Advanced Valuation

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For the valuations in this presentation, go to Seminars/ Presentations
Some Initial Thoughts

"One hundred thousand lemmings cannot be wrong"

Graffiti
Misconceptions about Valuation

- Myth 1: A valuation is an objective search for “true” value
  - Truth 1.1: All valuations are biased. The only questions are how much and in which direction.
  - Truth 1.2: The direction and magnitude of the bias in your valuation is directly proportional to who pays you and how much you are paid.

- Myth 2.: A good valuation provides a precise estimate of value
  - Truth 2.1: There are no precise valuations
  - Truth 2.2: The payoff to valuation is greatest when valuation is least precise.

- Myth 3: The more quantitative a model, the better the valuation
  - Truth 3.1: One’s understanding of a valuation model is inversely proportional to the number of inputs required for the model.
  - Truth 3.2: Simpler valuation models do much better than complex ones.
Approaches to Valuation

- **Discounted cashflow valuation**, relates the value of an asset to the present value of expected future cashflows on that asset.
- **Relative valuation**, estimates the value of an asset by looking at the pricing of 'comparable' assets relative to a common variable like earnings, cashflows, book value or sales.
- **Contingent claim valuation**, uses option pricing models to measure the value of assets that share option characteristics.
Discounted Cash Flow Valuation

- **What is it:** In discounted cash flow valuation, the value of an asset is the present value of the expected cash flows on the asset.

- **Philosophical Basis:** Every asset has an intrinsic value that can be estimated, based upon its characteristics in terms of cash flows, growth and risk.

- **Information Needed:** To use discounted cash flow valuation, you need
  - to estimate the life of the asset
  - to estimate the cash flows during the life of the asset
  - to estimate the discount rate to apply to these cash flows to get present value

- **Market Inefficiency:** Markets are assumed to make mistakes in pricing assets across time, and are assumed to correct themselves over time, as new information comes out about assets.
Discounted Cashflow Valuation: Basis for Approach

Value of asset = $\frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + \frac{CF_4}{(1+r)^4} \ldots + \frac{CF_n}{(1+r)^n}$

where $CF_t$ is the expected cash flow in period $t$, $r$ is the discount rate appropriate given the riskiness of the cash flow and $n$ 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.
**DCF Choices: Equity Valuation versus Firm Valuation**

**Firm Valuation:** Value the entire business

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing Investments</td>
<td>Debt</td>
</tr>
<tr>
<td>Generate cashflows today</td>
<td>Fixed Claim on cash flows</td>
</tr>
<tr>
<td>Includes long lived (fixed) and short-lived (working capital) assets</td>
<td>Little or No role in management</td>
</tr>
<tr>
<td></td>
<td>Fixed Maturity</td>
</tr>
<tr>
<td></td>
<td>Tax Deductible</td>
</tr>
<tr>
<td>Expected Value that will be created by future investments</td>
<td>Equity</td>
</tr>
<tr>
<td>Growth Assets</td>
<td>Residual Claim on cash flows</td>
</tr>
<tr>
<td></td>
<td>Significant Role in management</td>
</tr>
<tr>
<td></td>
<td>Perpetual Lives</td>
</tr>
</tbody>
</table>

**Equity valuation:** Value just the equity claim in the business
Equity Valuation

Figure 5.5: Equity Valuation

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets in Place</td>
<td>Debt</td>
</tr>
<tr>
<td>Growth Assets</td>
<td>Equity</td>
</tr>
</tbody>
</table>

Cash flows considered are cashflows from assets, after debt payments and after making reinvestments needed for future growth

Discount rate reflects only the cost of raising equity financing

Present value is value of just the equity claims on the firm
Firm Valuation

Figure 5.6: Firm Valuation

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets in Place</td>
<td>Debt</td>
</tr>
<tr>
<td>Growth Assets</td>
<td>Equity</td>
</tr>
</tbody>
</table>

Cash flows considered are cashflows from assets, prior to any debt payments but after firm has reinvested to create growth assets.

Discount rate reflects the cost of raising both debt and equity financing, in proportion to their use.

Present value is value of the entire firm, and reflects the value of all claims on the firm.
The Drivers of Value…

**Current Cashflows**
These are the cash flows from existing investments, net of any reinvestment needed to sustain future growth. They can be computed before debt cashflows (to the firm) or after debt cashflows (to equity investors).

**Growth from new investments**
Growth created by making new investments; function of amount and quality of investments

**Efficiency Growth**
Growth generated by using existing assets better

**Expected Growth during high growth period**
Since value creating growth requires excess returns, this is a function of:
- Magnitude of competitive advantages
- Sustainability of competitive advantages

**Length of the high growth period**
Stable growth firm, with no or very limited excess returns

**Cost of financing (debt or capital) to apply to discounting cashflows**
Determined by:
- Operating risk of the company
- Default risk of the company
- Mix of debt and equity used in financing

**Terminal Value of firm (equity)**
DISCOUNTED CASHFLOW VALUATION

**Cashflow to Firm**
- EBIT \( (1-t) \)
- \((\text{Cap Ex} - \text{Depr})\)
- Change in WC
- \(= \text{FCFF} \)

**Expected Growth**
- Reinvestment Rate
- \(* \text{Return on Capital} \)

Firm is in stable growth: Grows at constant rate forever

**Terminal Value**
- \(= \text{FCFF}_{n+1} / (r-g) \)

**Discount at WACC**
- \(= \text{Cost of Equity} \left(\frac{\text{Equity}}{\text{Debt} + \text{Equity}}\right) + \text{Cost of Debt} \left(\frac{\text{Debt}}{\text{Debt} + \text{Equity}}\right) \)

**Cost of Equity**
- \(= \text{Riskfree Rate} + \text{Default Spread} \times (1-t) \)

**Cost of Debt**
- \(= \text{Riskfree Rate} + \text{Default Spread} \times (1-t) \)

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

**Beta**
- Measures market risk

**Risk Premium**
- Premium for average risk investment

**Weights**
- Based on Market Value

**Type of Business**
- Operating Leverage
- Financial Leverage

**Base Equity Premium**
- Country Risk Premium
Amgen: Status Quo

Current Cashflow to Firm

\[
\text{EBIT}(1-t) = 7336(1-0.28) = 6058
\]

\[
\text{Net Cash Flow} \times (1-t) = 6443
\]

\[
\text{Change in Working Capital} = 37
\]

\[
\text{FCFF} = 6058 - 423 = 5635
\]

Reinvestment Rate = 6480/6058 = 106.98%

Return on Capital = 18.26%

Cost of Capital (WACC) = 11.7% (E = 90%) + 3.66% (D = 10%) = 10.90%

Expected Growth in EBIT (1-t)

\[
\text{Expected Growth} = 0.60 \times 0.16 = 0.096 \quad 9.6%
\]

Return on Capital = 16%

Stable Growth

\[
g = 4\%; \quad \text{Beta} = 1.10;\]

Debt Ratio= 20%; Tax rate=35%

Cost of capital = 8.08%

ROC = 10.00%; Reinvestment Rate = 4/10 = 40%

Terminal Value

\[
10 = \frac{7300(1.0808 - 0.04)}{0.0808 - 0.04} = 179,099
\]

On May 1, 2007, Amgen was trading at $55/share

Op. Assets = 94214

+ Cash: = 1283

- Debt = 8272

Equity = 87226

Options = 479

Value/Share $74.33

Cost of Equity = 11.70%

Riskfree Rate: Riskfree rate = 4.78%

\[
\text{Beta} = 1.73
\]

Risk Premium = 4%

\[
\text{Unlevered Beta for Sectors: 1.59}
\]

\[
\text{D/E} = 11.06%
\]
Tata Motors: April 2010

Current Cashflow to Firm

EBIT(1-t) : Rs 20,116
- Nt CpX : Rs 31,590
- Chg WC : Rs 2,732
= FCFF : Rs 14,205
Reinv Rate = (31590+2732)/20116 = 170.61%; Tax rate = 21.00%
Return on capital = 17.16%

Expected Growth from new inv.
.70*.1716=0.1201

Reinvestment Rate
70%

Return on Capital
17.16%

Terminal Value
5= 23493/(.1039-.05) = Rs 435,686

Rs Cashflows

Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10
--- | --- | --- | --- | --- | --- | --- | --- | --- | --- | ---
EBIT (1-t) | 22533 | 25240 | 28272 | 31668 | 35472 | 39236 | 42848 | 46192 | 49150 | 51607
- Reinvestment | 15773 | 17668 | 19790 | 22168 | 24830 | 25242 | 25138 | 24482 | 23264 | 21503
FCFF | 6760 | 7572 | 8482 | 9500 | 10642 | 13994 | 17711 | 21710 | 25886 | 30104

Value/Share Rs 614

Discount at Cost of Capital (WACC) = 14.00% (.747) + 8.09% (0.253) = 12.50%

Cost of Equity
14.00%

Cost of Debt
(5%+ 4.25%+3)(1-.3399)
= 8.09%

Weights
E = 74.7% D = 25.3%

Riskfree Rate:
Rs Riskfree Rate= 5%

Beta
1.20

Mature market premium
4.5%

Lambda
0.80

Country Equity Risk Premium
4.50%

Country Default Spread
3%

On April 1, 2010
Tata Motors price = Rs 781

Growth declines to 5% and cost of capital moves to stable period level.
Ia. Estimating Discount Rates
Cost of Equity

\[
\text{Cost of Equity} = \text{Riskfree Rate} + \text{Beta} \times (\text{Risk Premium})
\]

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

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

- Historical Premium
  1. Mature Equity Market Premium: Average premium earned by stocks over T.Bonds in U.S.
  2. Country risk premium = Country Default Spread* (\( \sigma_{\text{Equity}} / \sigma_{\text{Country bond}} \))

- Implied Premium
  Based on how the equity market is priced today and a simple valuation model.
A. The Riskfree Rate

- 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

1. **Time horizon matters**: Thus, the riskfree rates in valuation will depend upon when the cash flow is expected to occur and will vary across time.
2. **Not all government securities are riskfree**: Some governments face default risk and the rates on bonds issued by them will not be riskfree.

**For a rate to be riskfree in valuation, it has to be long term, default free and currency matched (to the cash flows)**
Test 1: A riskfree rate in US dollars!

- In valuation, we estimate cash flows forever (or at least for very long time periods). The right riskfree rate to use in valuing a company in US dollars would be
  a) A three-month Treasury bill rate
  b) A ten-year Treasury bond rate
  c) A thirty-year Treasury bond rate
  d) A TIPs (inflation-indexed treasury) rate
Test 2: A Riskfree Rate in Euros
Test 3: Estimating the Riskfree Rate in Rupees… and US dollars..

The Indian government had 10-year Rupee bonds outstanding, with a yield to maturity of about 8% on April 1, 2010. In January 2010, the Indian government had a local currency sovereign rating of Ba2. The typical default spread (over a default free rate) for Ba2 rated country bonds in early 2010 was 3%. What would you use as a riskfree rate in Indian Rupees?
Sovereign Default Spread: Three paths to the same destination…

- **Sovereign dollar or euro denominated bonds**: Find sovereign bonds denominated in US dollars, issued by emerging markets. The difference between the interest rate on the bond and the US treasury bond rate should be the default spread. For instance, in January 2012, the US dollar denominated 10-year bond issued by the Brazilian government (with a Baa2 rating) had an interest rate of 3.5%, resulting in a default spread of 1.6% over the US treasury rate of 1.9% at the same point in time. (On the same day, the ten-year Brazilian BR denominated bond had an interest rate of 12%)

- **CDS spreads**: Obtain the default spreads for sovereigns in the CDS market. In January 2012, the CDS spread for Brazil in that market was 1.43%.

- **Average spread**: For countries which don’t issue dollar denominated bonds or have a CDS spread, you have to use the average spread for other countries in the same rating class.
Sovereign Default Spreads: End of 2011

<table>
<thead>
<tr>
<th>Rating</th>
<th>Default spread in basis points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aaa</td>
<td>0</td>
</tr>
<tr>
<td>Aa1</td>
<td>25</td>
</tr>
<tr>
<td>Aa2</td>
<td>50</td>
</tr>
<tr>
<td>Aa3</td>
<td>70</td>
</tr>
<tr>
<td>A1</td>
<td>85</td>
</tr>
<tr>
<td>A2</td>
<td>100</td>
</tr>
<tr>
<td>A3</td>
<td>115</td>
</tr>
<tr>
<td>Baa1</td>
<td>150</td>
</tr>
<tr>
<td>Baa2</td>
<td>175</td>
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<tr>
<td>Baa3</td>
<td>200</td>
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<td>Ba1</td>
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<td>B3</td>
<td>600</td>
</tr>
<tr>
<td>Caa1</td>
<td>700</td>
</tr>
<tr>
<td>Caa2</td>
<td>850</td>
</tr>
<tr>
<td>Caa3</td>
<td>1000</td>
</tr>
</tbody>
</table>
Why do riskfree rates vary? Riskfree rates in early 2012
In January 2012, the 10-year treasury bond rate in the United States was 1.87%, a historic low. Assume that you were valuing a company in US dollars then, but were wary about the riskfree rate being too low. Which of the following should you do?

a) Replace the current 10-year bond rate with a more reasonable normalized riskfree rate (the average 10-year bond rate over the last 30 years has been about 4%)

b) Use the current 10-year bond rate as your riskfree rate but make sure that your other assumptions (about growth and inflation) are consistent with the riskfree rate

c) Something else…
B. Equity Risk Premiums

- 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 T.bill rates or T.Bond rates
  - Whether you use geometric or arithmetic averages.
- For instance, looking at the US:

<table>
<thead>
<tr>
<th></th>
<th>Arithmetic Average</th>
<th>Geometric Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stocks - T. Bills</td>
<td>Stocks - T. Bonds</td>
</tr>
<tr>
<td>1928-2011</td>
<td>7.55%</td>
<td>5.79%</td>
</tr>
<tr>
<td></td>
<td>2.22%</td>
<td>2.36%</td>
</tr>
<tr>
<td>1962-2011</td>
<td>5.38%</td>
<td>3.36%</td>
</tr>
<tr>
<td></td>
<td>2.39%</td>
<td>2.68%</td>
</tr>
<tr>
<td>2002-2011</td>
<td>3.12%</td>
<td>-1.92%</td>
</tr>
<tr>
<td></td>
<td>6.46%</td>
<td>8.94%</td>
</tr>
</tbody>
</table>
The perils of trusting the past……..

- **Noisy estimates**: Even with long time periods of history, the risk premium that you derive will have substantial standard error. For instance, if you go back to 1928 (about 80 years of history) and you assume a standard deviation of 20% in annual stock returns, you arrive at a standard error of greater than 2%:

  \[
  \text{Standard Error in Premium} = \frac{20\%}{\sqrt{80}} = 2.26\%
  \]

- **Survivorship Bias**: Using historical data from the U.S. equity markets over the twentieth century does create a sampling bias. After all, the US economy and equity markets were among the most successful of the global economies that you could have invested in early in the century.

  These problems get exacerbated in emerging markets, where there is far less historical data and survivor bias is worse.
Risk Premium for a Mature Market? Broadening the sample

Historical ERP - By Country 1900-2010

- Geometric Mean
- Arithmetic Mean
Two Ways of Estimating Country Equity Risk Premiums for other markets.. Brazil in August 2004

- **Default spread on Country Bond**: In this approach, the country equity risk premium is set equal to the default spread of the bond issued by the country (but only if it is denominated in a currency where a default free entity exists.
  - Brazil was rated B2 by Moody’s and the default spread on the Brazilian dollar denominated C.Bond at the end of August 2004 was 6.01%. (10.30%-4.29%)
- **Relative Equity Market approach**: The country equity risk premium is based upon the volatility of the market in question relative to U.S market.
  
  Total equity risk premium = Risk Premium_{US} \times \frac{\sigma_{Country Equity}}{\sigma_{US Equity}}

  Using a 4.82% premium for the US, this approach would yield:

  Total risk premium for Brazil = 4.82% \times \frac{34.56%}{19.01%} = 8.76%
  
  Country equity risk premium for Brazil = 8.76% - 4.82% = 3.94%

  (The standard deviation in weekly returns from 2002 to 2004 for the Bovespa was 34.56% whereas the standard deviation in the S&P 500 was 19.01%)
And a third approach

- Country ratings measure default risk. While default risk premiums and equity risk premiums are highly correlated, one would expect equity spreads to be higher than debt spreads.
- Another is to multiply the bond default spread by the relative volatility of stock and bond prices in that market. Using this approach for Brazil in August 2004, you would get:
  - Country Equity risk premium = Default spread on country bond* \( \frac{\sigma_{\text{Country Equity}}}{\sigma_{\text{Country Bond}}} \)
    - Standard Deviation in Bovespa (Equity) = 34.56%
    - Standard Deviation in Brazil C-Bond = 26.34%
    - Default spread on C-Bond = 6.01%
  - Country Equity Risk Premium = 6.01% \( \frac{34.56\%}{26.34\%} \) = 7.89%

In January 2007, Brazil’s rating had improved to B1 and the interest rate on the Brazilian $ denominated bond dropped to 6.2%. The US treasury bond rate that day was 4.7%, yielding a default spread of 1.5% for Brazil.

- Standard Deviation in Bovespa (Equity) = 24%
- Standard Deviation in Brazil $-Bond = 12%
- Default spread on Brazil $-Bond = 1.50%
- Country Risk Premium for Brazil = 1.50% \( \times \) \( \frac{24}{12} \) = 3.00%

On January 1, 2009, Brazil’s rating was Ba1 but the interest rate on the Brazilian $ denominated bond was 6.3%, 4.1% higher than the US treasury bond rate of 2.2% on that day.

