 - tax rate)

Just Equity Investors:

+ Dividends
+ Stock Buybacks
Measuring Cash Flow to the Firm

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

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

- Trailing Earnings
- Unofficial numbers

Normalize Earnings

- Financial Expenses
- Capital Expenses
- Non-recurring expenses

Cleanse operating items of

Measuring Earnings

- Operating leases
- Convert into debt
- Adjust operating income

H&D Expenses
- Convert into asset
- Adjust operating income

Firm’s history

Comparable Firms

Firm’s history

Update
- Trailing Earnings
- Unofficial numbers

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I. Update Earnings

When valuing companies, we often depend upon financial statements, and can be updated by using:
- Trailing 12-month data, constructed from quarterly earnings reports.
- Informal and unofficial news reports, if quarterly reports are unavailable.
- Tailoring 12-month data, consisting of quarterly earnings reports.

Updating makes the most difference for smaller and more volatile firms, as well as for firms that have undergone significant restructuring.
II. Correcting Accounting Earnings

The Operating Lease Adjustment: While accounting convention treats operating leases as operating expenses, they are really financial expenses. The operating earnings have to be adjusted to reflect this 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. However, this has no effect on equity earnings but does change the operating earnings.
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. The following adjustments to earnings and capital:

\[ \text{PV of Operating Leases} = \text{Operating Earnings} + \text{Pre-tax cost of Debt} \]

\[ \text{Adjusted Operating Earnings} = \text{Operating Earnings} + \text{Depreciation on Leased Asset} \]

As an approximation, this works:

\[ \text{Adjusted Operating Earnings} = \text{Operating Earnings} + \text{PV of Operating Leases} \]

\[ \text{Adjusted Operating Earnings} = \text{Operating Earnings} + \text{PV of Operating Leases} - \text{Depreciation on Leased Asset} \]
Operating Leases at The Home Depot in 1998

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

Operating Lease Expense Present Value

<table>
<thead>
<tr>
<th>Year</th>
<th>Lease Expense</th>
<th>Present Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>$2,016</td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>$2,571</td>
<td>$2,571</td>
</tr>
<tr>
<td>2000</td>
<td>$2,571</td>
<td>$2,571</td>
</tr>
<tr>
<td>2001</td>
<td>$2,571</td>
<td>$2,571</td>
</tr>
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<td>2002</td>
<td>$2,571</td>
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<td>2003</td>
<td>$2,571</td>
<td>$2,571</td>
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<td>2004</td>
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<tr>
<td>2005</td>
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</tr>
<tr>
<td>2006</td>
<td>$2,571</td>
<td>$2,571</td>
</tr>
<tr>
<td>2007</td>
<td>$2,571</td>
<td>$2,571</td>
</tr>
<tr>
<td>2008</td>
<td>$2,571</td>
<td>$2,571</td>
</tr>
<tr>
<td>2009</td>
<td>$2,571</td>
<td>$2,571</td>
</tr>
<tr>
<td>2010</td>
<td>$2,571</td>
<td>$2,571</td>
</tr>
</tbody>
</table>

Debt outstanding at the Home Depot = $1,205 + $2,571 = $3,776 mil.

Present Value of Operating Leases = $2,571.

Adjusted Operating Income = $2,016 + 2,571 * 0.0625 = $2,177 mil.

(The Home Depot has other debt outstanding of $1,205 million.)

$1,450 (PV of 10-yr annuity)
The Effects of Capitalizing Operating Leases

- Book capital invested: will increase, leading to an increase in debt.
- Operating income: will increase, since operating leases will now be treated as capital leases and the imputed interest will be included.
- Net income: will be unaffected since it is after both operating and financial expenses.
- Operating income: will increase, since operating leases will now be treated as capital leases and the imputed interest will be included.
- Return on Capital: will generally decrease since the increase in operating income will be proportionately lower than the increase in book capital invested.
- Financial expenses anyway: will be unaffected since it is after both operating and financial expenses.
- 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

<table>
<thead>
<tr>
<th>Category</th>
<th>R&amp;D as % of Operating Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computers</td>
<td>50.00%</td>
</tr>
<tr>
<td>Petroleum</td>
<td>20.00%</td>
</tr>
<tr>
<td>Market</td>
<td>10.00%</td>
</tr>
</tbody>
</table>
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. To capitalize R&D, one can:

- Collect past R&D expenses for as long as the amortizable life
- Specify an amortizable life for R&D (2 - 10 years)
- Specify an amortizable life for R&D
- Sum up the unamortized R&D 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...:)

R&D expenses: Operating or Capital Expenses?
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 (current)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>$ 177.80</td>
<td>$ 0.00</td>
<td>$ 0.00</td>
<td>$ 177.80</td>
</tr>
<tr>
<td>1995</td>
<td>$ 42.20</td>
<td>$ 159.60</td>
<td>$ 42.20</td>
<td>$ 199.80</td>
</tr>
<tr>
<td>1996</td>
<td>$ 79.80</td>
<td>$ 69.60</td>
<td>$ 79.80</td>
<td>$ 149.60</td>
</tr>
<tr>
<td>1997</td>
<td>$ 139.60</td>
<td>$ 102.80</td>
<td>$ 139.60</td>
<td>$ 242.40</td>
</tr>
<tr>
<td>1998</td>
<td>$ 205.20</td>
<td>$ 159.40</td>
<td>$ 205.20</td>
<td>$ 364.60</td>
</tr>
<tr>
<td>1999</td>
<td>$ 17.80</td>
<td>$ 159.40</td>
<td>$ 17.80</td>
<td>$ 177.20</td>
</tr>
</tbody>
</table>

Value of research asset = $ 3,035.4 million

Amortization of research asset in 1998 = $ 484.6 million

Adjustment to Operating Income = $ 1,594 million - $ 484.6 million = $ 1,109.4 million
The Effect of Capitalizing R&D

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 since the amortization will offset the R&D added back. The faster R&D is growing, the more operating income will be affected.

Net income will increase proportionately, depending again upon how fast R&D is growing.

Book value of equity (and capital) will increase by the capitalized research asset.

Capital expenditures will increase by the amount of R&D.

Depreciation will increase by the amortization of the research asset.

After-tax operating income.

For all firms, the net cap ex will increase by the same amount as the R&D added back, and the capital expenditures will increase by the amount of 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 loss of $500 million
A profit 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  □

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?
Aswath Damodaran

IV. Accounting Malfeasance

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.

Though all firms may be governed by the same accounting standards, more conservative firms will show higher earnings than more aggressive firms. The hidden truth is that they show to these standards can vary.
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?

- Temporary Problems
- Long-term Operating Problems
- Leverage Problems
- Operating Margin Problems
- Life Cycle Related
- Strategic Problems
- Operating Problems
- In recession
- Few years
- Ramping up

Value the firm by doing detailed cash flow forecasts starting with revenues and how it affects earnings with revenues and expenses.

(4) Problem is structural, target for:

- Average operating ROE (if normal)
- Target for: Operating Margins of Stable Firms in the Sector.
- Target for: A debt ratio that the firm will feel comfortable with by end of period, which could be its own optimal or the industry average.
- Target for: An industry-average operating margin.

Normalize earnings if firm's size has not changed significantly over time:

- Average Dollar Earnings
- Average Earnings (Net Income if Equity and EBIT if the firm made by the firm over time if firm's size has changed over time)
- Average Equity or Average ROC on current BV of capital (if valuing a firm) or current BV of equity (if valuing equity) on current BV.
What tax rate?

- The tax rate that you should use in computing your after-tax cost of debt
- The effective tax rate in the financial statements (taxes paid/EBIT)
- The tax rate based upon taxes paid and EBIT (taxes paid/EBIT)
- The marginal tax rate
- None of the above
- Any of the above, as long as you compute your after-tax cost of debt using the same tax rate
The choice really is between the effective tax rate 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. Thus if you choose to use the effective tax rate, adjust the tax rate towards the marginal tax rate over time.

By using the marginal tax rate, we tend to underestimate 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. The marginal tax rate on income for all firms that make money is 40%. Estimate the after-tax operating income each year for the next 3 years.

Year 1
EBIT: 500
Taxes: EBIT (1-t)
After-tax income: 300

Year 2
EBIT: 500
Taxes: EBIT (1-t)
After-tax income: 300

Year 3
EBIT: 500
Taxes: EBIT (1-t)
After-tax income: 300

A Tax Rate for a Money Losing Firm
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 (or sometimes all) of the capital expenditures. For some or a lot or (or sometimes all) of the capital expenditures and depreciation, assumptions about net capital expenditures can therefore never be made independently of assumptions about growth in the future. Assumptions about net capital expenditures can therefore never be made independently of assumptions about growth in the future. High growth firms will have much higher net capital expenditures than low growth firms. High growth firms will have much higher net capital expenditures than low growth firms. In general, the net capital expenditures will be a function of how fast a firm is growing or expecting to grow. High growth firms will have a function of how fast a firm is growing or expecting to grow.
Capital expenditures should include research and development expenses, once they have been reclassified as capital expenses. The adjusted net cap ex will be

\[
\text{Adjusted Net Capital Expenditures} = \text{Net Capital Expenditures} + \text{Current Year's R&D expenses} - \text{Amortization of Research Asset}
\]

Two caveats:

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

2. The best place to find acquisitions is in the statement of cash flows, usually categorized under other investment activities.

The adjusted net cap ex will be

\[
\text{Adjusted Net Capital Expenditures} = \text{Net Capital Expenditures} + \text{Acquisitions of other firms} - \text{Amortization of such acquisitions}
\]
## Cisco’s Acquisitions: 1999

<table>
<thead>
<tr>
<th>Price Paid</th>
<th>Method of Acquisition</th>
<th>Acquired</th>
<th>Method of Acquisition</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1,344</td>
<td>Pooling</td>
<td>GeoTel</td>
<td></td>
</tr>
<tr>
<td>$318</td>
<td>Purchase</td>
<td>Fibex</td>
<td></td>
</tr>
<tr>
<td>$103</td>
<td>Purchase</td>
<td>Sentient</td>
<td></td>
</tr>
<tr>
<td>$129</td>
<td>Purchase</td>
<td>Selsius Systems</td>
<td></td>
</tr>
<tr>
<td>$153</td>
<td>Purchase</td>
<td>Clarity Wireless</td>
<td></td>
</tr>
<tr>
<td>$158</td>
<td>Purchase</td>
<td>Summa Four</td>
<td></td>
</tr>
<tr>
<td>$58</td>
<td>Purchase</td>
<td>American Internet</td>
<td></td>
</tr>
<tr>
<td>$178</td>
<td>Pooling</td>
<td>Flexex</td>
<td></td>
</tr>
<tr>
<td>$1,159</td>
<td>Purchase</td>
<td>Amteva Tech</td>
<td></td>
</tr>
<tr>
<td>$1,118</td>
<td>Purchase</td>
<td>Pipeline</td>
<td></td>
</tr>
</tbody>
</table>

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

Adjusted Net Capital Expenditures = $3,723 mil

- Depreciation (from statement of CF) = $486 mil
- Amortization of R&D = $485 mil
- R & D expense = $1,594 mil
- Acquisitions = $2,516 mil

Adjusted Net Capital Expenditures = $3,723 mil

Net Cap Ex (from statement of CF) - Depreciation (from statement of CF) = $584 mil

Amortization was included in the depreciation number

Cisco's Net Capital Expenditures in 1999
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).

A cleaner definition of working capital from a cash flow perspective is the difference between non-cash current assets (inventory and accounts receivable) and non-debt current liabilities (accounts payable).

Any investment in this measure of working capital ties up cash. Therefore, any increases (decreases) in working capital will reduce (increase) cash flows in that period.

When forecasting future growth, it is important to forecast the effects of such growth on working capital needs, and 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, therefore, can be obtained by looking at non-cash working capital as a proportion of revenues. Some firms have negative non-cash working capital, assuming that this will continue into the future will generate positive cash flows for the firm. 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.
<table>
<thead>
<tr>
<th>Company</th>
<th>Revenues</th>
<th>Non-cash WC</th>
<th>% of Revenues</th>
<th>Change from last year</th>
<th>Average: last 3 years</th>
<th>Average: industry</th>
<th>Assumption in Valuation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amazon</td>
<td>$1,640</td>
<td>$400</td>
<td>-25.53%</td>
<td>($309)</td>
<td>-15.16%</td>
<td>-3.16%</td>
<td>8.23%</td>
</tr>
<tr>
<td>Cisco</td>
<td>$12,154</td>
<td>$700</td>
<td>-3.32%</td>
<td>($700)</td>
<td>-2.71%</td>
<td>7.04%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Motorola</td>
<td>$30,931</td>
<td>$2,154</td>
<td>8.23%</td>
<td>($829)</td>
<td>8.71%</td>
<td>15.16%</td>
<td>8.23%</td>
</tr>
</tbody>
</table>
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 will be paid on the stock. Managers like to hold on to cash to meet unforeseen future contingencies and invest in opportunities and are conservative and try to smooth out dividends (paid out). 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. 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)
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 is future growth built into the non-discretionary losses its basis when there is future growth built into the earnings calculation. Capital expenditures into discretionary and non-discretionary categories of capital expenditures (debt repayments - new debt issues) would need to make at the present, which would over estimate the value of the equity in the firm.