- Standard Deviation in Bovespa (Equity) = 33%
- Standard Deviation in Brazil $-Bond = 20%
- Default spread on Brazil $-Bond = 4.1%
- Country Risk Premium for Brazil = 4.10% \( \times \) \( \frac{33}{20} \) = 6.77%
**Country Risk Premiums**  
January 2012

<table>
<thead>
<tr>
<th>Country</th>
<th>Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angola</td>
<td>10.88%</td>
</tr>
<tr>
<td>Botswana</td>
<td>7.50%</td>
</tr>
<tr>
<td>Egypt</td>
<td>13.50%</td>
</tr>
<tr>
<td>Mauritius</td>
<td>8.63%</td>
</tr>
<tr>
<td>Morocco</td>
<td>9.60%</td>
</tr>
<tr>
<td>Namibia</td>
<td>9.00%</td>
</tr>
<tr>
<td>South Africa</td>
<td>7.73%</td>
</tr>
<tr>
<td>Tunisia</td>
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<tr>
<td>Austria [1]</td>
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<td>Lebanon</td>
<td>12.00%</td>
</tr>
<tr>
<td>Oman</td>
<td>7.28%</td>
</tr>
<tr>
<td>Qatar</td>
<td>6.75%</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>7.05%</td>
</tr>
<tr>
<td>Senegal</td>
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</tr>
<tr>
<td>United Arab Emirates</td>
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<tr>
<td>Argentina</td>
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</tr>
<tr>
<td>Belize</td>
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<td>Bolivia</td>
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<tr>
<td>Brazil</td>
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<tr>
<td>Chile</td>
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<tr>
<td>Colombia</td>
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<tr>
<td>Costa Rica</td>
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<tr>
<td>Ecuador</td>
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</tr>
<tr>
<td>El Salvador</td>
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</tr>
<tr>
<td>Guatemala</td>
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<tr>
<td>Honduras</td>
<td>13.50%</td>
</tr>
<tr>
<td>Mexico</td>
<td>8.25%</td>
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<tr>
<td>Nicaragua</td>
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</tr>
<tr>
<td>Panama</td>
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</tr>
<tr>
<td>Paraguay</td>
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</tr>
<tr>
<td>Peru</td>
<td>9.00%</td>
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<tr>
<td>Uruguay</td>
<td>9.60%</td>
</tr>
<tr>
<td>Venezuela</td>
<td>12.00%</td>
</tr>
<tr>
<td>Austria [1]</td>
<td>6.00%</td>
</tr>
<tr>
<td>Belgium [1]</td>
<td>7.05%</td>
</tr>
<tr>
<td>Cyprus [1]</td>
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</tr>
<tr>
<td>Denmark</td>
<td>6.00%</td>
</tr>
<tr>
<td>Finland [1]</td>
<td>6.00%</td>
</tr>
<tr>
<td>France [1]</td>
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</tr>
<tr>
<td>Germany [1]</td>
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<tr>
<td>Greece [1]</td>
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<td>Iceland</td>
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<tr>
<td>Ireland [1]</td>
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<tr>
<td>Italy [1]</td>
<td>7.50%</td>
</tr>
<tr>
<td>Malta [1]</td>
<td>7.50%</td>
</tr>
<tr>
<td>Netherlands [1]</td>
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</tr>
<tr>
<td>Norway</td>
<td>6.00%</td>
</tr>
<tr>
<td>Portugal [1]</td>
<td>10.13%</td>
</tr>
<tr>
<td>Spain [1]</td>
<td>7.28%</td>
</tr>
<tr>
<td>Sweden</td>
<td>6.00%</td>
</tr>
<tr>
<td>Switzerland</td>
<td>6.00%</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>6.00%</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>10.88%</td>
</tr>
<tr>
<td>Cambodia</td>
<td>13.50%</td>
</tr>
<tr>
<td>China</td>
<td>7.05%</td>
</tr>
<tr>
<td>Fiji Islands</td>
<td>12.00%</td>
</tr>
<tr>
<td>Hong Kong</td>
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</tr>
<tr>
<td>Indonesia</td>
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</tr>
<tr>
<td>India</td>
<td>9.00%</td>
</tr>
<tr>
<td>Indonesia</td>
<td>9.60%</td>
</tr>
<tr>
<td>Japan</td>
<td>7.05%</td>
</tr>
<tr>
<td>Korea</td>
<td>7.28%</td>
</tr>
<tr>
<td>Macao</td>
<td>7.05%</td>
</tr>
<tr>
<td>Malaysia</td>
<td>7.73%</td>
</tr>
<tr>
<td>Mongolia</td>
<td>12.00%</td>
</tr>
<tr>
<td>Pakistan</td>
<td>15.00%</td>
</tr>
<tr>
<td>Papua New Guinea</td>
<td>12.00%</td>
</tr>
<tr>
<td>Philippines</td>
<td>10.13%</td>
</tr>
<tr>
<td>Singapore</td>
<td>6.00%</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>12.00%</td>
</tr>
<tr>
<td>Taiwan</td>
<td>7.05%</td>
</tr>
<tr>
<td>Thailand</td>
<td>8.25%</td>
</tr>
<tr>
<td>Turkey</td>
<td>10.13%</td>
</tr>
<tr>
<td>Vietnam</td>
<td>12.00%</td>
</tr>
</tbody>
</table>
Approach 1: Assume that every company in the country is equally exposed to country risk. In this case,

$$E(\text{Return}) = \text{Riskfree Rate} + \text{Country ERP} + \beta \ (\text{US premium})$$

Implicitly, this is what you are assuming when you use the local Government’s dollar borrowing rate as your riskfree rate.

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

$$E(\text{Return}) = \text{Riskfree Rate} + \beta \ (\text{US premium} + \text{Country ERP})$$

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)

$$E(\text{Return}) = \text{Riskfree Rate} + \beta \ (\text{US premium}) + \lambda \ (\text{Country ERP})$$

**ERP: Equity Risk Premium**
Estimating Company Exposure to Country Risk: Determinants

- **Source of revenues**: Other things remaining equal, a company should be more exposed to risk in a country if it generates more of its revenues from that country. A Brazilian firm that generates the bulk of its revenues in Brazil should be more exposed to country risk than one that generates a smaller percent of its business within Brazil.

- **Manufacturing facilities**: Other things remaining equal, a firm that has all of its production facilities in Brazil should be more exposed to country risk than one which has production facilities spread over multiple countries. The problem will be accented for companies that cannot move their production facilities (mining and petroleum companies, for instance).

- **Use of risk management products**: Companies can use both options/futures markets and insurance to hedge some or a significant portion of country risk.
Different companies should be exposed to different degrees to country risk. For instance, a Korean firm that generates the bulk of its revenues in Western Europe and the US should be less exposed to country risk than one that generates all its business within Korea.

The factor “λ” measures the relative exposure of a firm to country risk. One simplistic solution would be to do the following:

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

Consider two firms – Tata Motors and Tata Consulting Services, both Indian companies. In 2008-09, Tata Motors got about 91.37% of its revenues in India and TCS got 7.62%. The average Indian firm gets about 80% of its revenues in India:

\[ \lambda_{\text{Tata Motors}} = \frac{91\%}{80\%} = 1.14 \]
\[ \lambda_{\text{TCS}} = \frac{7.62\%}{80\%} = 0.09 \]

There are two implications

- A company’s risk exposure is determined by where it does business and not by where it is incorporated.
- Firms might be able to actively manage their country risk exposures
Why revenue exposure can be deceptive…

- **Operations can still be exposed to country risk:** Even though a company may very little of its revenues from a market, there is the very real possibility that its operations are still centered in that market, thus exposing it to country risk.
  - While Tata Consulting Services gets the bulk of its revenues from the United States and Western Europe, the bulk of its operations (back office, consulting and outsourcing) are in India.

- **Acquisitions and strategic decisions to enter new markets can alter country risk exposure:** A firm can change its revenue exposure dramatically with a big acquisition of a company in another market as well as by targeting new markets for growth.
  - Tata Motors acquired Jaguar/Land Rover in 2008-09. While the 2008-09 numbers don’t reflect this acquisition yet, Tata Motors will get a much larger portion of its revenues from developed markets in the future.
  - TCS is actively expanding targeting Latin America for growth. While the percent of revenues from Latin American right now is very small, it may grow over time.
Estimating lambdas: Tata Motors versus TCS

<table>
<thead>
<tr>
<th>% of production/operations in India</th>
<th>Tata Motors</th>
<th>TCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of revenues in India</td>
<td>91.37% (in 2009) Estimated 70% (in 2010)</td>
<td>7.62%</td>
</tr>
<tr>
<td>Lambda</td>
<td>0.80</td>
<td>0.20</td>
</tr>
<tr>
<td>Flexibility in moving operations</td>
<td>Low. Significant physical assets.</td>
<td>High. Human capital is mobile.</td>
</tr>
</tbody>
</table>
Estimate Deutsche Bank’s country risk exposure

Based upon 2008 financial statements, Deutsche Bank’s total credit/investment exposure by region.

<table>
<thead>
<tr>
<th>Region</th>
<th>Overall exposure</th>
<th>%</th>
<th>Avg company</th>
<th>Lambda</th>
<th>Risk Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Europe</td>
<td>298241</td>
<td>54.58%</td>
<td>80.00%</td>
<td>0.68</td>
<td>0.00%</td>
</tr>
<tr>
<td>United States</td>
<td>184061</td>
<td>33.68%</td>
<td>80.00%</td>
<td>0.42</td>
<td>0.00%</td>
</tr>
<tr>
<td>Latin America</td>
<td>5938</td>
<td>1.09%</td>
<td>75.00%</td>
<td>0.01</td>
<td>4.50%</td>
</tr>
<tr>
<td>Africa &amp; Middle East</td>
<td>2272</td>
<td>0.42%</td>
<td>75.00%</td>
<td>0.01</td>
<td>7.00%</td>
</tr>
<tr>
<td>Asia</td>
<td>42491</td>
<td>7.78%</td>
<td>70.00%</td>
<td>0.11</td>
<td>3.50%</td>
</tr>
<tr>
<td>Eastern Europe</td>
<td>13445</td>
<td>2.46%</td>
<td>70.00%</td>
<td>0.04</td>
<td>3.00%</td>
</tr>
<tr>
<td><strong>Deutschc Bank</strong></td>
<td><strong>546448</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Deutsch Bank Cost of equity = Rf + Beta (ERP) + CRP

= 3.6% + 1.162 (6%) + 0.60%

= 11.172%
An Alternative: Watch what I pay, not what I say…

On January 1, 2012, the S&P 500 was at 1257.60, essentially unchanged for the year. And it was a year of macro shocks – political upheaval in the Middle East and sovereign debt problems in Europe. The treasury bond rate dropped below 2% and buybacks/dividends surged.

In the trailing 12 months, the cash returned to stockholders was 74.17. Using the average cash yield of 4.71% for 2002-2011 the cash returned would have been 59.29.

Analysts expect earnings to grow 9.6% in 2012, 11.9% in 2013, 8.2% in 2014, 4.5% in 2015 and 2% thereafter, resulting in a compounded annual growth rate of 7.18% over the next 5 years. We will assume that dividends & buybacks will grow 7.18% a year for the next 5 years.

After year 5, we will assume that earnings on the index will grow at 1.87%, the same rate as the entire economy (= riskfree rate).

Data Sources:
Dividends and Buybacks last year: S&P
Expected growth rate: News stories, Yahoo!
Finance, Bloomberg

<table>
<thead>
<tr>
<th>Year</th>
<th>Dividends</th>
<th>Buybacks</th>
<th>Total Cash Returned</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>63.54</td>
<td>68.11</td>
<td>131.65</td>
</tr>
<tr>
<td>2012</td>
<td>73.00</td>
<td>78.24</td>
<td>151.24</td>
</tr>
<tr>
<td>2013</td>
<td>83.86</td>
<td>83.86(1.0187)</td>
<td>167.72</td>
</tr>
<tr>
<td>2014</td>
<td>63.54(1.0187)</td>
<td>68.11(1.0187)</td>
<td>131.65(1.0187)</td>
</tr>
<tr>
<td>2015</td>
<td>73.00(1.0187)</td>
<td>78.24(1.0187)</td>
<td>151.24(1.0187)</td>
</tr>
<tr>
<td>2016</td>
<td>83.86(1.0187)</td>
<td>83.86(1.0187)</td>
<td>167.72(1.0187)</td>
</tr>
</tbody>
</table>

Expected Return on Stocks (1/1/12) = 7.91%
T.Bond rate on 1/1/12 = 1.87%
Equity Risk Premium = 7.91% - 1.87% = 6.04%
Implied Premiums in the US

Implied Premium for US Equity Market

Year

Implied Premium

0.00%
1.00%
2.00%
3.00%
4.00%
5.00%
6.00%
7.00%
The Anatomy of a Crisis: Implied ERP from September 12, 2008 to January 1, 2009
Implied Premium versus Risk Free Rate

*Figure 11: Implied ERP and Risk free Rates*

At the end of 2008, the ERP was almost three times the riskfree rate. The highest ratio ever prior to this was in 1960, when the ERP was 1.2 times the riskfree rate.

\[ \text{Expected Return on Stocks} = \text{T.Bond Rate} + \text{Equity Risk Premium} \]
Equity Risk Premiums and Bond Default Spreads

Figure 15: Equity Risk Premiums and Bond Default Spreads
Equity Risk Premiums and Cap Rates (Real Estate)

Figure 17: Equity Risk Premiums, Cap Rates and Bond Spreads
Implied Premium for India using the Sensex: April 2010

- Level of the Index = 17559
- FCFE on the Index = 3.5% (Estimated FCFE for companies in index as % of market value of equity)

Other parameters
- Riskfree Rate = 5% (Rupee)
- Expected Growth (in Rupee)
  - Next 5 years = 20% (Used expected growth rate in Earnings)
  - After year 5 = 5%

Solving for the expected return:
- Expected return on Equity = 11.72%
- Implied Equity premium for India = 11.72% - 5% = 6.72%
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.
- The slope of the regression corresponds to the beta of the stock, and measures the riskiness of the stock.
- 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.
Beta estimates are noisy...
In emerging markets... two betas for Tata Motors
Determinants of Betas

Beta of Firm

Nature of product or service offered by company:
- Other things remaining equal, the more discretionary the product or service, the higher the beta.

Operating Leverage (Fixed Costs as percent of total costs):
- Other things remaining equal, the greater the proportion of the costs that are fixed, the higher the beta of the company.

Implications
1. Cyclical companies should have higher betas than non-cyclical companies.
2. Luxury goods firms should have higher betas than basic goods.
3. High priced goods/service firms should have higher betas than low prices goods/services firms.
4. Growth firms should have higher betas.

Beta of Equity

Financial Leverage:
- Other things remaining equal, the greater the proportion of capital that a firm raises from debt, the higher its equity beta will be.

Implications
- Highly levered firms should have higher betas than firms with less debt.

Aswath Damodaran
Bottom-up Betas

Step 1: Find the business or businesses that your firm operates in.

Step 2: Find publicly traded firms in each of these businesses and obtain their regression betas. Compute the simple average across these regression betas to arrive at an average beta for these publicly traded firms. Unlever this average beta using the average debt to equity ratio across the publicly traded firms in the sample.

Unlevered beta for business = Average beta across publicly traded firms/ (1 + (1-t) (Average D/E ratio across firms))

If you can, adjust this beta for differences between your firm and the comparable firms on operating leverage and product characteristics.

Step 3: Estimate how much value your firm derives from each of the different businesses it is in.

While revenues or operating income are often used as weights, it is better to try to estimate the value of each business.

Step 4: Compute a weighted average of the unlevered betas of the different businesses (from step 2) using the weights from step 3.

Bottom-up Unlevered beta for your firm = Weighted average of the unlevered betas of the individual business

If you expect the business mix of your firm to change over time, you can change the weights on a year-to-year basis.

Step 5: Compute a levered beta (equity beta) for your firm, using the market debt to equity ratio for your firm.

Levered bottom-up beta = Unlevered beta (1+ (1-t) (Debt/Equity))

If you expect your debt to equity ratio to change over time, the levered beta will change over time.
Two examples...

- **Amgen**
  - The unlevered beta for pharmaceutical firms is 1.59. Using Amgen’s debt to equity ratio of 11%, the bottom up beta for Amgen is
  - Bottom-up Beta = 1.59 \times (1+ (1-.35)(.11)) = 1.73

- **Tata Motors**
  - The unlevered beta for automobile firms is 0.98. Using Tata Motor’s debt to equity ratio of 33.87%, the bottom up beta for Tata Motors is
  - Bottom-up Beta = 0.98 \times (1+ (1-.3399)(.3387)) = 1.20

- **A Question to ponder:** Tata Motors recently made two big investments.
  - **Tata Nano:** Promoted as the cheapest car in the world, Tata Motors hopes that volume (especially in Asia) will make up for tight margins.
  - **Jaguar/Land Rover:** Tata acquired both firms, catering to luxury markets.
    What effect will these investments have on Tata Motor’s beta?
From Cost of Equity to Cost of Capital

Cost of Capital = Cost of Equity (Equity/(Debt + Equity)) + Cost of Borrowing (1-t) (Debt/(Debt + Equity))

Cost of borrowing should be based upon
(1) synthetic or actual bond rating
(2) default spread
Cost of Borrowing = Riskfree rate + Default spread

Marginal tax rate, reflecting tax benefits of debt

Cost of equity based upon bottom-up beta

Weights should be market value weights
What is debt?

- General Rule: Debt generally has the following characteristics:
  - Commitment to make fixed payments in the future
  - The fixed payments are tax deductible
  - Failure to make the payments can lead to either default or loss of control of the firm to the party to whom payments are due.

- As a consequence, debt should include
  - Any interest-bearing liability, whether short term or long term.
  - Any lease obligation, whether operating or capital.
Estimating the Cost of Debt

- If the firm has bonds outstanding, and the bonds are traded, the yield to maturity on a long-term, straight (no special features) bond can be used as the interest rate.
- If the firm is rated, use the rating and a typical default spread on bonds with that rating to estimate the cost of debt.
- If the firm is not rated,
  - and it has recently borrowed long term from a bank, use the interest rate on the borrowing or
  - estimate a synthetic rating for the company, and use the synthetic rating to arrive at a default spread and a cost of debt
- The cost of debt has to be estimated in the same currency as the cost of equity and the cash flows in the valuation.
Amgen was the only firm in the group that had a bond rating. In 2007, its actual rating was A+.

For firms without a rating, you estimate a synthetic rating. 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 Tata Motor’s interest coverage ratio, we used the interest expenses and EBIT from 2008-09.

$$\text{Interest Coverage Ratio} = \frac{17527}{6737} = 2.60$$
### Interest Coverage Ratios, Ratings and Default Spreads: The January 2010 Edition for Small market cap companies

<table>
<thead>
<tr>
<th>If interest coverage ratio is greater than</th>
<th>≤ to</th>
<th>Rating is</th>
<th>Spread is</th>
</tr>
</thead>
<tbody>
<tr>
<td>-100000</td>
<td>0.4999999</td>
<td>D</td>
<td>15.00%</td>
</tr>
<tr>
<td>0.5</td>
<td>0.799999</td>
<td>C</td>
<td>12.00%</td>
</tr>
<tr>
<td>0.8</td>
<td>1.249999</td>
<td>CC</td>
<td>10.00%</td>
</tr>
<tr>
<td>1.25</td>
<td>1.499999</td>
<td>CCC</td>
<td>8.50%</td>
</tr>
<tr>
<td>1.5</td>
<td>1.999999</td>
<td>B-</td>
<td>5.50%</td>
</tr>
<tr>
<td>2</td>
<td>2.499999</td>
<td>B</td>
<td>5.25%</td>
</tr>
<tr>
<td>2.5</td>
<td>2.999999</td>
<td>B+</td>
<td>4.25%</td>
</tr>
<tr>
<td>3</td>
<td>3.499999</td>
<td>BB</td>
<td>4.00%</td>
</tr>
<tr>
<td>3.5</td>
<td>3.999999</td>
<td>BB+</td>
<td>3.50%</td>
</tr>
<tr>
<td>4</td>
<td>4.499999</td>
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<td>2.00%</td>
</tr>
<tr>
<td>4.5</td>
<td>5.999999</td>
<td>A-</td>
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</tr>
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<td>6</td>
<td>7.499999</td>
<td>A</td>
<td>1.25%</td>
</tr>
<tr>
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<td>A+</td>
<td>1.00%</td>
</tr>
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<td>12.499999</td>
<td>AA</td>
<td>0.75%</td>
</tr>
<tr>
<td>12.5</td>
<td>100000</td>
<td>AAA</td>
<td>0.50%</td>
</tr>
</tbody>
</table>
Estimating the cost of debt for a firm

- The actual rating for Amgen was A. Using the 2007 default spread of 0.85%, we estimate a cost of debt of
  \[ \text{Cost of debt} = \text{Riskfree rate} + \text{Default spread} = 4.78\% + 0.85\% = 5.63\% \]

- The synthetic rating for Tata Motors is B+. Using the 2010 default spread of 4.25%, we estimate a cost of debt of 12.25% (using a RS riskfree rate of 5% and adding in the country default spread of 3%):
  \[ \text{Cost of debt} = \text{Riskfree rate} + \text{Country default spread} + \text{Company default spread} = 5.00\% + 4.25\%+ 3\% = 12.25\% \]

- The synthetic rating for Kristin Kandy is A-. Using the 2004 default spread of 1.00% and a riskfree rate of 4.50%, we estimate a cost of debt of 5.50%.
  \[ \text{Cost of debt} = \text{Riskfree rate} + \text{Default spread} = 4.50\% + 1.00\% = 5.50\% \]

- The synthetic rating for Amazon.com in 2000 was BBB. The default spread for BBB rated bond was 1.50% in 2000 and the treasury bond rate was 6.5%.
  \[ \text{Cost of debt} = \text{Riskfree Rate} + \text{Default spread} = 6.50\% + 1.50\% = 8.00\% \]
Default Spreads: The effect of the crisis of 2008.. And the aftermath

<table>
<thead>
<tr>
<th>Rating</th>
<th>1-Jan-08</th>
<th>12-Sep-08</th>
<th>12-Nov-08</th>
<th>1-Jan-09</th>
<th>1-Jan-10</th>
<th>1-Jan-11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aaa/AAA</td>
<td>0.99%</td>
<td>1.40%</td>
<td>2.15%</td>
<td>2.00%</td>
<td>0.50%</td>
<td>0.55%</td>
</tr>
<tr>
<td>Aa1/AA+</td>
<td>1.15%</td>
<td>1.45%</td>
<td>2.30%</td>
<td>2.25%</td>
<td>0.55%</td>
<td>0.60%</td>
</tr>
<tr>
<td>Aa2/AA</td>
<td>1.25%</td>
<td>1.50%</td>
<td>2.55%</td>
<td>2.50%</td>
<td>0.65%</td>
<td>0.65%</td>
</tr>
<tr>
<td>Aa3/AA-</td>
<td>1.30%</td>
<td>1.65%</td>
<td>2.80%</td>
<td>2.75%</td>
<td>0.70%</td>
<td>0.75%</td>
</tr>
<tr>
<td>A1/A+</td>
<td>1.35%</td>
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<td>3.25%</td>
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</tr>
<tr>
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<tr>
<td>A3/A-</td>
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<td>1.05%</td>
<td>1.00%</td>
</tr>
<tr>
<td>Baa1/BBB+</td>
<td>1.73%</td>
<td>2.65%</td>
<td>4.50%</td>
<td>5.25%</td>
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<td>1.40%</td>
</tr>
<tr>
<td>Baa2/BBB</td>
<td>2.02%</td>
<td>2.90%</td>
<td>5.00%</td>
<td>5.75%</td>
<td>1.80%</td>
<td>1.60%</td>
</tr>
<tr>
<td>Baa3/BBB-</td>
<td>2.60%</td>
<td>3.20%</td>
<td>5.75%</td>
<td>7.25%</td>
<td>2.25%</td>
<td>2.05%</td>
</tr>
<tr>
<td>Ba1/BB+</td>
<td>3.20%</td>
<td>4.45%</td>
<td>7.00%</td>
<td>9.50%</td>
<td>3.50%</td>
<td>2.90%</td>
</tr>
<tr>
<td>Ba2/BB</td>
<td>3.65%</td>
<td>5.15%</td>
<td>8.00%</td>
<td>10.50%</td>
<td>3.85%</td>
<td>3.25%</td>
</tr>
<tr>
<td>Ba3/BB-</td>
<td>4.00%</td>
<td>5.30%</td>
<td>9.00%</td>
<td>11.00%</td>
<td>4.00%</td>
<td>3.50%</td>
</tr>
<tr>
<td>B1/B+</td>
<td>4.55%</td>
<td>5.85%</td>
<td>9.50%</td>
<td>11.50%</td>
<td>4.25%</td>
<td>3.75%</td>
</tr>
<tr>
<td>B2/B</td>
<td>5.65%</td>
<td>6.10%</td>
<td>10.50%</td>
<td>12.50%</td>
<td>5.25%</td>
<td>5.00%</td>
</tr>
<tr>
<td>B3/B-</td>
<td>6.45%</td>
<td>9.40%</td>
<td>13.50%</td>
<td>15.50%</td>
<td>5.50%</td>
<td>6.00%</td>
</tr>
<tr>
<td>Caa/CCC+</td>
<td>7.15%</td>
<td>9.80%</td>
<td>14.00%</td>
<td>16.50%</td>
<td>7.75%</td>
<td>7.75%</td>
</tr>
<tr>
<td>ERP</td>
<td>4.37%</td>
<td>4.52%</td>
<td>6.30%</td>
<td>6.43%</td>
<td>4.36%</td>
<td>5.20%</td>
</tr>
</tbody>
</table>
Updated Default Spreads - January 2012

<table>
<thead>
<tr>
<th>Rating</th>
<th>1 year</th>
<th>5 year</th>
<th>10 year</th>
<th>30 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aaa/AAA</td>
<td>0.35%</td>
<td>0.70%</td>
<td>0.65%</td>
<td>0.85%</td>
</tr>
<tr>
<td>Aa1/AA+</td>
<td>0.45%</td>
<td>0.75%</td>
<td>0.80%</td>
<td>1.10%</td>
</tr>
<tr>
<td>Aa2/AA</td>
<td>0.50%</td>
<td>0.80%</td>
<td>0.95%</td>
<td>1.15%</td>
</tr>
<tr>
<td>Aa3/AA-</td>
<td>0.60%</td>
<td>0.85%</td>
<td>1.05%</td>
<td>1.20%</td>
</tr>
<tr>
<td>A1/A+</td>
<td>0.65%</td>
<td>0.90%</td>
<td>1.15%</td>
<td>1.30%</td>
</tr>
<tr>
<td>A2/A</td>
<td>0.80%</td>
<td>1.05%</td>
<td>1.20%</td>
<td>1.40%</td>
</tr>
<tr>
<td>A3/A-</td>
<td>0.95%</td>
<td>1.25%</td>
<td>1.45%</td>
<td>1.65%</td>
</tr>
<tr>
<td>Baa1/BBB+</td>
<td>1.20%</td>
<td>1.70%</td>
<td>2.00%</td>
<td>2.20%</td>
</tr>
<tr>
<td>Baa2/BBB</td>
<td>1.30%</td>
<td>2.05%</td>
<td>2.30%</td>
<td>2.50%</td>
</tr>
<tr>
<td>Baa3/BBB-</td>
<td>2.00%</td>
<td>2.80%</td>
<td>3.10%</td>
<td>3.25%</td>
</tr>
<tr>
<td>Ba1/BB+</td>
<td>4.00%</td>
<td>4.00%</td>
<td>3.75%</td>
<td>3.75%</td>
</tr>
<tr>
<td>Ba2/BB</td>
<td>4.50%</td>
<td>5.50%</td>
<td>4.50%</td>
<td>4.75%</td>
</tr>
<tr>
<td>Ba3/BB-</td>
<td>4.75%</td>
<td>5.75%</td>
<td>4.75%</td>
<td>5.25%</td>
</tr>
<tr>
<td>B1/B+</td>
<td>5.75%</td>
<td>6.75%</td>
<td>5.50%</td>
<td>5.50%</td>
</tr>
<tr>
<td>B2/B</td>
<td>6.25%</td>
<td>7.75%</td>
<td>6.50%</td>
<td>6.00%</td>
</tr>
<tr>
<td>B3/B-</td>
<td>6.50%</td>
<td>9.00%</td>
<td>6.75%</td>
<td>6.25%</td>
</tr>
<tr>
<td>Caa/CCC</td>
<td>7.25%</td>
<td>9.25%</td>
<td>8.75%</td>
<td>8.25%</td>
</tr>
<tr>
<td>CC</td>
<td>8.00%</td>
<td>9.50%</td>
<td>9.50%</td>
<td>9.50%</td>
</tr>
<tr>
<td>C</td>
<td>9.00%</td>
<td>10.00%</td>
<td>10.50%</td>
<td>10.50%</td>
</tr>
<tr>
<td>D</td>
<td>10.00%</td>
<td>12.00%</td>
<td>12.00%</td>
<td>12.00%</td>
</tr>
</tbody>
</table>
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.

- For private companies, neither the market value of equity nor the market value of debt is observable. Rather than use book value weights, you should try
  - Industry average debt ratios for publicly traded firms in the business
  - Target debt ratio (if management has such a target)
  - Estimated value of equity and debt from valuation (through an iterative process)
## Company costs of capital

<table>
<thead>
<tr>
<th></th>
<th>Amgen</th>
<th>Tata Motors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riskfree rate</td>
<td>4.78%</td>
<td>5%</td>
</tr>
<tr>
<td>Beta</td>
<td>1.73</td>
<td>1.2</td>
</tr>
<tr>
<td>Mature ERP</td>
<td>4%</td>
<td>4.50%</td>
</tr>
<tr>
<td>Lambda</td>
<td>0</td>
<td>0.8</td>
</tr>
<tr>
<td>CRP</td>
<td>0</td>
<td>4.50%</td>
</tr>
<tr>
<td>Cost of equity</td>
<td>11.70%</td>
<td>14.00%</td>
</tr>
<tr>
<td>Rating</td>
<td>A</td>
<td>B+</td>
</tr>
<tr>
<td>Default spread</td>
<td>0.85%</td>
<td>4.25%</td>
</tr>
<tr>
<td>Default spread (country)</td>
<td>0.00%</td>
<td>3%</td>
</tr>
<tr>
<td>Cost of debt</td>
<td>5.63%</td>
<td>12.2500%</td>
</tr>
<tr>
<td>Marginal tax rate</td>
<td>35%</td>
<td>33.99%</td>
</tr>
<tr>
<td>After-tax cost of debt</td>
<td>3.66%</td>
<td>8.09%</td>
</tr>
<tr>
<td>MV of equity</td>
<td>$74,287</td>
<td>INR 322,388</td>
</tr>
<tr>
<td>MV of debt</td>
<td>$8,272</td>
<td>INR 109,198</td>
</tr>
<tr>
<td>D/ (D+E)</td>
<td>10.00%</td>
<td>25.30%</td>
</tr>
<tr>
<td>Cost of capital</td>
<td>10.90%</td>
<td>12.50%</td>
</tr>
</tbody>
</table>
Ib. Estimating Cashflows and Growth
Defining Cashflow

Cash flows can be measured to

All claimholders in the firm

- EBIT (1 - tax rate)
  - (Capital Expenditures - Depreciation)
  - Change in non-cash working capital
- = Free Cash Flow to Firm (FCFF)

Just Equity Investors

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

- Dividends
  + Stock Buybacks
From Reported to Actual Earnings

Normalize Earnings

- Firm's history
- Comparable Firms

Operating leases
- Convert into debt
- Adjust operating income

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

Cleanse operating items of
- Financial Expenses
- Capital Expenses
- Non-recurring expenses

Measuring Earnings

Update
- Trailing Earnings
- Unofficial numbers
Dealing with Operating Lease Expenses

- Operating Lease Expenses are treated as operating expenses in computing operating income. In reality, operating lease expenses should be treated as financing expenses, with the following adjustments to earnings and capital:
- Debt Value of Operating Leases = Present value of Operating Lease Commitments at the pre-tax cost of debt
- When you convert operating leases into debt, you also create an asset to counter it of exactly the same value.
- Adjusted Operating Earnings
  Adjusted Operating Earnings = Operating Earnings + Operating Lease Expenses - Depreciation on Leased Asset
  - As an approximation, this works:
  Adjusted Operating Earnings = Operating Earnings + Pre-tax cost of Debt * PV of Operating Leases.
### Operating Leases at Amgen

- Amgen has lease commitments and its pre-tax cost of debt is 5.63%. It also has $7,402 million in conventional debt.

<table>
<thead>
<tr>
<th>Year</th>
<th>Commitment</th>
<th>Present Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$96.00</td>
<td>$90.88</td>
</tr>
<tr>
<td>2</td>
<td>$95.00</td>
<td>$85.14</td>
</tr>
<tr>
<td>3</td>
<td>$102.00</td>
<td>$86.54</td>
</tr>
<tr>
<td>4</td>
<td>$98.00</td>
<td>$78.72</td>
</tr>
<tr>
<td>5</td>
<td>$87.00</td>
<td>$66.16</td>
</tr>
<tr>
<td>6-12</td>
<td>$107.43</td>
<td>$462.10 (752 million prorated)</td>
</tr>
</tbody>
</table>

Debt Value of leases = $869.55

- Debt outstanding at Amgen = $7,402 + $ 870 = $8,272 million
- Adjusted Operating Income = Stated OI + Lease exp this year - Depreciation = 5,071 m + 69 m - 870/12 = $5,068 million (12 year life for assets)
- Approximate Operating income = $5,071 m + 870 m (.0563) = $ 5,120 million
The Collateral Effects of Treating Operating Leases as Debt for a lease-rich company: The Gap

<table>
<thead>
<tr>
<th>C o n v e n t i o n a l Accounting</th>
<th>O p e r a t i n g Leases Treated as Debt</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Income Statement</strong></td>
<td></td>
</tr>
<tr>
<td>EBIT &amp; Leases = 1,990</td>
<td>EBIT &amp; Leases = 1,990</td>
</tr>
<tr>
<td>- Op Leases = 978</td>
<td>- Deprecn: OL= 628</td>
</tr>
<tr>
<td>EBIT = 1,012</td>
<td>EBIT = 1,362</td>
</tr>
<tr>
<td><strong>Balance Sheet</strong></td>
<td></td>
</tr>
<tr>
<td>Off balance sheet (Not shown as debt or as an asset). Only the conventional debt of $1,970 million shows up on balance sheet</td>
<td>Interest expense will rise to reflect the conversion of operating leases as debt. Net income should not change.</td>
</tr>
<tr>
<td><strong>Balance Sheet</strong></td>
<td></td>
</tr>
<tr>
<td>Asset</td>
<td>Liability</td>
</tr>
<tr>
<td>OL Asset 4397</td>
<td>OL Debt 4397</td>
</tr>
<tr>
<td>Total debt = 4397 + 1970 = $6,367 million</td>
<td></td>
</tr>
<tr>
<td><strong>Cost of capital = 8.20%(7350/9320) + 4%</strong></td>
<td><strong>Cost of capital = 8.20%(7350/13717) + 4%</strong></td>
</tr>
<tr>
<td>(1970/9320) = 7.31%</td>
<td>(6367/13717) = 6.25%</td>
</tr>
<tr>
<td>Cost of equity for The Gap = 8.20%</td>
<td></td>
</tr>
<tr>
<td>After-tax cost of debt = 4%</td>
<td></td>
</tr>
<tr>
<td>Market value of equity = 7350</td>
<td></td>
</tr>
<tr>
<td><strong>Return on capital = 1012 (1-.35)/(3130+1970)</strong></td>
<td><strong>Return on capital = 1362 (1-.35)/(3130+6367)</strong></td>
</tr>
<tr>
<td>= 12.90%</td>
<td>= 9.30%</td>
</tr>
</tbody>
</table>
What tax rate?

- The tax rate that you should use in computing the after-tax operating income should be
  - The effective tax rate in the financial statements (taxes paid/Taxable income)
  - The tax rate based upon taxes paid and EBIT (taxes paid/EBIT)
  - The marginal tax rate for the country in which the company operates
  - The weighted average marginal tax rate across the countries in which the company operates
  - None of the above
  - Any of the above, as long as you compute your after-tax cost of debt using the same tax rate
Capital expenditures should include

- **Research and development expenses**, once they have been re-categorized as capital expenses. The adjusted net cap ex will be
  
  \[
  \text{Adjusted Net Capital Expenditures} = \text{Net Capital Expenditures} + \text{Current year’s R&D expenses} - \text{Amortization of Research Asset}
  \]

- **Acquisitions of other firms**, since these are like capital expenditures. The adjusted net cap ex will be
  
  \[
  \text{Adjusted Net Cap Ex} = \text{Net Capital Expenditures} + \text{Acquisitions of other firms} - \text{Amortization of such acquisitions}
  \]

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**
Amgen Net Capital Expenditures

If we define capital expenditures broadly to include R&D and acquisitions:

- Accounting Capital Expenditures = $1,218 million
- Accounting Depreciation = $963 million

Accounting Net Cap Ex = $255 million

Net R&D Cap Ex = (3366-1150) = $2,216 million

Acquisitions in 2006 = $3,975 million

Total Net Capital Expenditures = $6,443 million

Acquisitions have been a volatile item. Amgen was quiet on the acquisition front in 2004 and 2005 and had a significant acquisition in 2003.
Working Capital Investments

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

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

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

- When forecasting future growth, it is important to forecast the effects of such growth on working capital needs, and building these effects into the cash flows.
## FCFF estimates: Last year

<table>
<thead>
<tr>
<th></th>
<th>Amgen</th>
<th>Tata Motors</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBIT (1-t)</td>
<td>$6,058.00</td>
<td>20,116.00Rs</td>
</tr>
<tr>
<td>- Net Cap Ex</td>
<td>$6,443.00</td>
<td>31,590.00Rs</td>
</tr>
<tr>
<td>- Change in non-cash WC</td>
<td>$37.00</td>
<td>2,732.00Rs</td>
</tr>
<tr>
<td>FCFF</td>
<td>-$422.00</td>
<td>14,206.00Rs</td>
</tr>
<tr>
<td>Reinvestment Rate</td>
<td>106.97%</td>
<td>170.62%</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 may be much **lower than the potential dividends** (that could have been paid out)

- managers are **conservative** and try to smooth out dividends
- managers like to **hold on to cash** to meet unforeseen future contingencies and investment opportunities

The potential dividends of a firm are the cash flows left over after the firm has made any “investments” it needs to make to create future growth and net debt repayments (debt repayments - new debt issues):

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

- Look at the past
  - The historical growth in earnings per share is usually a good starting point for growth estimation

- Look at what others are estimating
  - Analysts estimate growth in earnings per share for many firms. It is useful to know what their estimates are.