• Valuation models, where earnings are discounted back to the present, will use earnings would not be investing in new assets and thus could not grow.

• Even if earnings were cash flows, a firm that paid its earnings out as expenses in the earnings calculation, earnings are not cash flows, since there are both non-cash revenues and dividends. This cannot be true for several reasons:

Measuring Potential Dividends
Estimating Cash Flows: FCFE

Cash flows to Equity for a Levered Firm

\[
\text{Net Income} - (\text{Capital Expenditures} - \text{Depreciation}) - \text{Changes in non-cash Working Capital} - (\text{Principal Repayments} - \text{New Debt Issues}) - \text{Net Income} = \text{Free Cash Flow to Equity}.
\]

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

value debt to capital ratio, looking forward. In computing FCFE, the book value debt to capital ratio should be used when looking back in time but can be replaced with the market value debt to capital ratio, looking forward.

\[
\text{Net Income} - (1 - \delta) (\text{Capital Expenditures} - \text{Depreciation}) - (1 - \delta) \text{Working Capital Needs} = \text{Free Cash Flow to Equity}
\]

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

For this firm,

\[
\text{Proceeds from new debt issues} = \text{Principal Repayments} + d \times (\text{Capital Expenditures} - \text{Depreciation} + \text{Working Capital Needs})
\]

In computing FCFE, the book value debt to capital ratio should be used when looking back in time but can be replaced with the market value debt to capital ratio, looking forward.
Estimating FCFE: Disney

Net Income = $1,533 Million

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

Net Income = $1,533 Million

Dividends Paid = $345 Million

Free CF to Equity = Net Income - (Cap. Exp - Dep) - Depr*(1-DR) - Chg. Working Capital*(1-DR)

= $1,533 - ($1,746 - $1,134) - ($1,134(1-0.2383)) - ($477(1-0.2383))

= $704 Million
FCFE and Leverage: Is this a free lunch?
FCFE and Leverage: The Other Shoe Drops
In a discounted cash flow model, increasing the debt/equity ratio will generally increase the expected free cash flows to equity investors over future time periods and also the cost of equity applied in discounting these cash flows. Which of the following statements relating leverage to value would you subscribe to?

- Increasing leverage will increase value because the cash flow effects will offset the risk effects.
- Increasing leverage will decrease value because the risk effects will be greater than the cash flow effects.
- Increasing leverage will not affect value because the risk effects will exactly offset 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.

And where it is in terms of current leverage. 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

Earnings per Share = 325.00 Million Br

\[ \text{Free Cashflow to Equity} = \frac{\text{Net Income} - (\text{Cap Ex} - \text{Depr}) \times (1 - \text{Debt Ratio}) - \text{Change in Non-cash WC} \times (1 - \text{Debt Ratio})}{1} \]

\[ = \frac{325 - (396 - 183) \times (1 - 0.4348) - 12 \times (1 - 0.4348)}{1} \]

\[ = 120.39 \text{ Million Br} \]

\[ + 6.78 \text{ Million Br} = 127.17 \text{ Million Br} \]

\[ \text{Net Income (1996)} = 325 \text{ Million Br} \]

\[ \text{Change in Non-cash WC (1996)} = 12 \text{ Million Br} \]

\[ \text{Capital Spending (1996)} = 396 \text{ Million Br} \]

\[ \text{Depreciation (1996)} = 183 \text{ Million Br} \]

\[ \text{Debt Ratio} = 43.48\% \]

\[ \text{Dividends Paid} = 232 \text{ Million Br} \]

\[ \text{Estimating FCFE (1996):} \]

\[ \text{Free Cashflow to Equity} = 127.17 \text{ Million Br} \]
III. Estimating Growth

DCF Valuation
Ways of Estimating Growth in Earnings

- Look at the past
- The historical growth in earnings per share is usually a good starting point
- Ultimately, all growth in earnings can be traced to two fundamentals
- Look at fundamentals
- How much the firm is investing in new projects, and what returns these projects are making for the firm.
- 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 what others are estimating for growth estimation
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
- Arithmetic versus geometric averages

Historical growth rates can be sensitive to:

- How to deal with negative earnings
- The effect of changing size
- The period used in the estimation

In using historical growth rates, the following factors have to be considered:
## 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>Revenues</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>$22,416</td>
<td>4.31%</td>
<td>$3,216</td>
<td>5.56%</td>
<td>$4,151</td>
<td>10.89%</td>
<td>$22,416</td>
<td>14.18%</td>
</tr>
<tr>
<td>1995</td>
<td>$27,037</td>
<td>21.54%</td>
<td>$4,850</td>
<td>16.84%</td>
<td>$5,398</td>
<td>9.06%</td>
<td>$27,037</td>
<td>12.56%</td>
</tr>
<tr>
<td>1996</td>
<td>$27,973</td>
<td>3.46%</td>
<td>$4,268</td>
<td>-12.00%</td>
<td>$2,931</td>
<td>-33.13%</td>
<td>$27,973</td>
<td>5.40%</td>
</tr>
<tr>
<td>1997</td>
<td>$29,794</td>
<td>6.51%</td>
<td>$4,276</td>
<td>0.19%</td>
<td>$1,960</td>
<td>-33.13%</td>
<td>$29,794</td>
<td>12.56%</td>
</tr>
<tr>
<td>1998</td>
<td>$29,398</td>
<td>-1.33%</td>
<td>$3,019</td>
<td>-29.40%</td>
<td>$822</td>
<td>-57.78%</td>
<td>$29,398</td>
<td>4.28%</td>
</tr>
<tr>
<td>1999</td>
<td>$30,931</td>
<td>5.21%</td>
<td>$5,398</td>
<td>78.80%</td>
<td>$3,516</td>
<td>291.24%</td>
<td>$30,931</td>
<td>11.20%</td>
</tr>
</tbody>
</table>

**Arithmetic Average:**
- Revenues: 7.08%
- EBIT: 6.82%
- EBITDA: 7.08%

**Geometric Average:**
- Revenues: 6.82%
- EBIT: 5.39%
- EBITDA: 4.31%

**Standard Deviation:**
- Revenues: 41.56%
- EBIT: 141.78%
- EBITDA: 141.78%
Cisco: Linear and Log-Linear Models for Growth

<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>

\[ \text{ln(EPS)} = -4.66 + 0.4212 \times (t) \]

Growth Rate = \$0.0383/\$0.13 = 30.5% (Average EPS from 1991-99)

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

\[ \text{EPS} = -0.066 + 0.0383 (t) \]

\[ \text{Growth rate approximately 42.12%} \]

\[ \text{Year} \]

| 1991 | 1.394 |
| 1992 | 1.3863 |
| 1993 | 1.7148 |
| 1994 | 1.8326 |
| 1995 | 2.5257 |
| 1996 | 2.5557 |
| 1997 | 2.6593 |
| 1998 | 2.7189 |
| 1999 | 2.9120 |

\[ \text{ln(EPS)} \]
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?

- -600%
- +600%
- +120%
- Cannot be estimated
Dealing with Negative Earnings

When earnings are negative, the growth rate is meaningless. Thus, when the earnings in the starting period are negative, the growth rate cannot be estimated. It does not tell you much about the future.

There are three solutions:

1. Use the absolute value of earnings in the starting period as the denominator
2. Use the higher of the two numbers as the denominator:
   - $0.30/0.05 = 600\%$
3. Use a linear regression model and divide the coefficient by the average earnings.

When earnings are negative, the growth rate cannot be estimated. (0.30/-0.05 = 600%)
### The Effect of Size on Growth: Callaway Golf

<table>
<thead>
<tr>
<th>Year</th>
<th>Net Profit Growth Rate</th>
<th>Year</th>
<th>Net Profit Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>1.80%</td>
<td>1991</td>
<td>6.40%</td>
</tr>
<tr>
<td>1992</td>
<td>19.30%</td>
<td>1993</td>
<td>41.20%</td>
</tr>
<tr>
<td>1994</td>
<td>78.00%</td>
<td>1995</td>
<td>97.70%</td>
</tr>
<tr>
<td>1996</td>
<td>122.30%</td>
<td>1997</td>
<td>89.32%</td>
</tr>
<tr>
<td>1998</td>
<td>25.26%</td>
<td>1999</td>
<td>25.26%</td>
</tr>
<tr>
<td>2000</td>
<td>201.56%</td>
<td>2001</td>
<td>113.47%</td>
</tr>
<tr>
<td>2002</td>
<td>122.30%</td>
<td>2003</td>
<td>25.26%</td>
</tr>
<tr>
<td>2004</td>
<td>122.30%</td>
<td>2005</td>
<td>25.26%</td>
</tr>
<tr>
<td>2006</td>
<td>122.30%</td>
<td>2007</td>
<td>25.26%</td>
</tr>
</tbody>
</table>

Geometric Average Growth Rate = 102%
Extrapolation and its Dangers

<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>

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.
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. The sectors that they follow, and the information that goes into this estimate is far more limited. 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.

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

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

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

- The median forecast error for All-America analysts is 2% lower than the median
  error of other analysts in the quarter prior to being chosen as All-America analysts.

- However, in the calendar year following being chosen as All-America analysts,
  buy recommendations have a 3% rise in price, and sell recommendations have a
  13.8% rise in price.

- For these recommendations, the price changes are sustained, and they continue to rise in the following period (2.4% for
  buys; 1.8% for the sells).

- There is no evidence that analysts who are chosen for the All-America Analysts
  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 for All-America analysts is 4.7% lower than the median
  of other analysts.

- These analysts become slightly better forecasters in the quarter after being chosen,
  because they were chosen because they were better forecasters of earnings.

- There is no evidence that analysts who are chosen for the All-America Analysts
  team have a greater impact on the stock price than revisions from other analysts.

- The median forecast error for All-America analysts is 2% lower than the median
  forecast error in the quarter prior to being chosen as All-America analysts.

- The recommendations made by the All-America Analysts have a greater impact on
  the stock price than revisions from other analysts.
Aswath Damodaran

The Five Deadly Sins of an Analyst

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

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

Stockholm Syndrome (shortly to be renamed the Bre-X Syndrome): Analysts who start identifying with the managers of the firms they are supposed to follow.

Factophobia: Generally is coupled with delusions of being a famous story teller; tendency to base a recommendation on a "story" coupled with a refusal to face the facts.

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.

Tunnel Vision: Sins of an Analyst
Proposition 1: There is far less private information and far more public information in most analyst forecasts than is generally claimed.

Proposition 2: The biggest source of private information for analysts remains the company itself which might explain why All-America analysts become better forecasters than other analysts and why there is such a high correlation across analysts’ forecasts and revisions (information bias and the need to preserve sources) why there are more buy recommendations than sell recommendations after they are chosen to be part of the team.”

Proposition 3: There is value in knowing what analysts are forecasting as earnings growth for a firm. There is, however, danger when they agree too much (lemmingitis) and when they disagree too little (in which far more far less private information and far more public information in most analyst forecasts than is generally claimed).
III. Fundamental Growth Rates

Current Return on Investment on Projects = 12%

Next Period's Return on Investment = 12%

Current Earnings = $120

Investment in Existing Projects = $1000

Investment in New Projects = $100

Change in ROI from current to next period: 0%

Change in Earnings = $12

1. Change in Earnings

\[ \text{Change in Earnings} = \text{Current Earnings} \times \text{Period: 0%} \times \text{Change in Return on Investment} \]

\[ \text{Change in Earnings} = \text{Current Earnings} \times \text{Period: 0%} \times \text{Change in Return on Investment} \]

2. Next Period's Earnings

\[ \text{Next Period's Earnings} = \text{Current Earnings} \times \text{Period: 12%} \times \text{Investment in New Projects} \]

\[ \text{Next Period's Earnings} = \text{Current Earnings} \times \text{Period: 12%} \times \text{Investment in New Projects} \]

3. Total Earnings

\[ \text{Total Earnings} = \text{Next Period's Earnings} + \text{Change in Earnings} \]

\[ \text{Total Earnings} = \text{Next Period's Earnings} + \text{Change in Earnings} \]
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:

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

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

\[
\text{Current Earnings} = \frac{1000 \times .12}{100 \times (13\% - 12\%)} + 100 \times 13\%
\]

\[
\text{Current Earnings} = \frac{120}{122} \times 13\% = 10\%
\]

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

\[
\text{Current Earnings} = \frac{10\% \times 12\% \times 83.33\%}{\text{Return on Investment} \times \text{Return on Investment}}
\]

\[
\text{Current Earnings} = \frac{120}{122} \times 13\% = 19.17\%
\]

In the special case where ROI on existing projects remains unchanged and is equal to the ROI on new projects.
I. Expected Long Term Growth in EPS

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

\[
\text{Proposition 1: The expected growth rate in earnings for a company cannot exceed its return on equity in the long term.}
\]

\[
\text{EPS} = \frac{\text{Retention Ratio} \times \text{ROE}}{1 - \text{Retention Ratio}}
\]

\[
\text{Return on Investment} = \frac{\text{Net Income}}{\text{Book Value of Equity}}
\]

\[
\text{Reinvestment Rate} = \frac{\text{Current Earnings} - \text{Expected Earnings}}{\text{Current Earnings}}
\]

\[
\text{EPS} = \text{ROE} \times \left(1 - \frac{1}{\text{ROE}}\right)
\]

\[
\text{EPS} = \text{ROE} \times \left(1 - \frac{1}{\text{ROE}}\right)
\]

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

\[
\text{Return on Investment} = \text{ROE} = \frac{\text{Net Income}}{\text{Book Value of Equity}}
\]

\[
\text{Reinvestment Rate} = \frac{\text{Current Earnings} - \text{Expected Earnings}}{\text{Current Earnings}} = \text{Retention Ratio}
\]

Proposition follows:

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

\[
\text{I. Expected Long Term Growth in EPS}
\]
Current Return on Equity = 15.79%

Current Retention Ratio = 1 - DPS/EPS = 1 - 1.13/2.45 = 53.88%

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

\[
\text{Expected Growth Rate} = 0.5388 \times (15.79\%) = 8.51\%
\]
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? 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?
When the ROE is expected to change,

$$g_{EPS} = b \times ROE_{t+1} + \frac{(ROE_{t+1} - ROE_t)}{ROE_t}$$

Proposition 2: Small changes in ROE translate into large changes in earnings per share.

Proposition 3: No firm can, in the long term, sustain growth in the 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.

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

When the ROE is expected to change,

$$g_{EPS} = b \times ROE_{t+1} + \frac{(ROE_{t+1} - ROE_t)}{ROE_t}$$

Changes in ROE and Expected Growth
Assume now that ABN’s expansion into Asia will push up the ROE to 17%. While the retention ratio will remain 53.88%, the expected growth rate in that year will be:

\[ \text{EPS} = b \times \text{ROE}_t + (\text{ROE}_{t+1} - \text{ROE}_t) / \text{ROE}_t \]

\[ = (0.5388)(0.17) + (0.17 - 0.1579) / 0.1579 = 16.83\% \]

Note that 1.21% improvement in ROE translates into almost a doubling of the growth rate from 8.71% to 16.83%.
ROE and Leverage

ROE = ROC + D/E (ROC - i (1-t))

where,

ROC = EBIT / BV of Capital

D/E = BV of Debt / BV of Equity

where,

BV: Book Value

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

i = Interest Expense on Debt / BV of Debt

t = Tax rate on ordinary income

D/E = BV of Debt / BV of Equity

BV of Equity = BV of Capital - BV of Debt

1 - (1 - t) = (1 - t)
Decomposing ROE: Brahma

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

After-tax Cost of Debt = 8.25% (1-0.32) = 5.61% (Real BR)

Debt/Equity Ratio = (542+478)/1326 = 0.77

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

Real Return on Capital = 687 (1-0.32) / (1326+542+478) = 19.91%

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))

\[
\text{Return on Equity} = 9.54\% + 1.91 (9.54\% - 0.125\%) = 8.42\%
\]

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

\[
\text{Debt/Equity Ratio} = \frac{2378 + 1303}{1925} = 1.91
\]

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

\[
\text{After-tax Cost of Debt} = 13.5\% (1 - 0.25) = 10.125\%
\]

Return on Capital = 7.13 (1 - 0.25)/(1925 + 2378 + 1303) = 9.54%

\[
\text{Return on Capital} = \frac{7.13 (1 - 0.25)}{1925 + 2378 + 1303} = 9.54\%
\]
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): expected growth in earnings can be invested in projects earning the return on equity. The limitation of the EPS fundamental growth equation is that it...
Ill. Expected Growth in EBIT and Fundamentals: Stable ROC and Reinvestment Rate

Return on Capital (ROC) = EBIT/(BV of Debt + BV of Equity)

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

Proposition: The net capital expenditure needs of a firm, for a given growth rate, should be inversely proportional to the quality of its investments.

Given growth rate, the reinvestment rate should be inversely proportional to the quality of the firm's investments.

Reinvestment Rate = ROC = EBIT/(BV of Debt + BV of Equity)
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 cap ex or working capital investments being made. 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) = 36.45%

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:

\[
\text{Expected Growth Rate} = ROC_{t+1} \times \text{Reinvestment Rate} + \frac{(ROC_t - ROC_{t+1})}{ROC_t}
\]

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.
Motorola’s Growth Rate

Motorola’s current return on capital is 12.18% and its reinvestment rate making 17.22%.

We expect Motorola’s return on capital to rise to 17.40% over the next 5 years.

\[
\text{Expected Growth Rate} = \text{ROC}_{\text{New Investments}} \times \text{Reinvestment Rate} + \left\{ \left[ 1 + \left( \frac{\text{ROC}_{\text{New Investments}} - \text{ROC}_{\text{Current}}}{\text{ROC}_{\text{Current}}} \right)^{\frac{1}{5}} \right] - 1 \right\} 
\]

\[
= \frac{17.22 \times 0.5299 + \left\{ \left[ 1 + \left( \frac{0.1722 - 0.1218}{0.1218} \right)^{\frac{1}{5}} \right] - 1 \right\}}{1 + 0.1218} 
\]

\[
= 0.174 \text{ or } 17.40\% 
\]

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

Growth from new investments: \(0.1722 \times 0.5299 = 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.

\[\text{Growth from new investments: } 17.22 \times \frac{5299}{100} = 9.12\% \]

\[\text{Growth from more efficiently using existing investments: } 17.40\% - 9.12\% = 8.28\% \]

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

\[\text{We expect Motorola’s return on capital to rise to } 17.22\% \text{ over the next 5 years.}\]

\[\text{Motorola’s current return on capital is 12.18\% and its reinvestment rate is 52.99\%.} \]
When operating income is negative or margins are changing, we use a three-step process to estimate growth:

1. **Estimate expected operating margins each year**
   - Set a target margin that the firm will move towards.
   - Adjust the current margin towards the larger margin.

2. **Estimate the capital that needs to be invested to generate revenue growth**
   - Use historical revenue growth to get estimates of revenue growth in the near future.
   - Decrease the growth rate as the firm becomes larger.
   - Keep track of absolute revenues to make sure that the growth is feasible.

3. **Estimate growth rates in revenues over time**
   - Decrease the growth rate as the firm becomes larger.
   - Use expected revenue growth to get estimates of revenue growth in the near future.

   When operating income is negative or margins are changing.
<table>
<thead>
<tr>
<th>Year</th>
<th>Operating Income</th>
<th>Revenues</th>
<th>Operating Margin</th>
<th>Growth Rate</th>
<th>Revenue</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$2,928</td>
<td>13.98%</td>
<td>$1,802</td>
<td>5.00%</td>
<td>$2,068</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>$1,816</td>
<td>12.27%</td>
<td>$1,479</td>
<td>10.00%</td>
<td>$1,640</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>$1,101</td>
<td>11.04%</td>
<td>$1,381</td>
<td>20.00%</td>
<td>$1,060</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>$1,040</td>
<td>9.20%</td>
<td>$1,144</td>
<td>30.00%</td>
<td>$795</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>$610</td>
<td>6.44%</td>
<td>$648</td>
<td>40.00%</td>
<td>$447</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>$491</td>
<td>2.30%</td>
<td>$540</td>
<td>60.00%</td>
<td>$343</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>$182</td>
<td>3.91%</td>
<td>$2,610</td>
<td>80.00%</td>
<td>$104</td>
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</tr>
<tr>
<td>8</td>
<td>$84</td>
<td>13.23%</td>
<td>$1,161</td>
<td>100.00%</td>
<td>$88</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>$38</td>
<td>17.11%</td>
<td>$906</td>
<td>50.00%</td>
<td>$33</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>$28</td>
<td>7.96%</td>
<td>$537</td>
<td>13.08%</td>
<td>$13</td>
<td></td>
</tr>
</tbody>
</table>

Commerce One: Revenues and Revenue Growth
<table>
<thead>
<tr>
<th>Year</th>
<th>Revenues</th>
<th>Sales/Capital Reinvestment Capital ROC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$9,682</td>
<td>14.39%</td>
</tr>
<tr>
<td>2</td>
<td>$9,340</td>
<td>13.76%</td>
</tr>
<tr>
<td>3</td>
<td>$8,718</td>
<td>14.17%</td>
</tr>
<tr>
<td>4</td>
<td>$8,369</td>
<td>16.17%</td>
</tr>
<tr>
<td>5</td>
<td>$8,618</td>
<td>14.39%</td>
</tr>
<tr>
<td>6</td>
<td>$8,700</td>
<td>14.39%</td>
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<tr>
<td>7</td>
<td>$8,274</td>
<td>14.39%</td>
</tr>
<tr>
<td>8</td>
<td>$8,740</td>
<td>14.39%</td>
</tr>
<tr>
<td>9</td>
<td>$8,269</td>
<td>14.39%</td>
</tr>
<tr>
<td>10</td>
<td>$8,371</td>
<td>14.39%</td>
</tr>
</tbody>
</table>

Industry average = 15%
Expected Growth Rate

Equity Earnings Operating Income

Historical Fundamentals Analysts

Stable ROE Changing ROE

ROE \times \text{Equity Reinvestment Ratio} + \frac{(\text{ROE}_{t+1} - \text{ROE}_t)}{\text{ROE}_t}

Net Income

Earnings per Share

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

Negative Earnings

Changing ROC

Stable ROC

Revenue

Expenditure

Operational Income

Per Share
IV. Closure in Valuation

Discounted Cashflow Valuation

IV. Closure in Valuation
Getting Closure in Valuation

A publicly traded firm potentially has an infinite life. The value is the present value of 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:

\[
\text{Value} = \frac{\sum_{t=1}^{\infty} \frac{CF_t}{(1+r)^t}}{\text{Terminal Value}} + \frac{1}{CF_1} \left( \frac{1}{1 + (1+g)^N} \right)
\]

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:

\[
\text{Value} = \frac{\sum_{t=1}^{N} \frac{CF_t}{(1+r)^t}}{\text{Terminal Value}} + \frac{1}{CF_1} \left( \frac{1}{1 + (1+g)^N} \right)
\]

Therefore, the present value of cash flows forever.
Ways of Estimating Terminal Value

Terminal Value

Liquidation Value

Most useful when assets are separable and marketable

Easiest approach but technically soundest

Stable Growth Model

Most useful when assets can sustain forever, and the excess returns during the period it will earn

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 it will earn.

Multiple Approach

Terminal Value
Stable Growth and Terminal Value

When a firm’s cash flows beyond a certain point in time, they will all approach stable growth. The valuation formula above can be used to estimate the “terminal value” of all cash flows beyond.

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

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.

While they do approach stable growth, the valuation formula above can be used to estimate the “terminal value” of all cash flows beyond.

\[
\text{Terminal Value} = \frac{\text{Expected Cash Flow Next Period}}{r - g}
\]
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 will be lower but it can be set lower. If you are assuming that your firm will disappear over time, the stable growth rate can be negative.
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

1. 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.

2. 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.

3. Barriers to entry and differential advantages
   Ultimately, high growth comes from high project returns, which, in turn, come from barriers to entry and differential advantages. The question of how long growth will last and how high it will be can therefore be framed as a question about what the barriers to entry are, how long they will stay up and how strong they are, how barriers to entry and differential advantages will remain.