- Look at fundamentals
  - Ultimately, all growth in earnings can be traced to two fundamentals - how much the firm is investing in new projects, and what returns these projects are making for the firm.
Fundamental Growth when Returns are stable

Expected Growth

Net Income

Retention Ratio = 1 - Dividends/Net Income

Return on Equity = Net Income/Book Value of Equity

Operating Income

Reinvestment Rate = (Net Cap Ex + Chg in WC)/EBIT(1-t)

Return on Capital = EBIT(1-t)/Book Value of Capital

Return on Equity × Net Income × Operating Income
Measuring Return on Capital (Equity)

ROC = \frac{\text{EBIT} \times (1 - \text{tax rate})}{\text{Book Value of Equity} + \text{Book value of debt} - \text{Cash}}

Adjust EBIT for:
- Extraordinary or one-time expenses or income
- Operating leases and R&D
- Cyclicality in earnings (Normalize)
- Acquisition Debris (Goodwill amortization etc.)

Use a marginal tax rate to be safe. A high ROC created by paying low effective taxes is not sustainable.

Adjust book equity for:
1. Capitalized R&D
2. Acquisition Debris (Goodwill)

Adjust book value of debt for:
- Capitalized operating leases

Use end of prior year numbers or average over the year but be consistent in your application.
## Expected Growth Estimates

<table>
<thead>
<tr>
<th></th>
<th>Amgen</th>
<th>Tata Motors</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBIT (1-t)</td>
<td>$6,058</td>
<td>20,116Rs</td>
</tr>
<tr>
<td>BV of Debt</td>
<td>$4,827</td>
<td>62,805Rs</td>
</tr>
<tr>
<td>BV of Equity</td>
<td>$28,348</td>
<td>78,395Rs</td>
</tr>
<tr>
<td>- Cash</td>
<td>$0</td>
<td>23,973Rs</td>
</tr>
<tr>
<td>Invested Capital</td>
<td>$33,174</td>
<td>117,227Rs</td>
</tr>
<tr>
<td>ROIC (most recent year)</td>
<td>18.26%</td>
<td>17.16%</td>
</tr>
<tr>
<td>Reinvestment Rate (most recent year)</td>
<td>106.97%</td>
<td>170.62%</td>
</tr>
<tr>
<td>Expected ROIC</td>
<td>16.00%</td>
<td>17.16%</td>
</tr>
<tr>
<td>Reinvestment Rate</td>
<td>60.00%</td>
<td>70.00%</td>
</tr>
<tr>
<td>Expected growth rate</td>
<td>8.60%</td>
<td>12.01%</td>
</tr>
</tbody>
</table>
Fundamental Growth when return on equity (capital) is changing

When the return on equity or capital is changing, there will be a second component to growth, positive if the return is increasing and negative if the return is decreasing. If $\text{ROC}_t$ is the return on capital in period $t$ and $\text{ROC}_{t+1}$ is the return on capital in period $t+1$, the expected growth rate in operating income will be:

$$\text{Expected Growth Rate} = \text{ROC}_{t+1} \times \text{Reinvestment rate} + \left(\frac{\text{ROC}_{t+1} - \text{ROC}_t}{\text{ROC}_t}\right)$$

For example, assume that you have a firm that is generating a return on capital of 8% on its existing assets and expects to increase this return to 10% next year. The efficiency growth for this firm is

$$\text{Efficiency growth} = \frac{(10\% - 8\%)}{8\%} = 25\%$$

Thus, if this firm has a reinvestment rate of 50% and makes a 10% return on capital on its new investments as well, its total growth next year will be 30%

$$\text{Growth rate} = 0.50 \times 10\% + 25\% = 30\%$$

The key difference is that growth from new investments is sustainable whereas returns from efficiency are short term (or transitory). 
Ic. The Tail that wags the dog…
Terminal Value
Getting Closure in Valuation

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

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

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

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

Terminal Value

Liquidation Value
- Most useful when assets are separable and marketable

Multiple Approach
- Easiest approach but makes the valuation a relative valuation

Stable Growth Model
- 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 during the period.
Stable Growth and Terminal Value

- When a firm’s cash flows grow at a “constant” rate forever, the present value of those cash flows can be written as:
  \[
  \text{Value} = \frac{\text{Expected Cash Flow Next Period}}{(r - g)}
  \]
  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.
1. How high can the stable growth rate be?

- The stable growth rate cannot exceed the growth rate of the economy but it can be set lower.
  - 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 stable growth rate can be negative. The terminal value will be lower and you are assuming that your firm will disappear over time.
  - If you use nominal cashflows and discount rates, the growth rate should be nominal in the currency in which the valuation is denominated.

- One simple proxy for the nominal growth rate of the economy is the riskfree rate.
  - Riskfree rate = Expected inflation + Expected Real Interest Rate
  - Nominal growth rate in economy = Expected Inflation + Expected Real Growth
2. When will the firm reach stable growth?

- **Size of the firm**
  - Success usually makes a firm larger. As firms become larger, it becomes much more difficult for them to maintain high growth rates.

- **Current growth rate**
  - While past growth is not always a reliable indicator of future growth, there is a correlation between current growth and future growth. Thus, a firm growing at 30% currently probably has higher growth and a longer expected growth period than one growing 10% a year now.

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

- In stable growth, firms should have the characteristics of other stable growth firms. In particular,
  - The risk of the firm, as measured by beta and ratings, should reflect that of a stable growth firm.
    - Beta should move towards one
    - The cost of debt should reflect the safety of stable firms (BBB or higher)
  - The debt ratio of the firm might increase to reflect the larger and more stable earnings of these firms.
    - The debt ratio of the firm might moved to the optimal or an industry average
    - If the managers of the firm are deeply averse to debt, this may never happen
  - The return on capital generated on investments should move to sustainable levels, relative to both the sector and the company’s own cost of capital.
4. What excess returns will you generate in stable growth and why does it matter?

- Strange though this may seem, the terminal value is not as much a function of stable growth as it is a function of what you assume about excess returns in stable growth.

- The key connecting link is the reinvestment rate that you have in stable growth, which is a function of your return on capital:
  
  \[
  \text{Reinvestment Rate} = \frac{\text{Stable growth rate}}{\text{Stable ROC}}
  \]

  The terminal value can be written in terms of ROC as follows:
  
  \[
  \text{Terminal Value} = \frac{\text{EBIT}_{n+1} (1-t) (1 - \frac{g}{\text{ROC}})}{(\text{Cost of capital} - g)}
  \]

- In the scenario where you assume that a firm earns a return on capital equal to its cost of capital in stable growth, the terminal value will not change as the growth rate changes.

- If you assume that your firm will earn positive (negative) excess returns in perpetuity, the terminal value will increase (decrease) as the stable growth rate increases.
## Valuation: Stable Growth Inputs

<table>
<thead>
<tr>
<th></th>
<th>Amgen</th>
<th>Tata Motors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beta</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Growth</td>
<td>1.73</td>
<td>1.20</td>
</tr>
<tr>
<td>Stable Growth</td>
<td>1.10</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Lambda</strong></td>
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<td>High Growth</td>
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<td>0.80</td>
</tr>
<tr>
<td>Stable Growth</td>
<td>0.00</td>
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<tr>
<td><strong>Country Risk Premium</strong></td>
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<tr>
<td>High Growth</td>
<td>0.00%</td>
<td>4.50%</td>
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<tr>
<td>Stable Growth</td>
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<tr>
<td><strong>Cost of equity</strong></td>
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<tr>
<td>High Growth</td>
<td>11.70%</td>
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<td>Stable Growth</td>
<td>9.18%</td>
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<td><strong>Debt Ratio</strong></td>
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<td>High Growth</td>
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<td>Stable Growth</td>
<td>20.00%</td>
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<tr>
<td><strong>Cost of debt</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Growth</td>
<td>5.63%</td>
<td>12.25%</td>
</tr>
<tr>
<td>Stable Growth</td>
<td>5.63%</td>
<td>9.00%</td>
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<tr>
<td><strong>Cost of capital</strong></td>
<td></td>
<td></td>
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<tr>
<td>High Growth</td>
<td>10.90%</td>
<td>12.50%</td>
</tr>
<tr>
<td>Stable Growth</td>
<td>8.08%</td>
<td>10.39%</td>
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<tr>
<td><strong>Return on capital</strong></td>
<td></td>
<td></td>
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<tr>
<td>High Growth</td>
<td>16.00%</td>
<td>17.16%</td>
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<td>Stable Growth</td>
<td>10.00%</td>
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<td><strong>Reinvestment Rate</strong></td>
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<td>High Growth</td>
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<td>Stable Growth</td>
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<td><strong>Expected growth rate</strong></td>
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<tr>
<td>High Growth</td>
<td>9.60%</td>
<td>12.01%</td>
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<tr>
<td>Stable Growth</td>
<td>4.00%</td>
<td>5.00%</td>
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</table>
### Terminal Value and Growth

<table>
<thead>
<tr>
<th>Stable growth rate</th>
<th>Amgen</th>
<th>Tata Motors</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>$150,652</td>
<td>435,686Rs</td>
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<tr>
<td>1%</td>
<td>$154,479</td>
<td>435,686Rs</td>
</tr>
<tr>
<td>2%</td>
<td>$160,194</td>
<td>435,686Rs</td>
</tr>
<tr>
<td>3%</td>
<td>$167,784</td>
<td>435,686Rs</td>
</tr>
<tr>
<td>4%</td>
<td>$179,099</td>
<td>435,686Rs</td>
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<tr>
<td>ROIC</td>
<td>10%</td>
<td>10.39%</td>
</tr>
<tr>
<td>Cost of capital</td>
<td>8.08%</td>
<td>10.39%</td>
</tr>
</tbody>
</table>
There are some firms that earn excess returns.....

While growth rates seem to fade quickly as firms become larger, well managed firms seem to do much better at sustaining excess returns for longer periods.

\[\text{A more sustainable measure}\]


**ROIC** is sustainable over time, but growth inevitably declines.

\[\begin{array}{c}
\text{ROIC, } \% \\
12 & 10 & 8 & 6 & 4 & 2 & 0 \\
\end{array}\]

\[\begin{array}{c}
\text{Real revenue growth, } \% \\
12 & 10 & 8 & 6 & 4 & 2 & 0 \\
\end{array}\]

\(\text{ROIC shown is 2-year simple average, including goodwill; growth shown is 2-year compound annual growth rate for revenues adjusted for inflation.}\)
II. Corporate Finance meets Value: The secret to value enhancement
Price Enhancement versus Value Enhancement

Stock price performance of companies that changed their names to include Web-oriented designations like "com," from 30 trading days before the name-change announcement to 30 days after. The study looked at stocks of companies that changed their names from January 1998 through March 26, 1999.

One day before name change

200%
150%
100%
50%
0%
-50% -100% -150% -200%

Days before name change

Days after name change

NAME THAT STOCK

New Markets, New Names
In the bull market, adding dot-com to a company name made a stock soar. Lately those zippy new monikers are disappearing.

New Name, Higher Price
But the stocks still got a bounce when dot-com goes away. Chart shows returns in the days before and after the name change.

Source: “ARose.com by Any Other Name,” by Michael J. Cooper, P. Raghavendra Rau and Oriti, Director, of Purdue University.

Source: Thomson Datastream; P. Raghavendra Rau, Michael J. Cooper. Igor Osaren, Purdue Univ.; Ajay Kshere, Virginia Univ.; Ajay Patel, Wake Forest Univ.
Value-Neutral Actions

- Stock splits and stock dividends change the number of units of equity in a firm, but cannot affect firm value since they do not affect cash flows, growth or risk.
- Accounting decisions that affect reported earnings but not cash flows should have no effect on value.
  - Changing inventory valuation methods from FIFO to LIFO or vice versa in financial reports but not for tax purposes
  - Changing the depreciation method used in financial reports (but not the tax books) from accelerated to straight line depreciation
  - Major non-cash restructuring charges that reduce reported earnings but are not tax deductible
  - Using pooling instead of purchase in acquisitions cannot change the value of a target firm.
- Decisions that create new securities on the existing assets of the firm (without altering the financial mix) such as tracking stock.
The Paths to Value Creation.. Back to the determinants of value..

- **Cashflows from existing assets**
  Cashflows before debt payments, but after taxes and reinvestment to maintain existing assets

- **Growth from new investments**
  Growth created by making new investments; function of amount and quality of investments

- **Efficiency Growth**
  Growth generated by using existing assets better

- **Expected Growth during high growth period**

- **Length of the high growth period**
  Since value creating growth requires excess returns, this is a function of:
  - Magnitude of competitive advantages
  - Sustainability of competitive advantages

- **Cost of capital to apply to discounting cashflows**
  Determined by:
  - Operating risk of the company
  - Default risk of the company
  - Mix of debt and equity used in financing

- **Are you investing optimally for future growth?**

- **Are you building on your competitive advantages?**

- **How well do you manage your existing investments/assets?**

- **Is there scope for more efficient utilization of existing assets?**

- **Stable growth firm, with no or very limited excess returns**
Value Creation 1: Increase Cash Flows from Assets in Place

- More efficient operations and cost cutting: Higher Margins
- Divest assets that have negative EBIT
- Reduce tax rate: - moving income to lower tax locales, - transfer pricing, - risk management

Revenues
* Operating Margin
= EBIT
- Tax Rate * EBIT
= EBIT (1-t)
+ Depreciation
- Capital Expenditures
- Chg in Working Capital
= FCFF

- Live off past over-investment
- Better inventory management and tighter credit policies
1.1.: Poor Investments: Should you divest?

- Every firm has at least a few investments in place that are poor investments, earning less than the cost of capital or even losing money.
- In deciding whether to divest, there are three values that we need to consider:
  - **Continuing Value**: This is the present value of the expected cash flows from continuing the investment through the end of its life.
  - **Salvage or Liquidation Value**: This is the net cash flow that the firm will receive if it terminated the project today.
  - **Divestiture Value**: This is the price that will be paid by the highest bidder for this investment.
- If the continuing value is the greatest, there can be no value created by terminating or liquidating this investment, even if it is a bad investment.
- If the liquidation or divestiture value is greater than the continuing value, the firm value will increase by the difference between the two values:
  - If liquidation is optimal: Liquidation Value - Continuing Value
  - If divestiture is optimal: Divestiture Value - Continuing Value
1.2: Manage working capital

If non-cash working capital is defined to be the difference between non-cash current assets (accounts receivable & inventory) and non-debt current liabilities (accounts payable & supplier credit), there are three ways in which you can reduce working capital (and increase cash flows):

- Reduce inventory at every stage in the process (work in process, finished goods)
- Offer less or tighter credit and/or demand a fair market interest rate when offering credit.
- Use supplier credit or accounts payable, but only if the financing cost (explicit or implicit) is lower than the company’s pre-tax cost of debt.

Reducing working capital is not a free good. The cash flow gain from reducing inventory and tightening credit has to be weighed off against the cost of lost sales and profits.
Value Creation 2: Increase Expected Growth

- Keeping all else constant, increasing the expected growth in earnings will increase the value of a firm.
- The expected growth in earnings of any firm is a function of two variables:
  - The amount that the firm reinvests in assets and projects
  - The quality of these investments

\[
\text{Reinvestment Rate} \times \text{Return on Capital} = \text{Expected Growth Rate}
\]

- Reinvest more in projects
- Increase operating margins
- Do acquisitions
- Increase capital turnover ratio

Price Leader versus Volume Leader Strategies

Return on Capital = Operating Margin * Capital Turnover Ratio
2.1: Increase the Reinvestment Rate

Holding all else constant, increasing the reinvestment rate will increase the expected growth in earnings of a firm. Increasing the reinvestment rate will, however, reduce the cash flows of the firms. The net effect will determine whether value increases or decreases.

As a general rule,

- Increasing the reinvestment rate when the ROC is less than the cost of capital will reduce the value of the firm
- Increasing the reinvestment rate when the ROC is greater than the cost of capital will increase the value of the firm
2.2: Improve Quality of Investments

- If a firm can increase its return on capital on new projects, while holding the reinvestment rate constant, it will increase its firm value.
  - The firm’s cost of capital still acts as a floor on the return on capital. If the return on capital is lower than the cost of capital, increasing the return on capital will reduce the amount of value destroyed but will not create value. The firm would be better off under those circumstances returning the cash to the owners of the business.
  - It is only when the return on capital exceeds the cost of capital, that the increase in value generated by the higher growth will more than offset the decrease in cash flows caused by reinvesting.

- This proposition might not hold, however, if the investments are in riskier projects, because the cost of capital will then increase.
Value Creating Growth... Evaluating the Alternatives.

<table>
<thead>
<tr>
<th>Category of growth</th>
<th>Shareholder value created for incremental $1 million of growth/target acquisition size</th>
<th>Revenue growth/acquisition size necessary to double typical company’s share price, $ billions</th>
</tr>
</thead>
<tbody>
<tr>
<td>New-product market development</td>
<td>1.75–2.00</td>
<td>5–6</td>
</tr>
<tr>
<td>Expanding an existing market</td>
<td>0.30–0.75</td>
<td>13–33</td>
</tr>
<tr>
<td>Maintaining/growing share in a growing market</td>
<td>0.10–0.50</td>
<td>20–100</td>
</tr>
<tr>
<td>Competing for share in a stable market</td>
<td>-0.25–0.40</td>
<td>n/m–25</td>
</tr>
<tr>
<td>Acquisition (25th to 75th percentile result)</td>
<td>-0.5–0.20</td>
<td>n/m–50</td>
</tr>
</tbody>
</table>
A postscript on creating growth: The Role of Acquisitions and Divestitures

- An acquisition is just a large-scale project. All of the rules that apply to individual investments apply to acquisitions, as well. For an acquisition to create value, it has to
  - Generate a higher return on capital, after allowing for synergy and control factors, than the cost of capital.
  - Put another way, an acquisition will create value only if the present value of the cash flows on the acquired firm, inclusive of synergy and control benefits, exceeds the cost of the acquisition.