4. Size of the firm
   As a firm becomes larger, it becomes much more difficult for them to maintain high growth rates.
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>Model</th>
<th>High Growth Firms</th>
<th>Stable Growth Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDM</td>
<td>1. Pay no or low dividends</td>
<td>Usually have high leverage</td>
</tr>
<tr>
<td></td>
<td>2. Have high risk</td>
<td>Have average risk</td>
</tr>
<tr>
<td></td>
<td>3. Earn ROC closer to WACC</td>
<td>Have ROC closer to WACC</td>
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<tr>
<td></td>
<td>4. Have low leverage</td>
<td>Have low net cap ex</td>
</tr>
<tr>
<td>FCFE</td>
<td>1. Have high net cap ex</td>
<td>Usually have low leverage</td>
</tr>
<tr>
<td></td>
<td>2. Have high ROC</td>
<td>Have high net cap ex</td>
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<td></td>
<td>3. Earn high ROC</td>
<td>Have high ROC</td>
</tr>
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<td>4. Have leverage</td>
<td>Have leverage closer to industry average</td>
</tr>
</tbody>
</table>

Stable Growth and Fundamentals
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:

\[
\text{Stable Growth Payout Ratio} = 1 - \frac{g}{\text{ROE}} = 1 - \frac{.05}{.15} = 66.67\%
\]

\[g = b \text{ (ROE)}\]
\[b = \frac{g}{\text{ROE}}\]
\[\text{Payout} = 1 - b\]
The FCFE/FCFF Models: Estimating Stable Growth Inputs

Aswath Damodaran

The soundest way of estimating reinvestment rates in stable growth is to relate them to expected growth and returns on capital:

\[ \text{Reinvestment Rate} = \frac{\text{Growth in Operating Income}}{\text{ROC}} \]

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:

\[ \text{Reinvestment Rate} = \frac{5\%}{16.52\%} = 30.27\% \]

If you are consistent about estimating reinvestment rates, your terminal value will be unaffected by your stable growth assumption. If your return on capital is equal to your cost of capital, excess returns that drive your value but not the stable growth are what matters. You will find:

\[ \text{Reinvestment Rate} = \frac{\text{Growth in Operating Income}}{\text{ROC}} \]

The soundest way of estimating reinvestment rates in stable growth is:
Discounted Cashflow Valuation

Using the Right Model

V. Beyond Inputs: Choosing and
Summarizing the Inputs

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

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

And/or fundamentals

In summary, at this stage in the process, we should have an estimate of...
Which cash flow should I discount?

(a) For firms which have leverage which is too high or too low, 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?)
Given cash flows to equity, should I discount dividends or FCFE?

**Dividends vs. FCFE**

- **Dividend Discount Model**
  - (a) For firms which pay dividends are not available (Example: Private Companies, IPOs)
  - (b) For firms where dividends are close to Free Cash Flow to Equity.

- **Use the FCFE Model**
  - (a) For firms which pay dividends which are significantly higher or lower than 10% of FCFE over a 5-year period, use the FCFE model.
  - (b) For firms where FCFE are difficult to estimate (Example: Banks and Financial Service companies)
  - (c) For firms where FCFE are significantly less than 80% or FCFE or dividends are greater than the Free Cash Flow to Equity.

**As a rule of thumb,** if dividends are less than 80% or FCFE or dividends are greater than 110% of FCFE over a 5-year period, use the FCFE model.

- **For firms which pay dividends which are significantly higher or lower than the Free Cash Flow to Equity.**

- **Use the Dividend Discount Model**

- **Use the FCFE Model**
What discount rate should I use?

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

Use a 3-Stage or n-stage Model
- Has firm characteristics that are very different from the norm
- Is small and growing at a very high rate (> Overall Growth Rate + 10%)
- or
- Has significant barriers to entry into the business

Use a 2-Stage Growth Model
- Is large & growing at a moderate rate (≤ Overall Growth Rate + 10%)
- or
- Has a single product & barriers to entry with a finite life (e.g., patents)

Use a Stable Growth Model
- Has the characteristics of a stable firm (average risk & reinvestment rates)
- constrained by regulation from growing at a rate faster than the economy
- or
- Large and growing at a rate close to or less than growth rate of the economy
### The Building Blocks of Valuation

#### Cash Flows to Equity

<table>
<thead>
<tr>
<th>Formula</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\text{Expected Dividends to Stockholders}$</td>
<td>Net Income $\times (1 \times \delta)$</td>
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<tr>
<td>$\text{Cashflows to Equity}$</td>
<td>$\text{EBIT} \times (1 - \text{tax rate}) - (\text{Capital Exp.} - \text{Depreciation}) - \text{Change in Working Capital}$</td>
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### Cash Flows to Firm

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<td>$\text{WACC} = \text{ke} \times \left(\frac{E}{E + D}\right) + \text{kd} \times \left(\frac{D}{E + D}\right)$</td>
<td>Weighted Average Cost of Capital</td>
</tr>
<tr>
<td>$\text{kd} = \text{Current Borrowing Rate} \times (1 - \text{tax rate})$</td>
<td>Cost of Debt</td>
</tr>
<tr>
<td>$\text{ke} = \text{Cost of Equity}$</td>
<td>Cost of Equity</td>
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</table>

#### Growth Models

- **Stable Growth**: $g$
- **Two-Stage Growth**: $g_1$, $g_2$
- **Three-Stage Growth**: $g_1$, $g_2$, $g_3$
- **High Growth**: $g$
- **Stable Transition**: $g$ to stable growth

#### Discount Rate

- **Cost of Equity**: The riskier the investment, the greater is the cost of equity.
- **Models**:
  - CAPM: Riskfree Rate + Beta $\times$ Risk Premium
  - APM: Riskfree Rate + $\sum \text{Beta}_j \times \text{Risk Premium}_j$ (for $n$ factors)
6. Tying up Loose Ends
Dealing with Cash and Marketable Securities

The simplest and most direct way of dealing with cash and cash and marketable securities is to keep it out of the valuation. Markets may discount the value of this cash or overpaying on acquisitions, and they may be contaminated by the inclusion of cash. (Use betas of the operating assets alone to estimate the cost of equity).

Once the firm has been valued, add back the value of cash and 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 and the discount rate. 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 estimated before interest income from cash and securities, and the discount rate should not be contaminated by the inclusion of 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?
The Case of Closed End Funds

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.
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 investments) 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

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 on December 31, 1997, and the Indonesian fund at a premium of 80%+ on NAV at the end of 31, 1997. Why might an investor be willing to pay such a premium for net asset value?
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.
How to value holdings in other firms

- Parent firm: portion of this value to value of firm
- Add value subsidiary separately

- Strip operating income of subsidiary estimating equity value
- Add debt in subsidiary to the debt in portion of firm value
- Add portion of this value to value of subsidiary
- Value subsidiary as a firm and add
  - Value equity in subsidiary and take share of holding
  - What to do...
When financial statements are consolidated, some analysts value the firm with the consolidated operating income and then subtract minority interests from the firm value to arrive at the value of the equity in the firm. What is wrong with this approach?
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. However, this approach assumes that common stock is the only equity claim on the firm. In many firms, there are other equity claims as well, including:

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

The value of these non-stock equity claims has to be subtracted from the value of equity before dividing by the number of shares outstanding.

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 that common stock is the only equity claim on the firm.
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. Warrants are therefore a long term call option on the equity of the firm, and can be valued using option pricing models. A warrant is therefore a long term call option on the equity of the firm which has relevance for estimating equity of the firm and have to be treated as equity, which has relevance 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 debt and equity for the leverage calculation.
A convertible bond is a bond that can be converted into a predetermined number of shares, at the option of the bondholder.

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. Firms generally add conversion options to bonds to lower the interest rate paid on the bonds.

A convertible bond can be considered to be made up of two securities - a straight bond and a conversion option.
Embedded in every convertible bond is a straight bond component.

The straight bond component is clearly debt.

Value of Bond = \[ d + P \cdot \text{PV of coupons at market interest rate + PV of face value} \]

Step 1: Obtain the coupon rate on the convertible bond. The coupon rate and the market interest rate, estimate the value of the bond as follows:

- 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 other bonds issued by the company or from other bonds that the company has outstanding or from its bond rating.
- Step 3: Using the market interest rate, estimate the value of the bond.
- Generally, be low because of the conversion option.

The easiest way to value the straight bond component is to act as if the conversion option does not exist and value the bond. This can be accomplished as follows:
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 result in stock dilution, and variance and constant dividend yields much shakier.
• Conversion options are often exercised before expiration, making it dangerous to use European option pricing models.

These problems can be partially alleviated by using a binomial option pricing model, allowing for shifts in variance and early exercise, and factoring in the dilution effect.
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 = Market Price per Warrant * Number of Warrants
  Alternatively estimate the value using option pricing models
- Value of Conversion Option = Market Value of Convertible Bonds - Value of Straight Debt Portion of Convertible Bonds

Step 4: Divide the remaining value of equity by the number of shares outstanding to get value per share.
An Example: Valuing Sterling Software

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.
Estimating the Value of Options

Convertible Debt has a 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: $115 million * 0.0575 = $6.6125 million
- Value of Straight Debt Portion of Convertible Debt = $6.6125 million + ($115 million / 1.075^8) = $103.21 million
- Value of Conversion Option in Debt = Market Value of Convertible Debt - Straight Debt Portion = $175 million - $103.21 million = $72 million

Value of Warrants = Number of Warrants * Warrant Price = 1.8 million warrants * $30 = $54 million
Value Per Share: Sterling Software

Value of Equity = $2,036 million
- Value of Equity in Convertible Debt = $72 million
- Value of Equity in Warrants = $54 million
Value of Equity in Common Stock = $1,910 million
Number of Shares outstanding = 25.50 million
Value per Share = $74.90
A Comparison to Other Approaches

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

\[
\text{Value of Equity per share} = \frac{\text{Value of Equity}}{\text{Fully diluted # of shares}}
\]

\[
= \frac{2036 + 115 + 1.8*55}{25.5 + 2.3 + 1.8} = \$ 76.01
\]

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

\[
\text{Value of Equity per share} = \frac{\text{Value of Equity} + \text{Proceeds from Exercise}}{\text{Fully diluted number of shares}}
\]

\[
= \frac{2036 + 115 + 1.8*55}{25.5 + 2.3 + 1.8} = \$ 76.01
\]

\[
= \frac{2036 + 115 + 1.8*55}{25.5 + 2.3 + 1.8} = \$ 68.78
\]

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

**The Treasury Stock Approach:** Add the expected proceeds from exercise to the numerator before dividing by the number of shares outstanding.
Valuations
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<tr>
<th>Company</th>
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<tbody>
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<tr>
<td>DaimlerChrysler</td>
<td>Stable FCFE</td>
<td>Dividends≠FCFE, Stable D/E, High g</td>
</tr>
</tbody>
</table>
The risk premium that I will be using in the latest valuations for mature equity markets is 4%. 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%.
Con Ed: Rationale for Model

The firm pays out dividends that are roughly equal to FCFE.

- 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 are consistent with stable, DDM model firm

- The firm is in stable leverage.
- The beta is 0.80 and has been stable over time.
- The firm is in stable growth; based upon size and the area that it serves. Its rates are also regulated; it is unlikely that the regulators will allow profits to grow at extraordinary rates.
- Firm Characteristics are consistent with stable, DDM model firm

Aswath Damodaran
Earnings per share for 2002 = $3.10 (Fourth quarter estimate used)
Dividends per share for 2002 = $2.22
Dividend payout ratio over 2002 = 71.61%
Expected growth rate in Earnings and Dividends = 3%

Cost of Equity = 4.05% + 0.80*4% = 7.20%
Con Ed Beta = 0.80 (Bottom-up beta estimate)

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

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

2002 Con Ed: A Stable Growth DDM: December 31,
Con Ed: Break Even Growth Rates

Expected Growth Rate

Value per share

Break even point: Value = Price
Estimating Implied Growth Rate

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:

\[
\text{Price per share} = \frac{\text{Retention ratio} \times \text{Return on equity}}{\text{Break-even Return on equity} - \text{Implied growth rate}}
\]

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

\[
\text{Fundamental growth rate} = (28.39\% \times 11\%) = 3.12\%
\]

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

\[
\text{Break even return on equity} = \frac{\text{Retention ratio} \times \text{Return on equity}}{\text{Implied growth rate}}
\]

\[
\text{Break even return on equity} = \frac{0.2839 \times 0.11}{0.0196} = 1.96%
\]

To estimate the implied growth rate, we set the market price equal to the value, and solve for the growth rate,
When you do any valuation, there are three possibilities. The first is that you are both right and the market is right and that you are both wrong. The second is that the market is right and that you are wrong. The third is that you are right and the market is wrong.

Assume that you invest in a misvalued firm, and that you are right and the market is wrong. Will you definitely profit from your investment?
Con Ed: A Look Back

Con Ed: Estimated Value versus Price per share


Price per share
Estimated Value
As a financial service institution, estimating FCFE or FCFF is very difficult. (stable growth rate roughly 4% in Euros)

The expected 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 would be a stable growth rate (roughly 4% in Euros).
### ABN Amro: Summarizing the Inputs

<table>
<thead>
<tr>
<th>Economic Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Term Riskfree Rate (in Euros)</td>
<td>4.95%</td>
</tr>
<tr>
<td>Risk Premium</td>
<td>4% (U.S. premium: Netherlands is AAA rated)</td>
</tr>
<tr>
<td>Current Earnings Per Share</td>
<td>1.54 EUR</td>
</tr>
<tr>
<td>Current DPS</td>
<td>0.90 EUR</td>
</tr>
</tbody>
</table>

#### Growth Phases

<table>
<thead>
<tr>
<th>Growth Phase</th>
<th>Length</th>
<th>Return on Equity</th>
<th>Payout Ratio</th>
<th>Retention Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Growth Phase</td>
<td>5 years</td>
<td>16.00%</td>
<td>58.44%</td>
<td>41.56%</td>
</tr>
<tr>
<td>Stable Growth Phase</td>
<td>Forever after 5 years</td>
<td>8.95%</td>
<td>41.56%</td>
<td>58.44%</td>
</tr>
</tbody>
</table>

#### Beta

- Assumed: 0.95
- Calculated: 1.00
- Assumed Beta: 0.95
- Calculated Beta: 1.00

#### Cost of Equity

- Assumed: 8.75% ($4.95% + 0.95(4\%))
- Calculated: 8.95% ($4.95% + 1.00(4\%))
The stock was trading at 15.99 Euros on December 31, 2002.

<table>
<thead>
<tr>
<th>Year</th>
<th>EPS</th>
<th>DPS</th>
<th>PV at 8.75%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>0.88</td>
<td>0.87</td>
<td>0.85 + 0.83 + 0.82 + 16.23 = 20.48 EUR</td>
</tr>
</tbody>
</table>

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

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

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

Terminal Price = 24.69 / (0.0895 - 0.04) = 24.69 EUR

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

PV at 8.75% | DPS | EPS |
---|---|---|
2002 | 0.88 | 0.87 | 0.85 |
2003 | 0.80 | 0.83 | 0.85 |
2004 | 1.00 | 1.16 | 1.19 |
2005 | 1.01 | 1.17 | 1.19 |
2006 | 1.02 | 1.18 | 1.19 |
2007 | 1.03 | 1.19 | 1.20 |
2008 | 1.04 | 1.20 | 1.21 |
2009 | 1.05 | 1.21 | 1.22 |

ABN AMRO: Valuation
Dividends

EPS = 1.54 EUR * Payout Ratio 58.44%

DPS = 0.90 EUR

Expected Growth

41.56% * 16% = 6.65%

0.96 EUR

1.02 EUR

1.09 EUR

1.16 EUR

1.24 EUR

Terminal Value = EPS * Payout / (r - g)

= (2.21 * 0.5531) / (0.0895 - 0.04) = 24.69

Cost of Equity

4.95% + 0.95 (0.04) = 8.75%

Discount at Cost of Equity

Value of Equity per Share = 20.48 EUR

Risk Premium

4%

Mature Market

Country Risk

4%

Main Market

Average beta for European banks

0.93

Beta

4.95%

Long term bond rate in Euros

Risk Free Rate

4%

Figure 1: VALUING ABN AMRO

Retention Ratio = 41.56%

ROE = 16%

Expected Growth

41.56% * 6.65%
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 that 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:

\[
P^* = P^u + \left( \frac{1}{r} \right) \left( \frac{(\frac{1}{u} - 1)}{(1 + \frac{1}{u}) - \frac{1}{u}} \right) \left( \frac{1}{DPS_0} \right) \sum_{t=1}^{\infty} \left( \frac{1}{u} \right) \left( \frac{1}{u} + \frac{1}{1 + \frac{1}{u}} \right) \]

In any valuation model, it is possible to extract the portion of the value attributable to growth, and to break this down further into that portion attributable to "high growth" and "stable growth".
Aswath Damodaran

ABN AMRO: Decomposing Value

Value of Assets in Place = Current DPS/Cost of Equity
\[ = \frac{0.90}{0.0895} \approx 10.06 \text{ Euros} \]

Value of Stable Growth = 0.90 \left( \frac{1.04}{0.0895-0.04} \right) - 10.06 \text{ Euros}
\[ = 8.85 \text{ Euros} \]

Value of High Growth = Total Value - (10.06 + 8.85)
\[ = 20.48 - (10.06 + 8.85) = 1.57 \text{ Euros} \]

(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 at U.S. companies (which have outpaced nominal GNP growth over the last 5 years) will continue to do so in the next 5 years. The consensus estimates of growth in earnings (from Zacks) is roughly 8% (with top-down estimates of growth in earnings from Zacks) is roughly 8% (with top-down estimates provide a reasonable estimate of the cash flows from buying the index.

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 conservative (albeit conservative) estimates of growth in earnings from Zacks is roughly 8% (with top-down estimates provide a reasonable estimate of the 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 after year 5</td>
<td>1.81%</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

S & P 500: Inputs to the Model (12/31/02)
S&P 500: 2-Stage DDM Valuation

Cost of Equity = 4.05% + 1(4%) = 8.05%

Terminal Value = 23.45*1.0405/(.0805 - .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 discount model understates the value because dividends are less than FCFE.
- The expected growth in earnings over the next 5 years will be much higher than 8%.
- The risk premium used in the valuation (4%) is too high.
- The market is overvalued.
- The dividend discount model understates the value because dividends are less than FCFE.
- The expected growth in earnings over the next 5 years will be much higher than 8%.
- The risk premium used in the valuation (4%) is too high.
- The market is overvalued.

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%.

<table>
<thead>
<tr>
<th>Year</th>
<th>Expected Dividends</th>
<th>Expected Terminal Value</th>
<th>Present Value</th>
<th>Intrinsic Value of Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>$37.46</td>
<td>$1,059.27</td>
<td>$27.70</td>
<td>$857.63</td>
</tr>
<tr>
<td>1</td>
<td>$37.71</td>
<td>$32.33</td>
<td>$27.69</td>
<td>$27.68</td>
</tr>
<tr>
<td>2</td>
<td>$34.91</td>
<td>$33.22</td>
<td>$27.66</td>
<td>$27.68</td>
</tr>
<tr>
<td>3</td>
<td>$37.11</td>
<td>$33.22</td>
<td>$27.68</td>
<td>$27.66</td>
</tr>
<tr>
<td>4</td>
<td>$40.72</td>
<td>$29.93</td>
<td>$27.66</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 FCFE yield for the index was about 3.15% in 2001.
- The estimated free cashflows to equity for each firm in the index and average the free cashflows to equity for each firm in 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 cross holdings that Japanese firms have in other firms and the lack of transparency in these holdings, makes it difficult to value these holdings.
- The earnings of many export oriented Japanese firms tend to be heavily influenced by exchange rate movements.
- The earnings earlier in the decade and in the 1980s, reflecting the Japanese economy.

Several reasons:

Japanese firms have proved to be among the most difficult to value for
Valuing Sony: August 2000

Sony had net income of 31 billion JPY in 1999, down from 76 billion JPY in 1997 and 38 billion in 1998. The return on equity at Sony dropped from 7.25% in 1997 to 2.13% in 1999. The return on equity at Sony had net income of 31 billion JPY in 1999, down from 76 billion JPY.

Capital expenditure in 1999 amounted to 103 billion JPY, whereas dividends of 21 billion JPY in 1999, dropped from 5.25% in 1997 to 2.13% in 1999. The return on equity at Sony.

Non-cash working capital at Sony in 1999 was 220 billion JPY on revenues of 2593 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.
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 the return on equity of 5.25% which is the return on normalized earnings. We will use the return on equity of 5.25%, which is the return on
non-cash working capital will grow at 8.48% of revenues.
We will assume that the net capital expenditures will grow at the same rate and that the book debt to capital ratio is 25.8%; we will assume that they will finance reinvestment with this ratio (rather than the market value). 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).
We will use a beta of 1.10, to reflect the unlevered beta of electronic firms (globally) 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 losing higher growth.

Sony: Rationale for Model
Estimating the Inputs

Cost of Equity = 7% + 1.10 (4%) = 6.40%

Book Value Debt Ratio = 25.8%

Book Value of Equity = 6.60 Billion JPY

Expected Change in non-cash Working Capital = (27.1 - 25.93)*0.0848

Expected Revenues next year = 25.93(1.03) = 27.1 Billion JPY

Current Revenues = 27.93 Billion JPY

Expected Net Capital Expenditures = 27 Billion (1.03) = 27.81 Billion JPY

Current Net Capital Expenditures = (103 - 76) = 27 Billion JPY

Reinvestment Needs

Normalized Net Income next year = 17.9 Billion * 0.525 = 9.4 Billion JPY

Estimated Return on Equity = 5.25%

Book Value of Equity (3/1999) = 17.9 Billion JPY

Normalized Earnings:
Aswath Damodaran

The Valuation

Expected FCFE next year

Expected Net Income = 94.24 billion

\[
\text{Net Cap Ex} = (0.64 - 0.03) = 27.81 \text{ billion JPY}
\]

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

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

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

Valuation

Cost of Equity = 6.4%; Stable Growth Rate = 3%;

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

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

Value of Equity = 68.71 billion JPY / (0.064 - 0.03) = 2021 billion JPY
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.

The Effect of Cross-holdings

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.
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 8% a year for the next 5 years. (Analysts are also forecasting a growth rate of 12% a year for the next 5 years.) Nestle has a debt to capital ratio of about 37.6% and is unlikely to change that leverage materially. (How do I know? I do not. I am just making an assumption.)

Like many large European firms, Nestle has paid less in dividends than it has available in FCFE.
<table>
<thead>
<tr>
<th></th>
<th>High Growth</th>
<th>Stable Growth</th>
<th>Long Term Government Bond Rate (SFr) = 4%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Expenditures/Share</td>
<td>11.42 SFr</td>
<td>11.42 SFr</td>
<td></td>
</tr>
<tr>
<td>Depreciation/Share</td>
<td>7.38 SFr</td>
<td>7.38 SFr</td>
<td></td>
</tr>
<tr>
<td>Current EPS = 108.88 SFr</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revenue/Share = 1,820 SFr</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Expected Growth</td>
<td>15.38%</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>Return on Equity</td>
<td>23.63%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retention Ratio</td>
<td>65.10% (Current)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WC/Revenues</td>
<td>9.30% (Existing)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Debt Ratio</td>
<td>37.60%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cap Ex/Deprecan</td>
<td>37.60%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beta</td>
<td>0.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>5 years</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Estimating the Risk Premium for Nestle

<table>
<thead>
<tr>
<th>Region</th>
<th>Revenue Weight</th>
<th>Risk Premium</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>70.5%</td>
<td>5.26%</td>
<td>70.5%</td>
</tr>
<tr>
<td>South America</td>
<td>4.3%</td>
<td>8.08%</td>
<td>4.3%</td>
</tr>
<tr>
<td>Switzerland</td>
<td>1.1%</td>
<td>0.83%</td>
<td>1.11%</td>
</tr>
<tr>
<td>Germany/France/UK</td>
<td>26.1%</td>
<td>10.0%</td>
<td>26.1%</td>
</tr>
<tr>
<td>Italy/Spain</td>
<td>4.0%</td>
<td>8.23%</td>
<td>4.06%</td>
</tr>
<tr>
<td>Asia</td>
<td>5.8%</td>
<td>0.0%</td>
<td>5.8%</td>
</tr>
<tr>
<td>Rest of W. Europe</td>
<td>18.4%</td>
<td>5.67%</td>
<td>18.4%</td>
</tr>
<tr>
<td>Eastern Europe</td>
<td>4.0%</td>
<td>5.26%</td>
<td>4.0%</td>
</tr>
</tbody>
</table>

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

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

Aswath Damodaran
The stock was trading 2906 SFr on December 31, 1999.

Terminal Value per Share = \( \frac{\text{Earnings per Share in year 6} \times (1 + DR)^5}{(1 + DR)^5} \)

Net Capital Ex = Depreciation * 0.93

Present Value = \( \frac{\text{Earnings per Share in year 6} - \text{Net Capital Ex} \times (1 - DR) \times (1 - DR)^5}{(1 + DR)^5} \)
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:

Terminal Value per Share = \( \frac{4986}{0.0847 - 0.05} \) = 4986 Sfr

\[ \text{Value} = \text{FCFE}_6 \times \frac{1}{(1 + 0.0847)^6} \]

\[ = \frac{3740.91}{1.0847^6} \]

\[ = 222.93 \text{ Sfr} \]

\[ \text{Value} = 274.04 + 178.76 + 83.78 + 89.12 + 83.78 + 1.0847 \]

\[ = 4986 \text{ Sfr} \]

Terminal Value per Share = \( \frac{4986}{0.0847 - 0.05} \) = 4986 Sfr

\[ \text{FCFE}_6 = 231.57 - 13.85(1 - 0.376) = 222.93 \text{ Sfr} \]

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:

Terminal Value per Share = \( \frac{4986}{0.0847 - 0.05} \) = 4986 Sfr

\[ \text{Value} = \text{FCFE}_6 \times \frac{1}{(1 + 0.0847)^6} \]

\[ = \frac{3740.91}{1.0847^6} \]

\[ = 222.93 \text{ Sfr} \]
A VALUATION OF NESTLÉ (PER SHARE)

Terminal Value = 173.93/(0.0847 - 0.05) = 3890

Cashflow to Equity
Net Income - (Cap Ex - Dep) (1 - DR) - Change in WC (!-DR)
= FCFE
= 79.28

Expected Growth
Retention Ratio * Return on Equity
= 0.651 * 0.2363 = 15.38%

Expected Growth = 4% + 0.85(5.26%) = 8.47%

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

Risk Premium
4% + 1.26% = 5.26%

Risk Free Rate
Swiss Franc Rate = 4%

Country Risk
Beta = 0.85

Base Equity Premium
4% + 1.26% = 5.26%

Risk Premium
4% + 1.26% = 5.26%

Debt Ratio = 37.6%

Firm is in stable growth: g = 5%; Beta = 0.85; Cap Ex/Deprec = 150%

Discount at Cost of Equity
Value of Equity per Share = 30.11 Sfr

Debt Ratio Stays 37.6%
Firm is in stable growth: g = 5%; Beta = 0.85
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

Market Wide Information
- Economic Growth
- Risk Premiums
- Interest Rates

Industry Wide Information
- Changes in laws and regulations
- Changes in technology

Firm Specific Information
- New Earnings Reports
- Changes in fundamentals (Risk and Return characteristics)
- New information
Assume that Nestle makes an earnings announcement which includes two pieces of news:

- 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.
- 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:

- The drop in net margin will make the return on equity lower (assuming turnover ratios remain unchanged). This will reduce expected growth.
- The drop in earnings will make the projected earnings and cash flows lower, even if the growth rate remains the same.