- A divestiture is the reverse of an acquisition, with a cash inflow now (from divesting the assets) followed by cash outflows (i.e., cash flows foregone on the divested asset) in the future. If the present value of the future cash outflows is less than the cash inflow today, the divestiture will increase value.

- A fair-price acquisition or divestiture is value neutral.
Acquisitions are great for target companies but not always for acquiring company stockholders…
And the long-term follow up is not positive either..

- Managers often argue that the market is unable to see the long term benefits of mergers that they can see at the time of the deal. If they are right, mergers should create long term benefits to acquiring firms.

- The evidence does not support this hypothesis:
  - McKinsey and Co. has examined acquisition programs at companies on
    - Did the return on capital invested in acquisitions exceed the cost of capital?
    - Did the acquisitions help the parent companies outperform the competition?
      Half of all programs failed one test, and a quarter failed both.
  - Synergy is elusive. KPMG in a more recent study of global acquisitions concludes that most mergers (>80%) fail - the merged companies do worse than their peer group.
  - A large number of acquisitions that are reversed within fairly short time periods. About 20% of the acquisitions made between 1982 and 1986 were divested by 1988. In studies that have tracked acquisitions for longer time periods (ten years or more) the divestiture rate of acquisitions rises to almost 50%.
A scary thought… The disease is spreading…

Indian firms acquiring US targets – 1999 - 2005

Figure 2. Acquisition Announcement Effect on the Acquiring Firms’ Stocks

Figure 3. Long Term Stock Performance of the Acquiring Firms
Growing through acquisitions seems to be a “loser’s game”

- Firms that grow through acquisitions have generally had far more trouble creating value than firms that grow through internal investments.
- In general, acquiring firms tend to
  - Pay too much for target firms
  - Over estimate the value of “synergy” and “control”
  - Have a difficult time delivering the promised benefits
- Worse still, there seems to be very little learning built into the process. The same mistakes are made over and over again, often by the same firms with the same advisors.
- Conclusion: There is something structurally wrong with the process for acquisitions which is feeding into the mistakes.
Seven reasons why acquisitions fail…

1. **Risk Transference**: Attributing acquiring company risk characteristics to the target firm. Just because you are a safe firm and operate in a secure market, does not mean that you can transfer these characteristics to a target firm.

2. **Debt subsidies**: Subsidizing target firm stockholders for the strengths of the acquiring firm is providing them with a benefit they did not earn.

3. **Auto-pilot Control**: Adding 20% or some arbitrary number to the market price just because other people do it is a recipe for overpayment. Using silly rules such as EPS accretion just makes the problem worse.

4. **Elusive Synergy**: While there is much talk about synergy in mergers, it is seldom valued realistically or appropriately.

5. **It’s all relative**: The use of transaction multiples (multiples paid by other acquirers in acquisitions) perpetuates over payment.

6. **Verdict first, trial afterwards**: Deciding you want to do an acquisition first and then looking for justification for the price paid does not make sense.

7. **It’s not my fault**: Holding no one responsible for delivering results is a sure-fire way not to get results…
Let's start with a target firm

- The target firm has the following income statement:
  
  - Revenues: 100
  - Operating Expenses: 80
  - Taxes: 8
  
  Operating Income = 20
  After-tax OI = 12

- Assume that this firm will generate this operating income forever (with no growth) and that the cost of equity for this firm is 20%. The firm has no debt outstanding. What is the value of this firm?
Test 1: Risk Transference…

Assume that as an acquiring firm, you are in a much safer business and have a cost of equity of 10%. What is the value of the target firm to you?
Lesson 1: Don’t transfer your risk characteristics to the target firm

- The cost of equity used for an investment should reflect the risk of the investment and not the risk characteristics of the investor who raised the funds.
- Risky businesses cannot become safe just because the buyer of these businesses is in a safe business.
Test 2: Cheap debt?

Assume as an acquirer that you have access to cheap debt (at 4%) and that you plan to fund half the acquisition with debt. How much would you be willing to pay for the target firm?
Lesson 2: Render unto the target firm that which is the target firm’s but not a penny more..

- As an acquiring firm, it is entirely possible that you can borrow much more than the target firm can on its own and at a much lower rate. If you build these characteristics into the valuation of the target firm, you are essentially transferring wealth from your firm’s stockholder to the target firm’s stockholders.

- When valuing a target firm, use a cost of capital that reflects the debt capacity and the cost of debt that would apply to the firm.
Test 3: Control Premiums

- Assume that you are now told that it is conventional to pay a 20% premium for control in acquisitions (backed up by Mergerstat). How much would you be willing to pay for the target firm?

- Would your answer change if I told you that you can run the target firm better and that if you do, you will be able to generate a 30% pre-tax operating margin (rather than the 20% margin that is currently being earned).

- What if the target firm were perfectly run?
Lesson 3: Beware of rules of thumb…

Valuation is cluttered with rules of thumb. After painstakingly valuing a target firm, using your best estimates, you will be often be told that

- It is common practice to add arbitrary premiums for brand name, quality of management, control etc…
- These premiums will be often be backed up by data, studies and services. What they will not reveal is the enormous sampling bias in the studies and the standard errors in the estimates.
- If you have done your valuation right, those premiums should already be incorporated in your estimated value. Paying a premium will be double counting.
Test 4: Synergy….

- Assume that you are told that the combined firm will be less risky than the two individual firms and that it should have a lower cost of capital (and a higher value). Is this likely?

- Assume now that you are told that there are potential growth and cost savings synergies in the acquisition. Would that increase the value of the target firm?

- Should you pay this as a premium?
The Value of Synergy

Synergy is created when two firms are combined and can be either financial or operating.

**Operating Synergy** accrues to the combined firm as:
- **Strategic Advantages**
  - Higher returns on new investments
  - Higher ROC
  - Higher Growth Rate
- **More new Investments**
- **More sustainable excess returns**
- **Cost Savings in current operations**
- **Longer Growth Period**
- **Higher Margin**
- **Higher Base-year EBIT**

**Financial Synergy**
- **Tax Benefits**
- **Added Debt Capacity**
- **Diversification?**
  - Lower taxes on earnings due to:
    - Higher depreciation
    - Operating loss carryforwards
  - Higher debt ratio and lower cost of capital
  - May reduce cost of equity for private or closely held firm
Valuing Synergy

(1) the firms involved in the merger are valued independently, by discounting expected cash flows to each firm at the weighted average cost of capital for that firm.

(2) the value of the combined firm, with no synergy, is obtained by adding the values obtained for each firm in the first step.

(3) The effects of synergy are built into expected growth rates and cashflows, and the combined firm is re-valued with synergy.

Value of Synergy = Value of the combined firm, with synergy - Value of the combined firm, without synergy
Synergy – Example
Higher growth and cost savings

<table>
<thead>
<tr>
<th></th>
<th>P&amp;G</th>
<th>Gillette</th>
<th>Piglet: No Synergy</th>
<th>Piglet: Synergy</th>
<th>Notes</th>
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</thead>
<tbody>
<tr>
<td>Free Cashflow to Equity</td>
<td>$5,864.74</td>
<td>$1,547.50</td>
<td>$7,412.24</td>
<td>$7,569.73</td>
<td>Annual operating expenses reduced by $250 million</td>
</tr>
<tr>
<td>Growth rate for first 5 years</td>
<td>12%</td>
<td>10%</td>
<td>11.58%</td>
<td>12.50%</td>
<td>Slightly higher growth rate</td>
</tr>
<tr>
<td>Growth rate after five years</td>
<td>4%</td>
<td>4%</td>
<td>4.00%</td>
<td>4.00%</td>
<td></td>
</tr>
<tr>
<td>Beta</td>
<td>0.90</td>
<td>0.80</td>
<td>0.88</td>
<td>0.88</td>
<td></td>
</tr>
<tr>
<td>Cost of Equity</td>
<td>7.90%</td>
<td>7.50%</td>
<td>7.81%</td>
<td>7.81%</td>
<td>Value of synergy</td>
</tr>
<tr>
<td>Value of Equity</td>
<td>$221,292</td>
<td>$59,878</td>
<td>$281,170</td>
<td>$298,355</td>
<td></td>
</tr>
</tbody>
</table>

$17,185
Lesson 4: Don’t pay for buzz words

- Through time, acquirers have always found ways of justifying paying for premiums over estimated value by using buzz words - synergy in the 1980s, strategic considerations in the 1990s and real options in this decade.

- While all of these can have value, the onus should be on those pushing for the acquisitions to show that they do and not on those pushing against them to show that they do not.
Test 5: Comparables and Exit Multiples

Now assume that you are told that an analysis of other acquisitions reveals that acquirers have been willing to pay 5 times EBIT. Given that your target firm has EBIT of $20 million, would you be willing to pay $100 million for the acquisition?

What if I estimate the terminal value using an exit multiple of 5 times EBIT?

As an additional input, your investment banker tells you that the acquisition is accretive. (Your PE ratio is 20 whereas the PE ratio of the target is only 10… Therefore, you will get a jump in earnings per share after the acquisition…)
Biased samples = Poor results

- Biased samples yield biased results. Basing what you pay on what other acquirers have paid is a recipe for disaster. After all, we know that acquirer, on average, pay too much for acquisitions. By matching their prices, we risk replicating their mistakes.

- Even when we use the pricing metrics of other firms in the sector, we may be basing the prices we pay on firms that are not truly comparable.

- When we use exit multiples, we are assuming that what the market is paying for comparable companies today is what it will continue to pay in the future.
Lesson 5: Don’t be a lemming...

- All too often, acquisitions are justified by using one of the following two arguments:
  - Every one else in your sector is doing acquisitions. You have to do the same to survive.
  - The value of a target firm is based upon what others have paid on acquisitions, which may be much higher than what your estimate of value for the firm is.

- With the right set of comparable firms (selected to back up your story), you can justify almost any price.

- And EPS accretion is a meaningless measure. After all, buying an company with a PE lower than yours will lead mathematically to EPS accretion.
Test 6: The CEO really wants to do this…

Now assume that you know that the CEO of the acquiring firm really, really wants to do this acquisition and that the investment bankers on both sides have produced fairness opinions that indicate that the firm is worth $100 million. Would you be willing to go along?
Lesson 6: Don’t let egos or investment bankers get the better of common sense…

- If you define your objective in a bidding war as winning the auction at any cost, you will win. But beware the winner’s curse!
- The premiums paid on acquisitions often have nothing to do with synergy, control or strategic considerations (though they may be provided as the reasons). They may just reflect the egos of the CEOs of the acquiring firms.
The odds seem to be clearly weighted against success in acquisitions. If you were to create a strategy to grow, based upon acquisitions, which of the following offers your best chance of success?

<table>
<thead>
<tr>
<th>This</th>
<th>Or this</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sole Bidder</td>
<td>Bidding War</td>
</tr>
<tr>
<td>Public target</td>
<td>Private target</td>
</tr>
<tr>
<td>Pay with cash</td>
<td>Pay with stock</td>
</tr>
<tr>
<td>Small target</td>
<td>Large target</td>
</tr>
<tr>
<td>Cost synergies</td>
<td>Growth synergies</td>
</tr>
</tbody>
</table>
Better to lose a bidding war than to win one…

Returns in the 40 months before & after bidding war
Source: Malmendier, Moretti & Peters (2011)
You are better off buying small rather than large targets… with cash rather than stock.
And focusing on private firms and subsidiaries, rather than public firms...
Growth vs Cost Synergies

Top-line trouble: 70 percent of mergers failed to achieve expected revenue synergies

| Mergers achieving stated percentage of expected revenue synergies, percent N = 77 |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| <30%                           | 23              | 5               | 13              | 14              | 17              |
| 30%–50%                        | 13              | 8               | 13              | 14              | 17              |
| 51%–60%                        | 14              | 8               | 13              | 14              | 17              |
| 61%–70%                        | 13              | 8               | 13              | 14              | 17              |
| 71%–80%                        | 17              | 5               | 13              | 14              | 17              |
| 81%–90%                        | 17              | 5               | 13              | 14              | 17              |
| >100%                          | 17              | 5               | 13              | 14              | 17              |

Typical sources of estimation error

- Ignoring or underestimating customer losses (typically 2% to 5%) that result from the integration
- Assuming growth or share targets out of line with overall market growth and competitive dynamics (no "outside view" calibration)


Cost-synergy estimation is better, but there are patterns emerging in the errors

| Mergers achieving stated percentage of expected cost savings, percent N = 92 |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| <30%                           | 3               | 5               | 1               | 4               | 13              |
| 30%–50%                        | 3               | 5               | 1               | 4               | 13              |
| 51%–60%                        | 1               | 4               | 12              | 13              | 25              |
| 61%–70%                        | 1               | 4               | 12              | 13              | 25              |
| 71%–80%                        | 1               | 4               | 12              | 13              | 25              |
| 81%–90%                        | 1               | 4               | 12              | 13              | 25              |
| >100%                          | 1               | 4               | 12              | 13              | 25              |

Typical sources of estimation error

- Underestimating one-time costs
- Using benchmarks from noncomparable situations
- Not sanity-checking management estimates against precedent transactions
- Failing to ground estimates in bottom-up analysis (e.g., location-by-location review of overlaps)

Synergy: Odds of success

- Studies that have focused on synergies have concluded that you are far more likely to deliver cost synergies than growth synergies.
- Synergies that are concrete and planned for at the time of the merger are more likely to be delivered than fuzzy synergies.
- Synergy is much more likely to show up when someone is held responsible for delivering the synergy.
- You are more likely to get a share of the synergy gains in an acquisition when you are a single bidder than if you are one of multiple bidders.
Lesson 7: For acquisitions to create value, you have to stay disciplined.

If you have a successful acquisition strategy, stay focused on that strategy. Don’t let size or hubris drive you to “expand” the strategy.

Realistic plans for delivering synergy and control have to be put in place before the merger is completed. By realistic, we have to mean that the magnitude of the benefits have to be reachable and not pipe dreams and that the time frame should reflect the reality that it takes a while for two organizations to work as one.

The best thing to do in a bidding war is to drop out.

Someone (preferably the person pushing hardest for the merger) should be held to account for delivering the benefits.

The compensation for investment bankers and others involved in the deal should be tied to how well the deal works rather than for getting the deal done.
III. Building Competitive Advantages: Increase length of the growth period

*Increase length of growth period*

- Build on existing competitive advantages
  - Brand name
  - Legal Protection
- Find new competitive advantages
  - Switching Costs
  - Cost advantages
Value Creation 4: Reduce Cost of Capital

Cost of Equity \(\frac{E}{D+E}\) + Pre-tax Cost of Debt \(\frac{D}{D+E}\) = Cost of Capital

- Change financing mix
- Make product or service less discretionary to customers
- Change product characteristics
- More effective advertising
- Reduce operating leverage
- Flexible wage contracts & cost structure
- Match debt to assets, reducing default risk
- Swaps
- Derivatives
- Hybrids

Outsourcing
## Debt: Summarizing the trade off

<table>
<thead>
<tr>
<th>Advantages of Debt</th>
<th>Disadvantages of debt</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Tax Benefit:</strong> Interest expenses on debt are tax deductible but cash flows to equity are generally not. &lt;br&gt;&lt;i&gt;Implication: The higher the marginal tax rate, the greater the benefits of debt.&lt;/i&gt;</td>
<td><strong>1. Expected Bankruptcy Cost:</strong> The expected cost of going bankrupt is a product of the probability of going bankrupt and the cost of going bankrupt. The latter includes both direct and indirect costs. The probability of going bankrupt will be higher in businesses with more volatile earnings and the cost of bankruptcy will also vary across businesses. &lt;br&gt;&lt;i&gt;Implication:&lt;/i&gt; 1. Firms with more stable earnings should borrow more, for any given level of earnings. 2. Firms with lower bankruptcy costs should borrow more, for any given level of earnings.</td>
</tr>
<tr>
<td><strong>2. Added Discipline:</strong> Borrowing money may force managers to think about the consequences of the investment decisions a little more carefully and reduce bad investments. &lt;br&gt;&lt;i&gt;Implication: As the separation between managers and stockholders increases, the benefits to using debt will go up.&lt;/i&gt;</td>
<td><strong>2. Agency Costs:</strong> Actions that benefit equity investors may hurt lenders. The greater the potential for this conflict of interest, the greater the cost borne by the borrower (as higher interest rates or more covenants). &lt;br&gt;&lt;i&gt;Implication: Firms where lenders can monitor/ control how their money is being used should be able to borrow more than firms where this is difficult to do.**</td>
</tr>
<tr>
<td></td>
<td><strong>3. Loss of flexibility:</strong> Using up available debt capacity today will mean that you cannot draw on it in the future. This loss of flexibility can be disastrous if funds are needed and access to capital is shut off. &lt;br&gt;&lt;i&gt;Implication:&lt;/i&gt; 1. Firms that can forecast future funding needs better should be able to borrow more. 2. Firms with better access to capital markets should be more willing to borrow more today.</td>
</tr>
</tbody>
</table>
Finding an optimal debt ratio: The Cost of Capital Approach

1. Estimate the Cost of Equity at different levels of debt:
   - Equity will become riskier -> Beta will increase -> Cost of Equity will increase.
   - Estimation will use levered beta calculation

2. Estimate the Cost of Debt at different levels of debt:
   - Default risk will go up and bond ratings will go down as debt goes up -> Cost of Debt will increase.
   - To estimating bond ratings, we will use the interest coverage ratio (EBIT/Interest expense)

3. Estimate the Cost of Capital at different levels of debt
4. Calculate the effect on Firm Value and Stock Price.
# Amgen’s Optimal Financing Mix

<table>
<thead>
<tr>
<th>Debt Ratio</th>
<th>Beta</th>
<th>Cost of Equity</th>
<th>Bond Rating</th>
<th>Interest rate on debt</th>
<th>Tax Rate</th>
<th>Cost of Debt (after-tax)</th>
<th>WACC</th>
<th>Firm Value (G)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>1.61</td>
<td>11.23%</td>
<td>AAA</td>
<td>5.13%</td>
<td>35.00%</td>
<td>3.33%</td>
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<td>AAA</td>
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<tr>
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<td>60%</td>
<td>3.51</td>
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<td>13.17%</td>
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<td>80%</td>
<td>7.02</td>
<td>32.87%</td>
<td>C</td>
<td>16.78%</td>
<td>16.15%</td>
<td>14.07%</td>
<td>17.83%</td>
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</tr>
<tr>
<td>90%</td>
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<td>14.37%</td>
<td>19.03%</td>
<td>$32,972</td>
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</table>

Amgen’s current debt ratio = 10%
Amgen’s optimal debt ratio = 30%
## Tata Motor’s Optimal Financing Mix

<table>
<thead>
<tr>
<th>Debt Ratio</th>
<th>Beta</th>
<th>Cost of Equity</th>
<th>Bond Rating</th>
<th>Interest rate on debt</th>
<th>Tax Rate</th>
<th>Cost of Debt (after-tax)</th>
<th>WACC</th>
<th>Firm Value (G)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>0.98</td>
<td>12.36%</td>
<td>AAA</td>
<td>8.50%</td>
<td>33.99%</td>
<td>5.61%</td>
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<td>A+</td>
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<td>33.99%</td>
<td>5.94%</td>
<td>12.20%</td>
<td>INR 450,734</td>
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<tr>
<td>20%</td>
<td>1.14</td>
<td>13.57%</td>
<td>BB+</td>
<td>11.50%</td>
<td>33.99%</td>
<td>7.59%</td>
<td>12.37%</td>
<td>INR 439,581</td>
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<td>30%</td>
<td>1.26</td>
<td>14.44%</td>
<td>B-</td>
<td>13.50%</td>
<td>33.99%</td>
<td>8.91%</td>
<td>12.78%</td>
<td>INR 415,561</td>
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<td>1.42</td>
<td>15.65%</td>
<td>CC</td>
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<td>12.09%</td>
<td>14.23%</td>
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<td>1.75</td>
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<td>C</td>
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<td>16.95%</td>
<td>14.98%</td>
<td>INR 262,949</td>
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<tr>
<td>60%</td>
<td>2.24</td>
<td>21.79%</td>
<td>D</td>
<td>23.00%</td>
<td>19.67%</td>
<td>20.52%</td>
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<td>70%</td>
<td>3.00</td>
<td>27.52%</td>
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<td>20.75%</td>
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<tr>
<td>90%</td>
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<td>73.00%</td>
<td>D</td>
<td>23.00%</td>
<td>8.40%</td>
<td>21.07%</td>
<td>26.26%</td>
<td>INR 138,352</td>
</tr>
</tbody>
</table>

Tata Motor’s current debt ratio = 25%
Tata Motor’s optimal debt ratio = 10%
III. Loose Ends in Valuation: From firm value to value of equity per share
But what comes next?