The earnings per share will be 105.5 Sfr instead of 108.8 Sfr.
A RE-VALUATION OF NESTLE (PER SHARE)
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 dividends are unlikely to reflect free cash flow to equity. In addition, the firm consistently funds a portion of its reinvestment needs with new debt issues.
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%. We estimate the firm’s book equity reinvestment in 2000, debt to capital ratio of 40.94% at the end of 1999 and use it to estimate the normalized equity reinvestment in the firm's book equity.

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 in non-cash working capital using non-cash working capital as a percentage of revenues in 2000:

\[ \text{Normalized change in non-cash working capital} = \frac{\text{Non-cash working capital}^{2000}}{\text{Revenue}^{2000}} \times \left( \frac{\text{Revenue}^{2000} - \text{Revenue}^{1999}}{\text{Revenue}^{2000}} \right) \]

\[ = \frac{180}{2253} \times \left( \frac{2253 - 1598}{2253} \right) = 52.3 \text{ million CY} \]

The working capital changes over the last 4 years have been volatile, and we normalize the change in non-cash working capital as a percentage of revenues in 2000:

\[ \text{Normalized change in non-cash working capital} = \frac{\text{Non-cash working capital}^{2000}}{\text{Revenue}^{2000}} \times \left( \frac{\text{Revenue}^{2000} - \text{Revenue}^{1999}}{\text{Revenue}^{2000}} \right) \]

\[ = \frac{180}{2253} \times \left( \frac{2253 - 1598}{2253} \right) = 52.3 \text{ million CY} \]

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%.
### Inputs for the 3 Stages

<table>
<thead>
<tr>
<th></th>
<th>High Growth</th>
<th>Transition Phase</th>
<th>Stable Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>5 years</td>
<td>5 years</td>
<td>Forever after yr 10</td>
</tr>
<tr>
<td>Beta</td>
<td>0.75</td>
<td>Moves to 0.80</td>
<td>0.80</td>
</tr>
<tr>
<td>Risk Premium</td>
<td>4% + 2.28%</td>
<td>--&gt;</td>
<td>4 + 0.95%</td>
</tr>
<tr>
<td>ROE</td>
<td>2.8% -&gt; 12%</td>
<td>12% -&gt; 20%</td>
<td>20%</td>
</tr>
<tr>
<td>Equity Reinv.</td>
<td>149.97%</td>
<td>Moves to 50%</td>
<td>50%</td>
</tr>
<tr>
<td>Expected Growth</td>
<td>44.91%</td>
<td>Moves to 10%</td>
<td>10%</td>
</tr>
</tbody>
</table>

We will assume that:

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

\[
= \frac{183.3 (1 - 0.4094)}{72.36} = 149.97\%
\]

Expected growth rate - next 5 years

\[
= \text{Equity reinvestment rate} \times \text{ROE}_{\text{New}} + [1 + (\text{ROE}_5 \times \text{ROE}_{\text{today}}) / \text{ROE}_{\text{today}}]^{1/5} - 1
\]

\[
= 1.4997 \times 0.12 + [(1+(0.12 \times 0.028) / 0.028)^{1/5} - 1] = 44.91\%
\]
<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>
<th>Sum of the present values of FCFE during high growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>CY1</td>
<td>13.96%</td>
<td>50.00%</td>
<td>CY665.91</td>
<td>%</td>
<td>CY1,331.81</td>
<td>%</td>
<td>CY1,110.18</td>
<td>= (186.65)</td>
</tr>
<tr>
<td>CY2</td>
<td>14.11%</td>
<td>69.94%</td>
<td>CY363.25</td>
<td>%</td>
<td>CY1,210.74</td>
<td>%</td>
<td>CY1,034.97</td>
<td></td>
</tr>
<tr>
<td>CY3</td>
<td>14.26%</td>
<td>69.68%</td>
<td>CY103.69</td>
<td>%</td>
<td>CY1,034.97</td>
<td>%</td>
<td>CY1,034.97</td>
<td></td>
</tr>
<tr>
<td>CY4</td>
<td>14.41%</td>
<td>88.92%</td>
<td>CY320.45</td>
<td>%</td>
<td>CY834.92</td>
<td>%</td>
<td>CY834.92</td>
<td></td>
</tr>
<tr>
<td>CY5</td>
<td>14.56%</td>
<td>88.94%</td>
<td>CY191.40</td>
<td>%</td>
<td>CY637.98</td>
<td>%</td>
<td>CY637.98</td>
<td></td>
</tr>
<tr>
<td>CY6</td>
<td>14.71%</td>
<td>88.98%</td>
<td>CY102.22</td>
<td>%</td>
<td>CY462.29</td>
<td>%</td>
<td>CY462.29</td>
<td></td>
</tr>
<tr>
<td>CY7</td>
<td>14.84%</td>
<td>88.99%</td>
<td>CY103.89</td>
<td>%</td>
<td>CY314.92</td>
<td>%</td>
<td>CY314.92</td>
<td></td>
</tr>
<tr>
<td>CY8</td>
<td>14.97%</td>
<td>88.99%</td>
<td>CY105.57</td>
<td>%</td>
<td>CY220.16</td>
<td>%</td>
<td>CY220.16</td>
<td></td>
</tr>
<tr>
<td>CY9</td>
<td>15.11%</td>
<td>88.99%</td>
<td>CY107.24</td>
<td>%</td>
<td>CY124.92</td>
<td>%</td>
<td>CY124.92</td>
<td></td>
</tr>
<tr>
<td>CY10</td>
<td>15.26%</td>
<td>88.99%</td>
<td>CY109.01</td>
<td>%</td>
<td>CY665.91</td>
<td>%</td>
<td>CY665.91</td>
<td></td>
</tr>
</tbody>
</table>

The sum of the present values of FCFE during high growth is $(186.65)$.  

**Tsingtao: Projected Cash Flows**
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

\[ \text{FCFE}_{11} = \text{Net Income}_{11} \times (1 - \text{Stable period equity reinvestment rate}) \]

\[ \text{FCFE}_{11} = 133.5 \times (1 - 0.5) = 73.25 \text{ million} \]

Terminal Value of equity in Tsingtao Breweries

\[ \text{Terminal Value} = \frac{\text{FCFE}_{11}}{\text{Cost of equity in stable growth} - \text{Stable growth rate}} \]

\[ \text{Terminal Value} = \frac{73.25}{0.1396 - 0.10} = 18,497 \text{ million} \]
Tsingtao: Valuation

The stock was trading at 10.10 Yuan per share, which would make it overvalued, based upon this valuation.

Value of Equity per share = \frac{\text{Value of Equity}}{\text{Number of Shares}} = \frac{\text{CY 4,596}\text{ million}}{653.15} = \text{CY 7.04 per share}

\text{PV of FCFE during the high growth period} + \text{PV of terminal value} = \text{CY 18,497} = \frac{\text{CY 18,497}}{(1.14^{15})}\times\frac{1.147^{15} \times 1.1426 \times 1.1441 \times 1.1396 \times 1.1365 \times 1.1326}{1.1411 ^ { \frac{1}{15} } } + \frac{1.1865 + \text{CY 18,497}}{1.14^{15}} = \text{CY 4,596 million}

\text{PV of Equity} = \text{Value of Equity} - \text{Value of Debt}

\text{Value of Equity}
DaimlerChrysler: Rationale for Model

June 2000

DaimlerChrysler is a mature firm in a mature industry. Therefore, we will assume a stable growth. Hence, we will use the FCFE model.

Since this is a relatively new organization, with two different cultures, we will probably change over time. Hence, we will use the FCFE model. Daimler has traditionally been more conservative on the use of debt (Daimler) than Chrysler, and bank-oriented in its use of debt (Chrysler). Thus, the debt ratio will change over time. Hence, we will use the FCFE model.
We will assume that the firm will maintain a long term growth rate of 3%. The bottom-up unlevered beta for automobile firms is 0.61, and market premium of 4% is used. 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. Based upon this operating income and the book values of debt and equity as of 1998, DaimlerChrysler had an after-tax return on capital of 7.15%. In 1999, Daimler Chrysler had earnings before interest and taxes of 9.324 million DM and had an effective tax rate of 46.94%.
Expected Reinvestment Rate ($\beta$ ROC) = 3% / 17.15% = 41.98%

Cost of Capital = 8.65% (62.3/(62.3+64.5)) + 2.69% (64.5/(62.3+64.5)) = 5.62%

After-tax Cost of Debt = (4.87% + 0.20%) (1 - 46.94%) = 2.69%

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

Bottom-up Levered Beta = 0.61 (1 + (1 - 46.94%) (64.5/62.3)) = 0.945

Cost of Capital

Daimler/Chrysler: Analyzing the Inputs
Daimler Chrysler Valuation

**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

**Value of operating assets** = 2957 / (0.056 - 0.03) = 130,915 mil DM

**Value of Firm** = 130,915 mil DM

**Debt Outstanding** = 64,488 mil DM

**Cash + Marketable Securities** = 18,068 mil DM

**Value of Firm** = 112,847 mil DM

**Value of Operating assets** = 2957 / (0.056 - 0.03)

**Value of Equity** = 130,915 - 64,488 - 18,068 = 48,359 mil DM

**Value per Share** = 72.7 DM per share

Stock was trading at 62.2 DM per share on June 1, 2000.
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?

Yes

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 running the firm reassesses its policy of funding the firm.

**FF Model - June 2000**

Tube Investments: Rationale for Using 2-Stage

**Aswath Damodaran**
Aswath Damodaran

**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)**

\[ 0.60 \times 0.092 = 0.0552 \]

5.52%

**Stable Growth**

- Country Premium: 5%
- Beta: 1.00
- Debt ratio: 44.2%
- Country Premium: 3%

**Country Premium**: 3%

**Terminal Value**

\[ \frac{5}{0.1478 - 0.05} = 28,378 \]

**Cost of Equity**

22.80%

**Cost of Debt**

\[ (0.12 + 1.50\%) \times (1 - 0.30) = 9.45\% \]

**Weights**

- E = 55.8%
- D = 44.2%

**Discount at Cost of Capital (WACC)**

\[ 0.558 \times 22.8\% + 0.442 \times 9.45\% = 16.90\% \]

**Firm Value**

19,578

**Firm Value**

19,578

**Current Cashflow to Firm**

- Terminal Value: 2775
- Reinvestment: 2,775
- Return on Capital: 9.20%
- Term Yr: 6
- 3.04
- 6.079

**Risk-free Rate**

- Real riskfree rate: 12%
- Beta: 1.17
- Risk Premium: 9.23%

**Unlevered Beta for Sectors**: 0.75

**Firm's D/E Ratio**: 79%

**Mature Risk Premium**: 4%

**Country Risk Premium**: 5%

**Tube Investments: Status Quo (in Rs)**

<table>
<thead>
<tr>
<th>EBIT(1-t)</th>
<th>Reinvestment</th>
<th>FCFF</th>
<th>Terminal Value 5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>$4,670</td>
<td>$2,802</td>
<td>$1,868</td>
<td>$2,775</td>
</tr>
<tr>
<td>$4,928</td>
<td>$2,957</td>
<td>$1,971</td>
<td>$3,082</td>
</tr>
<tr>
<td>$5,200</td>
<td>$3,120</td>
<td>$2,080</td>
<td>$3,229</td>
</tr>
<tr>
<td>$5,487</td>
<td>$3,292</td>
<td>$2,195</td>
<td>$3,467</td>
</tr>
<tr>
<td>$5,790</td>
<td>$3,474</td>
<td>$2,316</td>
<td>$3,750</td>
</tr>
</tbody>
</table>

**Terminal Value**

5% = 2775 / (1.1478 - 0.05) = 28,378

**Reinvestment Rate**: 60%

**Expected Growth**

- 60.092% = 0.552

**Return on Capital**: 5.52%

**Terminal Value**: 28,378

**Current Cashflow to Firm**

- FCFE: 658
- Chg WC: 4,150
- Nt CpX: 843
- EBIT(1-t): 4,255

**Value/Share**: 61.57
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.

The Effects of Return Improvements on Value
Current Cashflow to Firm

\[ \text{EBIT} (1-t) - \text{Chg WC} = \text{FCFF} \]

Reinvestment Rate = 112.82%

Expected Growth in EBIT (1-t)

\[ 0.60 \times 0.122 = 0.0732 \]

7.32%

Stable Growth = 5%; Beta = 1.00;

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

Country Premium = 3%; ROC = 12.20%

\[ \text{Reinvestment Rate} = 40.98\% \]

Terminal Value

\[ \frac{5}{0.1428 - 0.05} = 39.921 \]

Cost of Equity

\[ 22.80\% \]

Cost of Debt

\[ (12\% + 1.5\%) (1 - 0.30) = 9.45\% \]

Weights

\[ E = 55.8\%; D = 44.2\% \]

Discount at Cost of Capital (WACC)

\[ \text{WACC} = 22.8\% (0.558) + 9.45\% (0.442) = 16.99\% \]

Firm Value:

\[ 25,185 + \text{Cash: } 13,653 - \text{Debt: } 18,073 = \text{Equity: } 20,765 - \text{Options: } 0 \]

\[ \text{Value/Share: } 84.34 \]

Riskfree Rate:

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

Unlevered Beta for Sectors: 0.75

Firm's D/E Ratio: 79%

Mature risk premium: 4%

Country Risk Premium: 5%

\[ \text{Terminal Value} = 5 \times \left[ \frac{3.904}{1.1478 - 0.05} \right] = 39.921 \]

Terminal Value Rate:

\[ \text{Rate} = 12\% \]

\[ \text{Resultant Return} = 6.0 \times 1.22 = 7.32\% \]

Expected Growth Rate

\[ 60\% \]

Return on Capital

\[ 12.2\% \]

Reinvestment Rate to Firm

\[ 60\% \]

Current Cashflow to Firm

\[ \text{Current Investments: } \text{Higher Marginal Return} \text{(in Rs)} \]
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:

\[
\text{Expected Growth Rate} = 1.22 \times 0.60 + \left\{ 1 + \frac{1.22 - 0.92}{0.92} \right\}^{1/5} - 1
\]

= 1.313 or 13.13%
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

Would there be a corporate governance discount?
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.
Operating Leases at The Home Depot in 1998

The pre-tax cost of debt at the Home Depot is 5.80%

<table>
<thead>
<tr>
<th>Year Commitment</th>
<th>Present Value</th>
<th>Year Commitment</th>
<th>Present Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$2,647.70</td>
<td>2</td>
<td>$2,777.88</td>
</tr>
<tr>
<td>2</td>
<td>$1,780.03</td>
<td>3</td>
<td>$2,222.92</td>
</tr>
<tr>
<td>3</td>
<td>$1,955.33</td>
<td>4</td>
<td>$2,599.77</td>
</tr>
<tr>
<td>4</td>
<td>$2,450.00</td>
<td>5</td>
<td>$2,777.88</td>
</tr>
<tr>
<td>5</td>
<td>$2,360.00</td>
<td>6</td>
<td>$1,513.37</td>
</tr>
</tbody>
</table>

Debt Value of Leases = $2,647.70

The pre-tax cost of debt at the Home Depot is 5.80%
Other Adjustments from Operating Leases

EBIT $2,661 mil $2,815 mil
EBIT (1-t) $1,730 mil $1,829 mil
Debt $1,433 mil $4,081 mil
Operating Lease
Expensed
Converted to Debt
$4,081 mil
$1,433 mil
$2,815 mil
$1,433 mil
$2,815 mil
Current Cashflow to Firm

EBIT(1-t) : 1,829 - Net CapEx : 1,799
- Change WC : 190
= FCFF : <160

Reinvestment Rate = 108.75%

Expected Growth
in EBIT (1-t)

0.8862 * 0.1637 = 0.1451
14.51%

Stable Growth

g = 5%; Beta = 0.87;
D/(D+E) = 30%; ROC = 14.1%
Reinvestment Rate = 35.46%

Terminal Value
10 = 4806 / (0.0792 - 0.05) = 164,486

Cost of Equity

9.79%

Cost of Debt

(5% + 0.80%)(1 - 0.35) = 3.77%

Weights

E = 95.55%; D = 4.45%

Discount at Cost of Capital (WACC) = 9.79% (0.9555) + 3.77% (0.0445) = 9.52%

Firm Value:

68,949 + Cash: 62 - Debt: 4,081 = Equity 64,930 - Options 2,021

Value/Share $42.55

Riskfree Rate:

Government Bond Rate = 5% + Beta x Risk Premium = 0.87 x 5.5% = 4.86%

Unlevered Beta for Sectors: 0.86

Firm's D/E Ratio: 4.76%

Historical US Premium 5.5%

Country Risk Premium 0%

The Home Depot: A Valuator

Return on Capital

16.37%

Expected Growth

88.62%

Current Cashflow to Firm

14.51%

Terminal Value

10 = 4806 / (0.0792 - 0.05) = 164,486

Reinvestment Rate = 108.75%

= FCFE < 160
- Change WC : 170
- Net CapEx : 1.799
- Current Cashflow : 1.828

Return on Capital

16.37%

Expected Growth

88.62%
Dealing with Distress

The same business also in distress, and its value will be lower if the economy is doing badly and there are other firms in distress.

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

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

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

- Use the bond rating to estimate the cumulative probability of distress over 10 years.
- Estimate the probability of distress with a probit.
- Estimate the probability of distress by looking at market value of bonds.

A DCF valuation values a firm as a going concern. If there is a significant likelihood of distress, the value will be lower than the present value of the expected cashflows (a distress sale value), DCF valuations will underestimate the value of the firm.
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 Op Assets $5,530 + Cash & Non-op $2,260 = Value of Firm $7,790 - Value of Debt $4,923 = Value of Equity $2,867 - Equity Options $14 = Value per share $3.22

Value of Equity = $3.22

Beta:

3.00 > 1.10 → Risk Premium 4%

Internet/Retail

Operating Leverage

Current D/E: 441%

Base Equity Premium

Country Risk Premium

Current Revenue $3,804

Current Margin: -49.82%

Revenue Growth: 13.33%

EBITDA/Sales → 30%

Stable Growth

Stable Revenue Growth: 5%

Stable EBITDA/Sales

Stable ROIC: 7.36%

Stable Growth

2001

Global Crossing

November 2001

Stock Price = $1.86

Global Crossing

Forever

Terminal Value: 677(.0736-.05) = $28,683

Risk Free Rate: 4.8%

Beta = 1.2

Cost of Equity = 16.80%

Cost of Debt = 12.8%

Debt Ratio = 74.91% → 40%

Value of Equity = $2867

+ Cash & Non-op = $2,820

Value of Firm = $7,790

- Value of Debt = $4,923

Value of Op Assets = $5,530

+ Cash & Non-op = $2,260

Value of Equity = $2,867

- Equity Options = $14

Value per share = $3.22

Revenues = $3,804

EBITDA = $346

EBIT = $1,074

EBIT (1-t) = $1,550

+ Depreciation = $736

- Cap Ex = $1,716

- Chg WC = $46

FCFF = $392

Terminal Value = 677(.0736-.05)
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%

Probability of distress = 13.35% a year

\[
\sum_{t=0}^{653} \left( \frac{0.05(1.05)^t}{2000(1.05)^t} \right) + \left( \frac{0.05(1.05)^t}{1200(1.05)^t} \right) = 653
\]

Price of 8 year, 12% bond issued by Global Crossing = $653

Distress sale value of equity
- Book value of capital = $14,531 million
- Distress sale value = 15% of book value = 0.15*14531 = $2,180 million
- Book value of debt = $7,647 million
- Distress sale value of equity = $0

Distress adjusted value of equity
- Value of Global Crossing = $3.22 (.2337) + $0.00 (.7663) = $0.75

Distress sale value of equity
- Book value of debt = $7,647 million
- Book value of capital = $14,531 million
- Distress sale value of equity = $0

Probability of distress with Global Crossing
Bristol Myers, like most pharmaceutical firms, has a significant amount of research and development expenses. These expenses, when treated as operating expenditures, have a significant impact on the following:

- Operating Income
- Capital Expenditures
- Depreciation and Amortization
- Operating Ratios
- Investment Rates
- Return on Capital

When R&D expenses are reclassified as capital expenditures, there is a ripple effect on the following:

- Operating Income
- Capital Expenditures
- Depreciation and Amortization
- Operating Ratios
- Investment Rates
- Return on Capital
## 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>
<th>Amortization this year =</th>
<th>Value of Research Asset =</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>1939.00</td>
<td>1.00</td>
<td>1939.00</td>
<td>88.10</td>
<td>10-881.00</td>
</tr>
<tr>
<td>-11759.00</td>
<td>0.90</td>
<td>1583.10</td>
<td>175.90</td>
<td>96.30</td>
<td>6-1083.00</td>
</tr>
<tr>
<td>-21577.00</td>
<td>0.80</td>
<td>1261.60</td>
<td>157.70</td>
<td>80.80</td>
<td>8-1128.00</td>
</tr>
<tr>
<td>-31385.00</td>
<td>0.70</td>
<td>969.50</td>
<td>138.50</td>
<td>6.50</td>
<td>7-1194.00</td>
</tr>
<tr>
<td>-41276.00</td>
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<td>127.60</td>
<td>3.00</td>
<td>6-1274.00</td>
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<tr>
<td>-51199.00</td>
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<td>119.90</td>
<td>0.00</td>
<td>5-1383.00</td>
</tr>
<tr>
<td>-61108.00</td>
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<td>110.80</td>
<td>0.00</td>
<td>4-1496.00</td>
</tr>
<tr>
<td>-71128.00</td>
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<td>112.80</td>
<td>0.00</td>
<td>3-1615.00</td>
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<tr>
<td>-81083.00</td>
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<td>108.30</td>
<td>0.00</td>
<td>2-1731.00</td>
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<tr>
<td>-9983.00</td>
<td>0.10</td>
<td>98.30</td>
<td>98.30</td>
<td>0.00</td>
<td>1-1939.00</td>
</tr>
<tr>
<td>-10881.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>Current</td>
</tr>
</tbody>
</table>

Note: The unamortized portion and the amortization this year are calculated based on the given R&D expenses and a discount rate of 10%. The value of the research asset is calculated by discounting the future cash flows at the discount rate.
Amortization of asset for current year = $1,238 million

Additional tax benefit of expensing = (1939-1238) (0.35) = $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
- The tax effect of R&D expensing

$1,939 million
$1,238 million
$701 million (increase)

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
## Capitalizing R&D: The Effects

<table>
<thead>
<tr>
<th>Effect</th>
<th>R&amp;D Expensed</th>
<th>R&amp;D Capitalized</th>
<th>EBIT</th>
<th>EBIT (1-t)</th>
<th>Capital Spending</th>
<th>Depreciation</th>
<th>Net Cap Ex</th>
<th>Non-cash WC Chg</th>
<th>Reinvestment Rate</th>
<th>BV of Equity</th>
<th>ROC</th>
</tr>
</thead>
<tbody>
<tr>
<td>$704 mil</td>
<td>$801 mil</td>
<td>$1,405 mil</td>
<td>$3,444 mil</td>
<td>$3,397 mil</td>
<td>$6,100 mil</td>
<td>$4,069 mil</td>
<td>$79 mil</td>
<td>$79 mil</td>
<td>20.04%</td>
<td>$10,105 mil</td>
<td>38.65%</td>
</tr>
<tr>
<td>$701 mil</td>
<td>$1,238 mil</td>
<td>$1,320 mil</td>
<td>$2,005 mil</td>
<td>$2,309 mil</td>
<td>$3,444 mil</td>
<td>$4,070 mil</td>
<td>$801 mil</td>
<td>$801 mil</td>
<td>32.21%</td>
<td>$18,320 mil</td>
<td>25.21%</td>
</tr>
<tr>
<td>$6,094 mil</td>
<td>$6,094 mil</td>
<td>$7,044 mil</td>
<td>$7,044 mil</td>
<td>$7,044 mil</td>
<td>$10,084 mil</td>
<td>$10,084 mil</td>
<td>$79 mil</td>
<td>$79 mil</td>
<td>32.21%</td>
<td>$18,320 mil</td>
<td>25.21%</td>
</tr>
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<td>$1,405 mil</td>
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<td>$18,320 mil</td>
<td>25.21%</td>
</tr>
</tbody>
</table>

Capitalize R&D: The Effects
Current Cashflow to Firm

EBIT(1-t) : 4,607 - Nt CpX             1,405 - Chg WC                79 = FCFF               3,123

Reinvestment Rate = 32.21%

Expected Growth in EBIT (1-t)

.3221*.2515 = .081
8.10 %

Stable Growth g = 5%; Beta = 0.90; ROC = 15%
Reinvestment Rate = 33.33%

Terminal Value

5 = 4760/(.0861-.05) = 131,716

Cost of Equity

8.42%

Cost of Debt

(5.1%+0.75%)(1-.35) = 3.80%

Weights

E = 98.34% D = 1.66%

Discount at Cost of Capital (WACC) = 8.42% (.9834) + 3.80% (0.0166) = 8.34%

Oper. 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%(10-year T.Bond rate)
+ Beta
0.83
x Risk Premium
4.00% = 3.80% + 0.10%
Unlevered Beta for Sectors: 0.82
Firm’s D/E Ratio: 1.69%
Mature risk premium 4%
Country Risk Premium 0%

Bristol Myers: Status Quo

EBIT (1-t)$4,980 $5,383 $5,819 $6,290 $6,800
- Reinvestment$1,604 $1,734 $1,874 $2,026 $2,190
FCFF $3,376 $3,649 $3,945 $4,264 $4,610
The Dark Side of Valuation

Aswath Damodaran

http://www.stern.nyu.edu/~adamodar
Aswath Damodaran

To make our estimates, we draw our information from:

- The firm’s financial statements:
  - How much did the firm sell?
  - How much did it earn?