<table>
<thead>
<tr>
<th>Value of Operating Assets</th>
<th>Since this is a discounted cashflow valuation, should there be a real option premium?</th>
</tr>
</thead>
</table>
| + Cash and Marketable Securities | Operating versus Non-operating cash  
Should cash be discounted for earning a low return? |
| + Value of Cross Holdings | How do you value cross holdings in other companies?  
What if the cross holdings are in private businesses? |
| + Value of Other Assets | What about other valuable assets?  
How do you consider under utilized assets? |
| Value of Firm | Should you discount this value for opacity or complexity?  
How about a premium for synergy?  
What about a premium for intangibles (brand name)? |
| - Value of Debt | What should be counted in debt?  
Should you subtract book or market value of debt?  
What about other obligations (pension fund and health care)?  
What about contingent liabilities?  
What about minority interests? |
| = Value of Equity | Should there be a premium/discount for control?  
Should there be a discount for distress |
| - Value of Equity Options | What equity options should be valued here (vested versus non-vested)?  
How do you value equity options? |
| = Value of Common Stock | Should you divide by primary or diluted shares? |
| / Number of shares | |
| = Value per share | Should there be a discount for illiquidity/ marketability?  
Should there be a discount for minority interests? |
1. An Exercise in Cash Valuation

<table>
<thead>
<tr>
<th></th>
<th>Company A</th>
<th>Company B</th>
<th>Company C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterprise Value</td>
<td>$ 1 billion</td>
<td>$ 1 billion</td>
<td>$ 1 billion</td>
</tr>
<tr>
<td>Cash</td>
<td>$ 100 mil</td>
<td>$ 100 mil</td>
<td>$ 100 mil</td>
</tr>
<tr>
<td>Return on Capital</td>
<td>10%</td>
<td>5%</td>
<td>22%</td>
</tr>
<tr>
<td>Cost of Capital</td>
<td>10%</td>
<td>10%</td>
<td>12%</td>
</tr>
<tr>
<td>Trades in</td>
<td>US</td>
<td>US</td>
<td>Indonesia</td>
</tr>
</tbody>
</table>
Cash: Discount or Premium?

Market Value of $1 in cash:
Estimates obtained by regressing Enterprise Value against Cash Balances

- Mature firms, Negative excess returns
- All firms
- High Growth firms, High Excess Returns
2. Dealing with Holdings in Other firms

Holdings in other firms can be categorized into

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

We tend to be sloppy in practice in dealing with cross holdings. After valuing the operating assets of a firm, using consolidated statements, it is common to add on the balance sheet value of minority holdings (which are in book value terms) and subtract out the minority interests (again in book value terms), representing the portion of the consolidated company that does not belong to the parent company.
How to value holdings in other firms.. In a perfect world..

- In a perfect world, we would strip the parent company from its subsidiaries and value each one separately. The value of the combined firm will be
  - Value of parent company + Proportion of value of each subsidiary
- To do this right, you will need to be provided detailed information on each subsidiary to estimated cash flows and discount rates.
Two compromise solutions...

- The market value solution: When the subsidiaries are publicly traded, you could use their traded market capitalizations to estimate the values of the cross holdings. You do risk carrying into your valuation any mistakes that the market may be making in valuation.

- The relative value solution: When there are too many cross holdings to value separately or when there is insufficient information provided on cross holdings, you can convert the book values of holdings that you have on the balance sheet (for both minority holdings and minority interests in majority holdings) by using the average price to book value ratio of the sector in which the subsidiaries operate.
Tata Motor’s Cross Holdings

Value of Cross holdings: Tata Motors

- Tata Steel
- Tata Chemicals
- Non-listed Tata companies
3. Other Assets that have not been counted yet.

- **Unutilized assets**: If you have assets or property that are not being utilized (vacant land, for example), you have not valued it yet. You can assess a market value for these assets and add them on to the value of the firm.

- **Overfunded pension plans**: If you have a defined benefit plan and your assets exceed your expected liabilities, you could consider the over funding with two caveats:
  - Collective bargaining agreements may prevent you from laying claim to these excess assets.
  - There are tax consequences. Often, withdrawals from pension plans get taxed at much higher rates.

Do not double count an asset. If you count the income from an asset in your cashflows, you cannot count the market value of the asset in your value.
4. A Discount for Complexity: An Experiment

<table>
<thead>
<tr>
<th></th>
<th>Company A</th>
<th>Company B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Income</td>
<td>$ 1 billion</td>
<td>$ 1 billion</td>
</tr>
<tr>
<td>Tax rate</td>
<td>40%</td>
<td>40%</td>
</tr>
<tr>
<td>ROIC</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Expected Growth</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Cost of capital</td>
<td>8%</td>
<td>8%</td>
</tr>
<tr>
<td>Business Mix</td>
<td>Single Business</td>
<td>Multiple Businesses</td>
</tr>
<tr>
<td>Holdings</td>
<td>Simple</td>
<td>Complex</td>
</tr>
<tr>
<td>Accounting</td>
<td>Transparent</td>
<td>Opaque</td>
</tr>
</tbody>
</table>

Which firm would you value more highly?
Measuring Complexity: Volume of Data in Financial Statements

<table>
<thead>
<tr>
<th>Company</th>
<th>Number of pages in last 10Q</th>
<th>Number of pages in last 10K</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Electric</td>
<td>65</td>
<td>410</td>
</tr>
<tr>
<td>Microsoft</td>
<td>63</td>
<td>218</td>
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<tr>
<td>Wal-mart</td>
<td>38</td>
<td>244</td>
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<tr>
<td>Exxon Mobil</td>
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<td>332</td>
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<tr>
<td>Pfizer</td>
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<td>460</td>
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<tr>
<td>Citigroup</td>
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<tr>
<td>Intel</td>
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<td>215</td>
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<tr>
<td>AIG</td>
<td>164</td>
<td>720</td>
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<tr>
<td>Johnson &amp; Johnson</td>
<td>63</td>
<td>218</td>
</tr>
<tr>
<td>IBM</td>
<td>85</td>
<td>353</td>
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</table>
## Measuring Complexity: A Complexity Score

<table>
<thead>
<tr>
<th>Item</th>
<th>Factors</th>
<th>Follow-up Question</th>
<th>Answer</th>
<th>Weighting factor</th>
<th>Gerdau Score</th>
<th>GE Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Income</td>
<td>1. Multiple Businesses</td>
<td>Number of businesses (with more than 10% of revenues) = 1</td>
<td>2.00</td>
<td>2</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. One-time income and expenses</td>
<td>Percent of operating income = 10%</td>
<td>10.00</td>
<td>1</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Income from unspecified sources</td>
<td>Percent of operating income = 0%</td>
<td>10.00</td>
<td>0</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Items in income statement that are volatile</td>
<td>Percent of operating income = 15%</td>
<td>5.00</td>
<td>0.75</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Tax Rate</td>
<td>1. Income from multiple locales</td>
<td>Percent of revenues from non-domestic locales = 70%</td>
<td>3.00</td>
<td>2.1</td>
<td>1.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Different tax and reporting books</td>
<td>Yes or No</td>
<td>No</td>
<td>Yes=3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>3. Headquarters in tax havens</td>
<td>Yes or No</td>
<td>No</td>
<td>Yes=3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>4. Volatile effective tax rate</td>
<td>Yes or No</td>
<td>Yes</td>
<td>Yes=2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Capital Expenditures</td>
<td>1. Volatile capital expenditures</td>
<td>Yes or No</td>
<td>Yes</td>
<td>Yes=2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>2. Frequent and large acquisitions</td>
<td>Yes or No</td>
<td>Yes</td>
<td>Yes=4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>3. Stock payment for acquisitions and investments</td>
<td>Yes or No</td>
<td>No</td>
<td>Yes=4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Working capital</td>
<td>1. Unspecified current assets and current liabilities</td>
<td>Yes or No</td>
<td>No</td>
<td>Yes=3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>2. Volatile working capital items</td>
<td>Yes or No</td>
<td>Yes</td>
<td>Yes=2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Expected Growth rate</td>
<td>1. Off-balance sheet assets and liabilities (operating leases and R&amp;D)</td>
<td>Yes or No</td>
<td>No</td>
<td>Yes=3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>2. Substantial stock buybacks</td>
<td>Yes or No</td>
<td>No</td>
<td>Yes=3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>3. Changing return on capital over time</td>
<td>Yes or No</td>
<td>Yes</td>
<td>Yes=5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>4. Unsustainably high return</td>
<td>Yes or No</td>
<td>No</td>
<td>Yes=5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cost of capital</td>
<td>1. Multiple businesses</td>
<td>Number of businesses (more than 10% of revenues) = 1</td>
<td>1.00</td>
<td>1</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Operations in emerging markets</td>
<td>Percent of revenues = 50%</td>
<td>5.00</td>
<td>2.5</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Is the debt market traded?</td>
<td>Yes or No</td>
<td>No</td>
<td>No=2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>4. Does the company have a rating?</td>
<td>Yes or No</td>
<td>Yes</td>
<td>No=2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>5. Does the company have off-balance sheet debt?</td>
<td>Yes or No</td>
<td>Yes</td>
<td>No=2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>No-operating assets</td>
<td>Minority holdings as percent of book assets</td>
<td>Minority holdings as percent of book assets = 0%</td>
<td>20.00</td>
<td>0</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Firm to Equity value</td>
<td>Consolidation of subsidiaries</td>
<td>Minority interest as percent of book value of equity = 63%</td>
<td>20.00</td>
<td>12.6</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td>Per share value</td>
<td>Shares with different voting rights</td>
<td>Does the firm have shares with different voting rights? Yes = 10</td>
<td>Yes</td>
<td>Yes</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Equity options outstanding</td>
<td>Options outstanding as percent of shares</td>
<td>Options outstanding as percent of shares = 0%</td>
<td>10.00</td>
<td>0</td>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Complexity Score =</td>
<td></td>
<td></td>
<td></td>
<td>48.95</td>
<td>90.55</td>
</tr>
</tbody>
</table>
Dealing with Complexity

In Discounted Cashflow Valuation

- The Aggressive Analyst: Trust the firm to tell the truth and value the firm based upon the firm’s statements about their value.
- The Conservative Analyst: Don’t value what you cannot see.
- The Compromise: Adjust the value for complexity
  - Adjust cash flows for complexity
  - Adjust the discount rate for complexity
  - Adjust the expected growth rate/length of growth period
  - Value the firm and then discount value for complexity

In relative valuation

In a relative valuation, you may be able to assess the price that the market is charging for complexity:

With the hundred largest market cap firms, for instance:

\[
PBV = 0.65 + 15.31 \text{ ROE} - 0.55 \text{ Beta} + 3.04 \text{ Expected growth rate} - 0.003 \text{ # Pages in 10K}
\]
5. The Value of Synergy

- Synergy can be valued. In fact, if you want to pay for it, it should be valued.

- To value synergy, you need to answer two questions:
  
  (a) What **form** is the synergy expected to take? Will it **reduce costs** as a percentage of sales and increase profit margins (as is the case when there are economies of scale)? Will it **increase future growth** (as is the case when there is increased market power)?

  (b) **When can the synergy be reasonably expected to start** affecting cashflows? (Will the gains from synergy show up instantaneously after the takeover? If it will take time, when can the gains be expected to start showing up? )

- If you cannot answer these questions, you need to go back to the drawing board...
Sources of Synergy

Synergy is created when two firms are combined and can be either financial or operating.

Operating Synergy accrues to the combined firm as:

- Strategic Advantages:
  - Higher returns on new investments
    - Higher ROC
    - Higher Growth Rate
  - Higher Reinvestment
    - Higher Growth Rate
  - More sustainable excess returns
    - Longer Growth Period

- Economies of Scale:
  - Cost Savings in current operations
    - Higher Margin
    - Higher Base-year EBIT

Financial Synergy:

- Tax Benefits:
  - Lower taxes on earnings due to:
    - higher depreciation
    - operating loss carryforwards

- Added Debt Capacity:
  - Higher debt ratio and lower cost of capital

- Diversification?
  - May reduce cost of equity for private or closely held firm
Valuing Synergy

(1) the firms involved in the merger are valued independently, by discounting expected cash flows to each firm at the weighted average cost of capital for that firm.

(2) the value of the combined firm, with no synergy, is obtained by adding the values obtained for each firm in the first step.

(3) The effects of synergy are built into expected growth rates and cashflows, and the combined firm is re-valued with synergy.

Value of Synergy = Value of the combined firm, with synergy - Value of the combined firm, without synergy
## Valuing Synergy: P&G + Gillette

<table>
<thead>
<tr>
<th></th>
<th>P&amp;G</th>
<th>Gillette</th>
<th>Piglet: No Synergy</th>
<th>Piglet: Synergy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free Cashflow to Equity</td>
<td>$5,864.74</td>
<td>$1,547.50</td>
<td>$7,412.24</td>
<td>$7,569.73</td>
</tr>
<tr>
<td>Annual operating expenses reduced by $250 million</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Growth rate for first 5 years</td>
<td>12%</td>
<td>10%</td>
<td>11.58%</td>
<td>12.50%</td>
</tr>
<tr>
<td>Slightly higher growth rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Growth rate after five years</td>
<td>4%</td>
<td>4%</td>
<td>4.00%</td>
<td>4.00%</td>
</tr>
<tr>
<td>Beta</td>
<td>0.90</td>
<td>0.80</td>
<td>0.88</td>
<td>0.88</td>
</tr>
<tr>
<td>Cost of Equity</td>
<td>7.90%</td>
<td>7.50%</td>
<td>7.81%</td>
<td>7.81%</td>
</tr>
<tr>
<td>Value of Equity</td>
<td>$221,292</td>
<td>$59,878</td>
<td>$281,170</td>
<td>$298,355</td>
</tr>
</tbody>
</table>

*Value of synergy*
6. Brand name, great management, superb product …
Are we short changing the intangibles?

- There is often a temptation to add on premiums for intangibles. Among them are
  - Brand name
  - Great management
  - Loyal workforce
  - Technological prowess

- There are two potential dangers:
  - For some assets, the value may already be in your value and adding a premium will be double counting.
  - For other assets, the value may be ignored but incorporating it will not be easy.
# Categorizing Intangibles

<table>
<thead>
<tr>
<th>Intangible Type</th>
<th>Description</th>
<th>Valuation Approach</th>
<th>Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent and Cash flow generating intangibles</td>
<td>Copyrights, trademarks, licenses, franchises, professional practices (medical, dental)</td>
<td>Estimate expected cashflows from the product or service and discount back at appropriate discount rate.</td>
<td>• Life is usually finite and terminal value may be small. • Cash flows and value may be person dependent (for professional practices)</td>
</tr>
<tr>
<td>Not independent and cash flow generating to the firm</td>
<td>Brand names, Quality and Morale of work force, Technological expertise, Corporate reputation</td>
<td>• Compare DCF value of firm with intangible with firm without (if you can find one) • Assume that all excess returns of firm are due to intangible. • Compare multiples at which firm trades to sector averages.</td>
<td>With multiple intangibles (brand name and reputation for service), it becomes difficult to break down individual components.</td>
</tr>
<tr>
<td>No cash flows now but potential for cashflows in future</td>
<td>Undeveloped patents, operating or financial flexibility (to expand into new products/markets or abandon existing ones)</td>
<td>Option valuation • Value the undeveloped patent as an option to develop the underlying product. • Value expansion options as call options • Value abandonment options as put options.</td>
<td>• Need exclusivity. • Difficult to replicate and arbitrage (making option pricing models dicey)</td>
</tr>
</tbody>
</table>
## Valuing Brand Name

<table>
<thead>
<tr>
<th></th>
<th>Coca Cola</th>
<th>With Cott Margins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Revenues =</td>
<td>$21,962.00</td>
<td>$21,962.00</td>
</tr>
<tr>
<td>Length of high-growth period</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Reinvestment Rate =</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>Operating Margin (after-tax)</td>
<td>15.57%</td>
<td>5.28%</td>
</tr>
<tr>
<td>Sales/Capital (Turnover ratio)</td>
<td>1.34</td>
<td>1.34</td>
</tr>
<tr>
<td>Return on capital (after-tax)</td>
<td>20.84%</td>
<td>7.06%</td>
</tr>
<tr>
<td>Growth rate during period (g) =</td>
<td>10.42%</td>
<td>3.53%</td>
</tr>
<tr>
<td>Cost of Capital during period =</td>
<td>7.65%</td>
<td>7.65%</td>
</tr>
</tbody>
</table>

### Stable Growth Period

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth rate in steady state =</td>
<td>4.00%</td>
</tr>
<tr>
<td>Return on capital =</td>
<td>7.65%</td>
</tr>
<tr>
<td>Reinvestment Rate =</td>
<td>52.28%</td>
</tr>
<tr>
<td>Cost of Capital =</td>
<td>7.65%</td>
</tr>
<tr>
<td><strong>Value of Firm =</strong></td>
<td><strong>$79,611.25</strong></td>
</tr>
</tbody>
</table>
7. Be circumspect about defining debt for cost of capital purposes…

- **General Rule**: Debt generally has the following characteristics:
  - Commitment to make fixed payments in the future
  - The fixed payments are tax deductible
  - Failure to make the payments can lead to either default or loss of control of the firm to the party to whom payments are due.