- 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?

- 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?
  - What happens to firms as they mature? (Margins, Revenue Growth…)
  - Reinvestment needs… Risk
  - Susceptibility to macro-economic factors (recessions and cyclical firms)

- 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?

- 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 not too many comparable firms; in valuing a software firm, we might not have too much historical data, but not too many comparable firms; in valuing a software firm, we might not have too much...
The Dark Side...

Valuation is most difficult when a company

Life cycle as the firm being valued

No comparables (or even if they exist, they are all at the same stage of the

No history

Has negative earnings and low revenues in its current financial statements

-
Discounted Cash Flow Valuation: High Growth with Negative Earnings

\[
\text{Terminal Value} = \text{FCFF}_{n+1} \left( \frac{1}{r-g} \right)
\]

\[
\text{WACC} = \frac{\text{Cost of Equity} \times \text{Equity}}{(\text{Debt} + \text{Equity})} + \frac{\text{Cost of Debt} \times \text{Debt}}{(\text{Debt} + \text{Equity})}
\]

\[
\text{FCFF} = \text{Revenue} \times \text{Op Margin} (1-t) - \text{Reinvestment}
\]

\[
\text{EBIT} \times (1-t)
\]

\[
\text{EBIT} \times (1-t) + \text{Reinvestment}
\]

\[
\text{EBIT} \times (1-t) + \text{NOLs}
\]
Amazon’s Bottom-up Beta

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.

Aswath Damodaran
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

**Interest Coverage Ratio**

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

Compared to the interest coverage ratio, which should suggest a low rating, one can estimate the average interest coverage ratio for Amazon.com for the first 5 years. This yields an average interest coverage ratio of 2.82 over the next 5 years. This yields an average interest coverage ratio of 2.82 over the next 5 years. In effect, the rating will be lower in the earlier years and higher in the later years than BBB.
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

<table>
<thead>
<tr>
<th>Tax rate</th>
<th>0%</th>
<th>0%</th>
<th>16.1%</th>
<th>35%</th>
<th>35%</th>
<th>35%</th>
<th>35%</th>
<th>35%</th>
<th>35%</th>
<th>35%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-tax</td>
<td>8.00%</td>
<td>8.00%</td>
<td>8.00%</td>
<td>8.00%</td>
<td>8.00%</td>
<td>8.00%</td>
<td>7.80%</td>
<td>7.57%</td>
<td>7.00%</td>
<td>7.00%</td>
</tr>
<tr>
<td>After-tax</td>
<td>8.00%</td>
<td>8.00%</td>
<td>6.71%</td>
<td>5.20%</td>
<td>5.07%</td>
<td>5.04%</td>
<td>4.98%</td>
<td>4.88%</td>
<td>4.83%</td>
<td>4.83%</td>
</tr>
</tbody>
</table>

After-tax cost of debt right now = 8.00% \times (1 - 0.35) = 5.20%

After-tax cost of debt = Riskfree Rate + Default spread

Pre-tax cost of debt is 8.00% for BBB rated bonds.

The after-tax cost of debt will change as well, depending on the firm's tax rate. As the firm's tax rate changes, its cost of debt changes, and its after-tax cost of debt changes, too.

Estimating the cost of debt.
Aswath Damodaran

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%)

Debt

- Cost of Debt = 6.50% + 1.50% (default spread) = 8.00%
- Market Value of Debt = $349 mil (1.2%)

Cost of Capital

- Cost of Capital = 12.9% (.988) + 8.00% (1-0) (.012) = 12.84%
- Amazon.com has a book value of equity of $138 million and a book value of
  debt of $349 million. Shows you how irrelevant book value is in this process.

- Amazon.com has a book value of equity of $138 million and a book value of
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. 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 12-month trailing estimates for earnings and revenues than numbers for the most recent financial year. This rule becomes even more critical when valuing companies that are evolving and growing rapidly.

Last 10-K

<table>
<thead>
<tr>
<th>Revenues</th>
<th>EBIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1,117 million</td>
<td>- $410 million</td>
</tr>
<tr>
<td>$610 million</td>
<td>- $125 million</td>
</tr>
</tbody>
</table>

Trailing 12-month
Are S, G & A expenses capital expenditures?

Should Amazon.com’s selling expenses be treated as cap ex?

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. 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. 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.
<table>
<thead>
<tr>
<th>Year</th>
<th>EBIT</th>
<th>Taxes</th>
<th>EBIT(1-t)</th>
<th>NOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-$373</td>
<td>$0</td>
<td>-$373</td>
<td>$500</td>
</tr>
<tr>
<td>2</td>
<td>-$94</td>
<td>$0</td>
<td>-$94</td>
<td>$0</td>
</tr>
<tr>
<td>3</td>
<td>$407</td>
<td>$167</td>
<td>$240</td>
<td>$0</td>
</tr>
<tr>
<td>4</td>
<td>$873</td>
<td>$0</td>
<td>$873</td>
<td>$0</td>
</tr>
<tr>
<td>5</td>
<td>$1,038</td>
<td>$0</td>
<td>$1,038</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

Current EBIT * (1 - tax rate) = - $410 million

- (Capital Spending - Depreciation) = $212 million

- Change in Working Capital = -$80 million

Current FCFF = - $542 million

Estimating FCFF (1999)
## Growth in Revenues, Earnings and Reinvestment: Amazon

The sales/capital ratio of 3.00 was based on what Amazon accomplished last year and the average for the industry.

<table>
<thead>
<tr>
<th>Year</th>
<th>Growth</th>
<th>Revenue Investm</th>
<th>Sales/Capital</th>
<th>ROC</th>
<th>New Revenue</th>
<th>Chg in New Earnings &amp; Earnings</th>
<th>Reinvestment</th>
<th>ROC</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>3.99%</td>
<td>00 3.57 736</td>
<td>8208.00%</td>
<td>10</td>
<td>6.00%</td>
<td>10.80%</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>2001</td>
<td>1.19%</td>
<td>00 3.96 677</td>
<td>8208.00%</td>
<td>10</td>
<td>8.00%</td>
<td>15.60%</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>2002</td>
<td>1.87%</td>
<td>00 3.82 529</td>
<td>8208.00%</td>
<td>10</td>
<td>7.00%</td>
<td>20.40%</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>2003</td>
<td>2.22%</td>
<td>00 3.96 677</td>
<td>8208.00%</td>
<td>10</td>
<td>2.20%</td>
<td>25.20%</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>2004</td>
<td>1.65%</td>
<td>00 3.96 677</td>
<td>8208.00%</td>
<td>10</td>
<td>3.00%</td>
<td>30.00%</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>2005</td>
<td>2.82%</td>
<td>00 3.96 677</td>
<td>8208.00%</td>
<td>10</td>
<td>7.00%</td>
<td>45.00%</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>2006</td>
<td>1.96%</td>
<td>00 3.96 677</td>
<td>8208.00%</td>
<td>10</td>
<td>0.00%</td>
<td>75.00%</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>2007</td>
<td>-8.96%</td>
<td>00 3.96 677</td>
<td>8208.00%</td>
<td>10</td>
<td>100.00%</td>
<td>100.00%</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>2008</td>
<td>6.22%</td>
<td>00 3.96 677</td>
<td>8208.00%</td>
<td>10</td>
<td>150.00%</td>
<td>150.00%</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
Amazom.com: Stable Growth Inputs

- Expected Growth Rate
- Return on Capital
- Debt Ratio
- Beta
- Reinvestment Rate

% 100%
6% NMP
20% Negative
15% 1.20%
1.00 1.60

High Growth
Stable Growth

6%/20% = 30%
Estimating the Value of Equity Options

Details of options outstanding

- Average strike price of options outstanding = $13.375 million
- 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 options outstanding (using dilution-adjusted Black-Scholes model)

\[
\text{Value of equity options} = \frac{3.40 \times 79.92}{38 \times 340.79} \times 100\% 
\]

\[
= \frac{2,892}{38 \times 340.79} \times 100\% 
\]

\[
= \frac{2,892}{13,375} \times 100\% 
\]

\[
= 21.16\% 
\]

\[
= 2,892 \text{ million} 
\]
Stock Price = $ 84
Amazon.com

January 2000

Terminal Value = 1881/(.0961-.06) = 52,148

Cost of Equity 12.90%

Cost of Debt 6.5%+1.5%=8.0%

Tax rate = 0% -> 35%

Weights

Debt= 1.2% -> 15%

Value of Op Assets $ 14,910+ Cash $ 26 = Value of Firm $ 14,936

- Value of Debt $ 349 = Value of Equity $ 14,587

Value per share $ 34.32

Cost of Capital 12.84% 12.84% 12.84% 12.84% 12.84% 12.13% 11.96% 11.69% 11.52% 9.61%

Reinvestment:

Checks & Balances

Excess Cash

500 m

NOL:

$41,346

10.00% 35.00%

$2,688

$ 807

$ 807

$2,688

33.00%

10.00%

25.00%

8.00%

3.00%

1.50%

1.21%

500 m

$3,600

12.00%

8.00%

4.00%

2.00%

1.00%

0.10%

0.01%

1.21%

500 m

$3,600

12.00%

8.00%

4.00%

2.00%

1.00%

0.10%

0.01%

1.21%

500 m

$3,600

12.00%

8.00%

4.00%

2.00%

1.00%

0.10%

0.01%

1.21%

500 m

$3,600

12.00%

8.00%

4.00%

2.00%

1.00%

0.10%

0.01%
<table>
<thead>
<tr>
<th>%</th>
<th>14%</th>
<th>12%</th>
<th>10%</th>
<th>8%</th>
<th>6%</th>
</tr>
</thead>
<tbody>
<tr>
<td>50%</td>
<td>$1.94</td>
<td>$2.95</td>
<td>$7.84</td>
<td>$12.71</td>
<td>$17.57</td>
</tr>
<tr>
<td>55%</td>
<td>$1.94</td>
<td>$2.95</td>
<td>$7.84</td>
<td>$12.71</td>
<td>$17.57</td>
</tr>
<tr>
<td>60%</td>
<td>$1.94</td>
<td>$2.95</td>
<td>$7.84</td>
<td>$12.71</td>
<td>$17.57</td>
</tr>
</tbody>
</table>

What do you need to break-even at $84?
Amazon.com

January 2001

Stock Price = $14

Operating Margin: -34.60%

Sales Turnover: 3.02

Competitive Advantages

Stable Growth

Stable Revenue Growth: 5%

Stable Operating Margin: 9.32%

Stable Revenue: 21.13%

Stable ROC: 16.94%

Reinvest 29.5% of EBIT(1-t)

EBIT -$853m

EBIT(1-t) -$853m

FCFF -$1,315

NOL: $1,289 m

Cost of Capital: 10.36%

Cost of Debt: 5.53%

Beta: 2.18

T. Bond Rate = 5.1%

Net Operating Losses: $1,289 m

EBIT: $853

EBIT(1-t): $853

FCFF: -$1,315

NOL: $1,289 m