- Defined as such, debt should include
  - All interest bearing liabilities, short term as well as long term
  - All leases, operating as well as capital

- Debt should not include
  - Accounts payable or supplier credit
For some firms that are in financial trouble, the book value of debt can be substantially higher than the market value of debt. Analysts worry that subtracting out the market value of debt in this case can yield too high a value for equity.

A discounted cashflow valuation is designed to value a going concern. In a going concern, it is the market value of debt that should count, even if it is much lower than book value.

In a liquidation valuation, you can subtract out the book value of debt from the liquidation value of the assets.

Converting book debt into market debt,...,
But you should consider other potential liabilities when getting to equity value

- If you have under funded pension fund or health care plans, you should consider the under funding at this stage in getting to the value of equity.
  - If you do so, you should not double count by also including a cash flow line item reflecting cash you would need to set aside to meet the unfunded obligation.
  - You should not be counting these items as debt in your cost of capital calculations.…

- If you have contingent liabilities - for example, a potential liability from a lawsuit that has not been decided - you should consider the expected value of these contingent liabilities
  - Value of contingent liability = Probability that the liability will occur * Expected value of liability
8. The Value of Control

- The value of the control premium that will be paid to acquire a block of equity will depend upon two factors -
  - **Probability that control of firm will change**: This refers to the probability that incumbent management will be replaced. This can be either through acquisition or through existing stockholders exercising their muscle.
  - **Value of Gaining Control of the Company**: The value of gaining control of a company arises from two sources - the increase in value that can be wrought by changes in the way the company is managed and run, and the side benefits and perquisites of being in control.

\[
\text{Value of Gaining Control} = \text{Present Value (Value of Company with change in control - Value of company without change in control)} + \text{Side Benefits of Control}
\]
Current Cashflow to Firm

\[ \text{EBIT}(1-t): \quad 436 \text{ HRK} \]
- \[ \text{Nt CpX}: \quad 3 \text{ HRK} \]
- \[ \text{Chg WC}: \quad -118 \text{ HRK} \]
= \[ \text{FCFF}: \quad 551 \text{ HRK} \]

Reinv Rate = \( (3-118)/436 = -26.35\% \)
Tax rate = 17.35\%
Return on capital = 8.72\%

Expected Growth from new inv.
\[ 7083 \times 0.969 = 0.0686 \text{ or } 6.86\% \]

Return on Capital = 9.69\%

Terminal Value 5 = \[ \frac{365}{0.0992 - 0.04} = 6170 \text{ HRK} \]

Discount at $ Cost of Capital (WACC) = 10.7\% \times 0.974 + 5.40\% \times 0.026 = 10.55\%

Riskfree Rate: HRK Riskfree Rate = 4.25\%

\( \text{Beta} \times \text{Mature market premium} + \text{Country Default Spread} \times \text{Rel Equity Mkt Vol} \)

On May 1, 2010
AG Pfd price = 279 HRK
AG Common = 345 HRK

Aswath Damodaran
Adris Grupa: 4/2010 (Restructured)

**Current Cashflow to Firm**

- EBIT(1-t): 436 HRK
- Net CapX: 3 HRK
- Chg WC: -118 HRK
- FCFF: 551 HRK

Reinvest Rate = \( \frac{(3 - 118)}{436} = -26.35\% \)

Tax rate = 17.35%

Return on capital = 8.72%

**Expected Growth from new inv.**

\( \text{Reinvestment Rate} = 70.83\% \)

Expected growth = 0.7083 * 0.01054 = 0.0742 or 7.42%

**Stable Growth**

- \( g = 4\% \)
- Beta = 0.80
- Country Premium = 2%
- Cost of capital = 9.65%
- Tax rate = 20.00%
- ROC = 9.94%
- Reinvestment Rate = \( g / ROIC \)

\( = \frac{4}{9.94} = 0.41 \)

**Terminal Value**

\( \text{TV} = \frac{367}{0.0965 - 0.04} = 6508 \) HRK

**Discount at $ Cost of Capital (WACC) = 11.12\% * (0.90) + 8.20\% (0.10) = 10.55\%**

**Cost of Equity**

11.12%

**Cost of Debt**

\( (4.25\% + 4\% + 2\%) (1 - 0.20) = 8.20\% \)

**Weights**

\( E = 90\% \)

\( D = 10\% \)

**Riskfree Rate**

HRK Riskfree Rate = 4.25%

**Beta**

0.75

**Mature market premium**

4.5%

\( \text{Lambda} = 0.68 \)

\( \text{CRP for Croatia} = 3\% \)

\( \text{Lambda} = 0.42 \)

\( \text{CRP for Central Europe} = 3\% \)

\( \text{Country Default Spread} = 2\% \)

\( \text{Rel Equity Mkt Vol} = 1.50 \)

On May 1, 2010

AG Pfd price = 279 HRK

AG Common = 345 HRK

Average from 2004-09

70.83%
The value of control at Adris Grupa can be computed as the difference between the status quo value and the optimal value.

The value of a voting share derives entirely from the capacity you have to change the way the firm is run. In this case, we have two values for Adris Grupa’s Equity.

Status Quo Value of Equity = 5,469 million HKR
All shareholders, common and preferred, get an equal share of the status quo value.

Value for a non-voting share = 5469/(9.616+6.748) = 334 HKR/share

Optimal value of Equity = 5,735 million HKR

Value of control at Adris Grupa = 5,735 – 5469 = 266 million HKR

Only voting shares get a share of this value of control

Value per voting share = 334 HKR + 266/9.616 = 362 HKR
Traditional valuation techniques are built on the assumption of a going concern, i.e., a firm that has continuing operations and there is no significant threat to these operations.

- In discounted cashflow valuation, this going concern assumption finds its place most prominently in the terminal value calculation, which usually is based upon an infinite life and ever-growing cashflows.
- In relative valuation, this going concern assumption often shows up implicitly because a firm is valued based upon how other firms - most of which are healthy - are priced by the market today.

When there is a significant likelihood of truncation risk (i.e., that the firm will cease to exist or that your equity position will be extinguished), the going concern assumption will over value a firm.
Examples of truncation risk

- **Acts of god**: For much of recorded time, at least prior to insurance, the biggest risk to businesses came from acts of god – storms, earthquakes etc.
- **Terrorism & War**: An otherwise healthy business can be devastated by an act of terrorism or in the event of war.
- **Nationalization**: In some countries, successful businesses can be targeted by governments for nationalization, with equity investors getting well below fair value in compensation.
- **Default/Distress/Failute**: If a business is unable to generate enough cash flows from operations and/or to raise money from external sources to keep going, the “gig” is up.
Three ways of dealing with truncation risk

1. **Adjust the expected cash flows:** You can adjust the expected cash flows for the likelihood and consequences of catastrophic risk. Note that this will get progressively more difficult to do as you move through time, since you have consider the cumulative probabilities of events happening over long periods.

2. **Adjust the discount rate:** You can “hike” up the discount rate to cover the likelihood of failure. While it has the desired “intuitive” effect, the “increased” discount rate is often arbitrary and becomes a negotiating tool rather than a measure of expected return.

3. **Put a decision tree front on the analysis:**
   a. In one branch of the tree, assume that the “truncation” risk will not occur and value the firm using conventional DCF valuation.
   b. In the other branch, assume that truncation risk occurs and value the business/equity if it does.
   c. Estimate an expected value across both branches.
10. Equity to Employees: Effect on Value

- In recent years, firms have turned to giving employees (and especially top managers) equity option packages as part of compensation. These options are usually
  - Long term
  - At-the-money when issued
  - On volatile stocks

- Are they worth money? And if yes, who is paying for them?

- Two key issues with employee options:
  - How do options granted in the past affect equity value per share today?
  - How do expected future option grants affect equity value today?
Equity Options and Value

- Options outstanding
  - Step 1: List all options outstanding, with maturity, exercise price and vesting status.
  - Step 2: Value the options, taking into account dilution, vesting and early exercise considerations.
  - Step 3: Subtract from the value of equity and divide by the actual number of shares outstanding (not diluted or partially diluted).

- Expected future option and restricted stock issues
  - Step 1: Forecast value of options that will be granted each year as percent of revenues that year. (As firm gets larger, this should decrease)
  - Step 2: Treat as operating expense and reduce operating income and cash flows.
  - Step 3: Take present value of cashflows to value operations or equity.
IV. The Dark Side of Valuation: Valuing difficult-to-value companies
The fundamental determinants of value…

What are the cashflows from existing assets?
- Equity: Cashflows after debt payments
- Firm: Cashflows before debt payments

What is the value added by growth assets?
Equity: Growth in equity earnings/cashflows
Firm: Growth in operating earnings/cashflows

How risky are the cash flows from both existing assets and growth assets?
Equity: Risk in equity in the company
Firm: Risk in the firm’s operations

When will the firm become a mature firm, and what are the potential roadblocks?
Valuing stable, money making companies with consistent and clear accounting statements, a long and stable history and lots of comparable firms is easy to do.

The true test of your valuation skills is when you have to value “difficult” companies. In particular, the challenges are greatest when valuing:

- Young companies, early in the life cycle, in young businesses
- Companies that don’t fit the accounting mold
- Companies that face substantial truncation risk (default or nationalization risk)
Difficult to value companies…

Across the life cycle:
- **Young, growth firms**: Limited history, small revenues in conjunction with big operating losses and a propensity for failure make these companies tough to value.
- **Mature companies in transition**: When mature companies change or are forced to change, history may have to be abandoned and parameters have to be reestimated.
- **Declining and Distressed firms**: A long but irrelevant history, declining markets, high debt loads and the likelihood of distress make them troublesome.

Across sectors
- **Financial service firms**: Opacity of financial statements and difficulties in estimating basic inputs leave us trusting managers to tell us what’s going on.
- **Commodity and cyclical firms**: Dependence of the underlying commodity prices or overall economic growth make these valuations susceptible to macro factors.
- **Firms with intangible assets**: Accounting principles are left to the wayside on these firms.

Across the ownership cycle
- **Privately owned businesses**: Exposure to firm specific risk and illiquidity bedevil valuations.
- **VC and private equity**: Different equity investors, with different perceptions of risk.
- **Closely held public firms**: Part private and part public, sharing the troubles of both.
I. The challenge with young companies…

Making judgments on revenues/profits difficult because you cannot draw on history. If you have no product/service, it is difficult to gauge market potential or profitability. The company’s entire value lies in future growth but you have little to base your estimate on.

Cash flows from existing assets non-existent or negative.

What are the cashflows from existing assets?

Different claims on cash flows can affect value of equity at each stage.

What is the value of equity in the firm?

Limited historical data on earnings, and no market prices for securities makes it difficult to assess risk.

How risky are the cash flows from both existing assets and growth assets?

What is the value added by growth assets?

When will the firm become a mature firm, and what are the potential roadblocks?

Will the firm make it through the gauntlet of market demand and competition. Even if it does, assessing when it will become mature is difficult because there is so little to go on.
Upping the ante.. Young companies in young businesses…

- When valuing a business, we generally draw on three sources of information
  - The firm’s current financial statement
    - 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?
    - Susceptibility to macro-economic factors (recessions and cyclical firms)
  - The industry and comparable firm data
    - What happens to firms as they mature? (Margins.. Revenue growth… Reinvestment needs… Risk)

- It is when valuing these companies that you find yourself tempted by the dark side, where
  - “Paradigm shifts” happen…
  - New metrics are invented …
  - The story dominates and the numbers lag…
9a. Amazon in January 2000

**Current Revenue** $1,117

**Current Margin:** -36.71%

**From previous years**

- Reinvestment: -410m
- NOL: 500 m

**Value of Op Assets** $14,910

+ Cash $26

- Value of Debt $349

= Value of Firm $14,936

- Value of Equity $14,587

- Equity Options $2,892

= Value of Equity $14,587

**Value per share** $34.32

All existing options valued as options, using current stock price of $84.

**Used average interest coverage ratio over next 5 years to get BBB rating.**

**Cost of Debt** 6.5% + 1.5% = 8.0%

**Tax rate = 0% -> 35%**

**Cost of Capital**

<table>
<thead>
<tr>
<th>Year</th>
<th>Cost of Equity</th>
<th>Cost of Debt</th>
<th>AT cost of debt</th>
<th>Cost of Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12.90%</td>
<td>6.00%</td>
<td>8.00%</td>
<td>12.84%</td>
</tr>
<tr>
<td>2</td>
<td>12.90%</td>
<td>6.00%</td>
<td>8.00%</td>
<td>12.84%</td>
</tr>
<tr>
<td>3</td>
<td>12.90%</td>
<td>6.00%</td>
<td>8.00%</td>
<td>12.84%</td>
</tr>
<tr>
<td>4</td>
<td>12.90%</td>
<td>6.00%</td>
<td>8.00%</td>
<td>12.84%</td>
</tr>
<tr>
<td>5</td>
<td>12.90%</td>
<td>6.00%</td>
<td>8.00%</td>
<td>12.84%</td>
</tr>
<tr>
<td>6</td>
<td>12.42%</td>
<td>7.80%</td>
<td>10.00%</td>
<td>12.84%</td>
</tr>
<tr>
<td>7</td>
<td>12.30%</td>
<td>7.75%</td>
<td>9.75%</td>
<td>12.84%</td>
</tr>
<tr>
<td>8</td>
<td>12.10%</td>
<td>7.67%</td>
<td>9.50%</td>
<td>12.84%</td>
</tr>
<tr>
<td>9</td>
<td>11.70%</td>
<td>7.50%</td>
<td>9.00%</td>
<td>12.84%</td>
</tr>
<tr>
<td>10</td>
<td>10.50%</td>
<td>7.00%</td>
<td>8.50%</td>
<td>12.84%</td>
</tr>
</tbody>
</table>

**Used average interest coverage ratio over next 5 years to get BBB rating.**

**Sales Turnover Ratio:** 3.00

**Revenue Growth:** 42%

**Expected Margin:** -> 10.00%

**Sales to capital ratio and expected margin are retail industry average numbers**

**Sales Growth** 42%

**Expected Margin** -> 10.00%

**Competitive Advantages**

- Internet/Retail
- Operating Leverage
- Current D/E: 1.21%
- Base Equity Premium
- Country Risk Premium

**Riskfree Rate:** T. Bond rate = 6.5%

**Beta** 1.60 -> 1.00

**Risk Premium** 4%

Amazon was trading at $84 in January 2000.

**Pushed debt ratio to retail industry average of 15%.”**
Lesson 1: Don’t trust regression betas….
Lesson 2: Work backwards and keep it simple…

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenues</th>
<th>Operating Margin</th>
<th>EBIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tr12m</td>
<td>$1,117</td>
<td>-36.71%</td>
<td>-$410</td>
</tr>
<tr>
<td>1</td>
<td>$2,793</td>
<td>-13.35%</td>
<td>-$373</td>
</tr>
<tr>
<td>2</td>
<td>$5,585</td>
<td>-1.68%</td>
<td>-$94</td>
</tr>
<tr>
<td>3</td>
<td>$9,774</td>
<td>4.16%</td>
<td>$407</td>
</tr>
<tr>
<td>4</td>
<td>$14,661</td>
<td>7.08%</td>
<td>$1,038</td>
</tr>
<tr>
<td>5</td>
<td>$19,059</td>
<td>8.54%</td>
<td>$1,628</td>
</tr>
<tr>
<td>6</td>
<td>$23,862</td>
<td>9.27%</td>
<td>$2,212</td>
</tr>
<tr>
<td>7</td>
<td>$28,729</td>
<td>9.64%</td>
<td>$2,768</td>
</tr>
<tr>
<td>8</td>
<td>$33,211</td>
<td>9.82%</td>
<td>$3,261</td>
</tr>
<tr>
<td>9</td>
<td>$36,798</td>
<td>9.91%</td>
<td>$3,646</td>
</tr>
<tr>
<td>10</td>
<td>$39,006</td>
<td>9.95%</td>
<td>$3,883</td>
</tr>
<tr>
<td>TY(11)</td>
<td>$41,346</td>
<td>10.00%</td>
<td>$4,135 Industry</td>
</tr>
</tbody>
</table>

Average
Lesson 3: Scaling up is hard to do…

Typically, the revenue growth rate of a newly public company outpaces its industry average for only about five years.

Source: Andrew Metrick

The New York Times
Lesson 4: Don’t forget to pay for growth… and check your reinvestment…

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenue Growth</th>
<th>Yearly Revenue</th>
<th>Chg in Revenue</th>
<th>Reinvestment</th>
<th>Chg Rev/ Chg Reinvestment</th>
<th>ROC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>150.00%</td>
<td>150.00%</td>
<td>$1,676</td>
<td>$559</td>
<td>3.00</td>
<td>-76.62%</td>
</tr>
<tr>
<td>2</td>
<td>100.00%</td>
<td>200.00%</td>
<td>$2,793</td>
<td>$931</td>
<td>3.00</td>
<td>-8.96%</td>
</tr>
<tr>
<td>3</td>
<td>75.00%</td>
<td>150.00%</td>
<td>$4,189</td>
<td>$1,396</td>
<td>3.00</td>
<td>20.59%</td>
</tr>
<tr>
<td>4</td>
<td>50.00%</td>
<td>100.00%</td>
<td>$4,887</td>
<td>$1,629</td>
<td>3.00</td>
<td>25.82%</td>
</tr>
<tr>
<td>5</td>
<td>30.00%</td>
<td>75.00%</td>
<td>$4,398</td>
<td>$1,466</td>
<td>3.00</td>
<td>21.16%</td>
</tr>
<tr>
<td>6</td>
<td>25.20%</td>
<td>50.00%</td>
<td>$4,803</td>
<td>$1,601</td>
<td>3.00</td>
<td>22.23%</td>
</tr>
<tr>
<td>7</td>
<td>20.40%</td>
<td>25.20%</td>
<td>$4,868</td>
<td>$1,623</td>
<td>3.00</td>
<td>22.30%</td>
</tr>
<tr>
<td>8</td>
<td>15.60%</td>
<td>20.40%</td>
<td>$4,482</td>
<td>$1,494</td>
<td>3.00</td>
<td>21.87%</td>
</tr>
<tr>
<td>9</td>
<td>10.80%</td>
<td>15.60%</td>
<td>$3,587</td>
<td>$1,196</td>
<td>3.00</td>
<td>21.19%</td>
</tr>
<tr>
<td>10</td>
<td>6.00%</td>
<td>10.80%</td>
<td>$2,208</td>
<td>$736</td>
<td>3.00</td>
<td>20.39%</td>
</tr>
</tbody>
</table>
Lesson 5: There are always scenarios where the market price can be justified...

<table>
<thead>
<tr>
<th></th>
<th>6%</th>
<th>8%</th>
<th>10%</th>
<th>12%</th>
<th>14%</th>
</tr>
</thead>
<tbody>
<tr>
<td>30%</td>
<td>$ (1.94)</td>
<td>$ 2.95</td>
<td>$ 7.84</td>
<td>$ 12.71</td>
<td>$ 17.57</td>
</tr>
<tr>
<td>35%</td>
<td>$ 1.41</td>
<td>$ 8.37</td>
<td>$ 15.33</td>
<td>$ 22.27</td>
<td>$ 29.21</td>
</tr>
<tr>
<td>40%</td>
<td>$ 6.10</td>
<td>$ 15.93</td>
<td>$ 25.74</td>
<td>$ 35.54</td>
<td>$ 45.34</td>
</tr>
<tr>
<td>45%</td>
<td>$ 12.59</td>
<td>$ 26.34</td>
<td>$ 40.05</td>
<td>$ 53.77</td>
<td>$ 67.48</td>
</tr>
<tr>
<td>50%</td>
<td>$ 21.47</td>
<td>$ 40.50</td>
<td>$ 59.52</td>
<td>$ 78.53</td>
<td>$ 97.54</td>
</tr>
<tr>
<td>55%</td>
<td>$ 33.47</td>
<td>$ 59.60</td>
<td>$ 85.72</td>
<td>$ 111.84</td>
<td>$ 137.95</td>
</tr>
<tr>
<td>60%</td>
<td>$ 49.53</td>
<td>$ 85.10</td>
<td>$ 120.66</td>
<td>$ 156.22</td>
<td>$ 191.77</td>
</tr>
</tbody>
</table>
Lesson 6: Don’t forget to mop up…

- **Watch out for “other” equity claims:** If you buy equity in a young, growth company, watch out for other (often hidden) claims on the equity that don’t take the form of common shares. In particular, watch for options granted to managers, employees, venture capitalists and others (you will be surprised…).
  - Value these options as options (not at exercise value)
  - Take into consideration expectations of future option grants when computing expected future earnings/cash flows.

- **Not all shares are equal:** If there are differences in cash flow claims (dividends or liquidation) or voting rights across shares, value these differences.
  - Voting rights matter even at well run companies
Lesson 7: You will be wrong 100% of the time… and it really is not (always) your fault…

- No matter how careful you are in getting your inputs and how well structured your model is, your estimate of value will change both as new information comes out about the company, the business and the economy.
- As information comes out, you will have to adjust and adapt your model to reflect the information. Rather than be defensive about the resulting changes in value, recognize that this is the essence of risk.
- **A test:** If your valuations are unbiased, you should find yourself increasing estimated values as often as you are decreasing values. In other words, there should be equal doses of good and bad news affecting valuations (at least over time).
9b. Amazon in January 2001

Value of Op Assets: $8,789 + Cash & Non-op: $1,263 = Value of Firm: $10,052
Value of Debt: $1,879 = Value of Equity: $8,173
Equity Options: $845

Value per share: $20.83

Reinvestment:
- Cap ex includes acquisitions
- Working capital is 3% of revenues

Sales Turnover Ratio: 3.02

Beta: 2.18 -> 1.10

Riskfree Rate: T. Bond rate = 5.1%

Risk Premium: 4%

Internet/Retail
Operating Leverage
Current D/E: 37.5%

Base Equity Premium
Country Risk Premium

Cost of Equity: 13.81%
Cost of Debt: 6.5% + 3.5% = 10.0%
Tax rate: 0% -> 35%

Cost of Capital: 12.77% -> 15.00%

Debt Ratio: 27.27% 27.27% 27.27% 27.27% 27.27% 24.81% 24.20% 23.18% 21.13% 15.00%
Beta: 2.18 2.16 2.18 2.18 1.96 1.75 1.53 1.32 1.10
Cost of Equity: 13.81% 13.81% 13.81% 13.81% 12.95% 12.09% 11.22% 10.36% 9.50%
AT cost of debt: 10.00% 10.00% 10.00% 9.06% 6.11% 6.01% 5.85% 5.53% 4.55%
Cost of Capital: 12.77% 12.77% 12.77% 12.77% 12.52% 11.25% 10.62% 9.98% 9.34% 8.76%

Stable Growth
- Stable Revenue Growth: 5%
- Stable Operating Margin: 9.32%
- Stable ROC = 16.94%
- Reinvest 29.5% of EBIT(1-t)

Terminal Value: 1064/(0.0876-.05) = $28,310

Amazon.com January 2001
Stock price = $14
And the market is often “more wrong”....
An “option premium” for some young companies: The option to expand into a new product/market

- Firm will not expand in this section
- Expansion becomes attractive in this section

Diagram:
- Additional Investment to Expand
- PV of Cash Flows from Expansion
- Present Value of Expected Cash Flows on Expansion
An Example of an Expansion Option

- You have completed a DCF valuation of a small anti-virus software company, Secure Mail, and estimated a value of $115 million.
- Assume that there is the possibility that the company could use the customer base that it develops for the anti-virus software and the technology on which the software is based to create a database software program sometime in the next 5 years.
  - It will cost Secure Mail about $500 million to develop a new database program, if they decide to do it today.
  - Based upon the information you have now on the potential for a database program, the company can expect to generate about $40 million a year in after-tax cashflows for ten years. The cost of capital for private companies that provide database software is 12%.
  - The annualized standard deviation in firm value at publicly traded database companies is 50%.
  - The five-year treasury bond rate is 3%.
Valuing the Expansion Option

\[ S = \text{Value of entering the database software market} \]
\[ = \text{PV of } $40\text{ million for 10 years } @12% = $226\text{ million} \]
\[ K = \text{Exercise price} \]
\[ = \text{Cost of entering the database software market } = $ 500\text{ million} \]
\[ t = \text{Period over which you have the right to enter the market} \]
\[ = 5\text{ years} \]
\[ s = \text{Standard deviation of stock prices of database firms } = 50\% \]
\[ r = \text{Riskless rate } = 3\% \]

**Call Value** = $ 56 Million

- DCF valuation of the firm = $ 115 million
- Value of Option to Expand to Database market = $ 56 million
- Value of the company with option to expand = $ 171 million
A note of caution: Opportunities are not options…

Is the first investment necessary for the second investment?

Not necessary

A Zero competitive advantage on Second Investment

Pre-Requisit

An Exclusive Right to Second Investment

No option value

Option has no value

100% of option value

Option has high value

Second Investment has zero excess returns

Second investment has large sustainable excess return

Increasing competitive advantage/ barriers to entry
II. Mature Companies in transition..

- Mature companies are generally the easiest group to value. They have long, established histories that can be mined for inputs. They have investment policies that are set and capital structures that are stable, thus making valuation more grounded in past data.

- However, this stability in the numbers can mask real problems at the company. The company may be set in a process, where it invests more or less than it should and does not have the right financing mix. In effect, the policies are consistent, stable and bad.

- If you expect these companies to change or as is more often the case to have change thrust upon them,
The perils of valuing mature companies…

**Figure 7.1: Estimation Issues - Mature Companies**

- **Lots of historical data on earnings and cashflows.** Key questions remain if these numbers are volatile over time or if the existing assets are not being efficiently utilized.

- **What are the cashflows from existing assets?**

- **How risky are the cash flows from both existing assets and growth assets?**

- **What is the value added by growth assets?**

- **What is the value of equity in the firm?**

- **Equity claims can vary in voting rights and dividends.**

- **Operating risk should be stable, but the firm can change its financial leverage.** This can affect both the cost of equity and capital.

- **When will the firm become a mature firm, and what are the potential roadblocks?**

- **Maintaining excess returns or high growth for any length of time is difficult to do for a mature firm.**

Growth is usually not very high, but firms may still be generating healthy returns on investments, relative to cost of funding. Questions include how long they can generate these excess returns and with what growth rate in operations. Restructuring can change both inputs dramatically and some firms maintain high growth through acquisitions.
Hormel Foods: The Value of Control Changing

Hormel Foods sells packaged meat and other food products and has been in existence as a publicly traded company for almost 80 years. In 2008, the firm reported after-tax operating income of $315 million, reflecting a compounded growth of 5% over the previous 5 years.

The Status Quo

Run by existing management, with conservative reinvestment policies (reinvestment rate = 14.34% and debt ratio = 10.4%).

Anemic growth rate and short growth period, due to reinvestment policy

Low debt ratio affects cost of capital

<table>
<thead>
<tr>
<th>Year</th>
<th>Operating income after taxes</th>
<th>Expected growth rate</th>
<th>ROC</th>
<th>Reinvestment Rate</th>
<th>Reinvestment</th>
<th>FCFF</th>
<th>Cost of capital</th>
<th>Present Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trailing 12 months</td>
<td>$315</td>
<td>2.75%</td>
<td>14.34%</td>
<td>19.14%</td>
<td>$62</td>
<td>$262</td>
<td>6.79%</td>
<td>$245</td>
</tr>
<tr>
<td>1</td>
<td>$324</td>
<td>2.75%</td>
<td>14.34%</td>
<td>19.14%</td>
<td>$64</td>
<td>$269</td>
<td>6.79%</td>
<td>$236</td>
</tr>
<tr>
<td>2</td>
<td>$333</td>
<td>2.75%</td>
<td>14.34%</td>
<td>19.14%</td>
<td>$65</td>
<td>$276</td>
<td>6.79%</td>
<td>$227</td>
</tr>
<tr>
<td>3</td>
<td>$342</td>
<td>2.75%</td>
<td>14.34%</td>
<td>19.14%</td>
<td>$114</td>
<td>$4,840</td>
<td>7.23%</td>
<td>$3,974</td>
</tr>
<tr>
<td>Beyond</td>
<td>$350</td>
<td>2.35%</td>
<td>7.23%</td>
<td>32.52%</td>
<td>$114</td>
<td>$4,840</td>
<td>7.23%</td>
<td>$3,974</td>
</tr>
</tbody>
</table>

Value of operating assets: $4,682
(Add) Cash: $155
(Add) Cash: $491
(Add) Management Options: $53
Value of equity in common stock: $4,293
Value per share: $31.91

New and better management

More aggressive reinvestment which increases the reinvestment rate (to 40%) and length of growth (to 5 years), and higher debt ratio (20%).

Operating Restructuring

1. Expected growth rate = ROC * Reinvestment Rate
   Expected growth rate (status quo) = 14.34% * 19.14% = 2.75%
   Expected growth rate (optimal) = 14.00% * 40% = 5.60%
   ROC drops, reinvestment rises and growth goes up.

Financial Restructuring

2. Cost of capital = Cost of equity (1-Debt ratio) + Cost of debt (Debt ratio)
   Status quo = 7.33% (1-.104) + 3.60% (1-.40) (.104) = 6.79%
   Optimal = 7.75% (1-.20) + 3.60% (1-.40) (.20) = 6.63%
   Cost of equity rises but cost of capital drops.

Probability of management change = 10%
Expected value = $31.91 (.90) + $37.80 (.10) = $32.50
Lesson 1: Cost cutting and increased efficiency are easier accomplished on paper than in practice… and require commitment

<table>
<thead>
<tr>
<th>Exhibit 4: Top factors for meeting targets</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of respondents whose companies have met their cost reduction strategies, n = 178</td>
</tr>
</tbody>
</table>

**Top two factors most responsible for companies meeting cost targets or goals**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top-management support</td>
<td>44</td>
</tr>
<tr>
<td>Clear targets</td>
<td>39</td>
</tr>
<tr>
<td>Clear, well-planned approach</td>
<td>31</td>
</tr>
<tr>
<td>Necessary talent and capabilities in place</td>
<td>22</td>
</tr>
<tr>
<td>Sufficient accountability</td>
<td>19</td>
</tr>
<tr>
<td>Fact base necessary to make decisions</td>
<td>15</td>
</tr>
</tbody>
</table>

| Sufficient communication        | 8          |
| Less than expected impact of financial crisis | 7          |
| Sufficient investment in critical functional capabilities | 3          |
| Support from unions             | 3          |
| Necessary incentives in place   | 2          |
| Supportive regulations          | 0          |

1 Respondents who answered “don’t know” are not shown.
Lesson 2: Increasing growth is not always a value creating option... And it may destroy value at times...
Lesson 3: Financial leverage is a double-edged sword.


As debt ratio increases, equity becomes riskier (higher beta) and cost of equity goes up. (1)

As firm borrows more money, its ratings drop and cost of debt rises. (2)

Debt ratio is percent of overall market value of firm that comes from debt financing. (3)

At debt ratios > 80%, firm does not have enough operating income to cover interest expenses. Tax rate goes down to reflect lost tax benefits. (3)

As cost of capital drops, firm value rises (as operating cash flows remain unchanged). (3)

<table>
<thead>
<tr>
<th>Debt Ratio</th>
<th>Beta</th>
<th>Cost of Equity</th>
<th>Bond Rating</th>
<th>Interest Rate on Debt</th>
<th>Tax Rate</th>
<th>Cost of Debt (after-tax)</th>
<th>WACC</th>
<th>Firm Value (G)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>0.78</td>
<td>7.00%</td>
<td>AAA</td>
<td>3.60%</td>
<td>40.00%</td>
<td>2.16%</td>
<td>7.00%</td>
<td>$4,523</td>
</tr>
<tr>
<td>10%</td>
<td>0.83</td>
<td>7.31%</td>
<td>AAA</td>
<td>3.60%</td>
<td>40.00%</td>
<td>2.16%</td>
<td>6.80%</td>
<td>$4,665</td>
</tr>
<tr>
<td>10.39%</td>
<td>0.83</td>
<td>7.33%</td>
<td>AAA</td>
<td>3.60%</td>
<td>40.00%</td>
<td>2.16%</td>
<td>6.79%</td>
<td>$4,680</td>
</tr>
<tr>
<td>20%</td>
<td>0.89</td>
<td>7.70%</td>
<td>AAA</td>
<td>3.60%</td>
<td>40.00%</td>
<td>2.16%</td>
<td>6.59%</td>
<td>$4,815</td>
</tr>
<tr>
<td>30%</td>
<td>0.97</td>
<td>8.20%</td>
<td>A+</td>
<td>4.60%</td>
<td>40.00%</td>
<td>2.76%</td>
<td>6.57%</td>
<td>$4,834</td>
</tr>
<tr>
<td>40%</td>
<td>1.09</td>
<td>8.86%</td>
<td>A-</td>
<td>5.35%</td>
<td>40.00%</td>
<td>3.21%</td>
<td>6.60%</td>
<td>$4,808</td>
</tr>
<tr>
<td>50%</td>
<td>1.24</td>
<td>9.79%</td>
<td>B+</td>
<td>8.35%</td>
<td>40.00%</td>
<td>5.01%</td>
<td>7.40%</td>
<td>$4,271</td>
</tr>
<tr>
<td>60%</td>
<td>1.47</td>
<td>11.19%</td>
<td>B-</td>
<td>10.85%</td>
<td>40.00%</td>
<td>6.51%</td>
<td>8.38%</td>
<td>$3,757</td>
</tr>
<tr>
<td>70%</td>
<td>1.86</td>
<td>13.52%</td>
<td>CCC</td>
<td>12.35%</td>
<td>40.00%</td>
<td>7.41%</td>
<td>9.24%</td>
<td>$3,398</td>
</tr>
<tr>
<td>80%</td>
<td>2.79</td>
<td>18.53%</td>
<td>CC</td>
<td>14.35%</td>
<td>38.07%</td>
<td>8.89%</td>
<td>10.81%</td>
<td>$2,992</td>
</tr>
<tr>
<td>90%</td>
<td>5.39</td>
<td>34.70%</td>
<td>CC</td>
<td>14.35%</td>
<td>33.84%</td>
<td>9.49%</td>
<td>12.01%</td>
<td>$2,597</td>
</tr>
</tbody>
</table>
III. Dealing with decline and distress…

Historical data often reflects flat or declining revenues and falling margins. Investments often earn less than the cost of capital. Growth can be negative, as firm sheds assets and shrinks. As less profitable assets are shed, the firm’s remaining assets may improve in quality. Depending upon the risk of the assets being divested and the use of the proceeds from the divestiture (to pay dividends or retire debt), the risk in both the firm and its equity can change. There is a real chance, especially with high financial leverage, that the firm will not make it. If it is expected to survive as a going concern, it will be as a much smaller entity.

What are the cashflows from existing assets?

What is the value added by growth assets?

How risky are the cash flows from both existing assets and growth assets?

When will the firm become a mature firm, and what are the potential roadblocks?

Underfunded pension obligations and litigation claims can lower value of equity. Liquidation preferences can affect value of equity.

What is the value of equity in the firm?
a. Dealing with Decline

- In decline, firms often see declining revenues and lower margins, translating in negative expected growth over time.
- If these firms are run by good managers, they will not fight decline. Instead, they will adapt to it and shut down or sell investments that do not generate the cost of capital. This can translate into negative net capital expenditures (depreciation exceeds cap ex), declining working capital and an overall negative reinvestment rate. The best case scenario is that the firm can shed its bad assets, make itself a much smaller and healthier firm and then settle into long-term stable growth.
- As an investor, your worst case scenario is that these firms are run by managers in denial who continue to expand the firm by making bad investments (that generate lower returns than the cost of capital). These firms may be able to grow revenues and operating income but will destroy value along the way.
11. Sears Holdings: Status Quo

Current Cashflow to Firm
EBIT(1-t) : 1,183
- Nt CpX -18
- Chg WC - 67
= FCFF 1,268
Reinvestment Rate = -75/1183
= -7.19%
Return on capital = 4.99%

EBIT (1-t) $1,165 $1,147 $1,130 $1,113
- Reinvestment ($349) ($344) ($339) ($334)
FCFF $1,514 $1,492 $1,469 $1,447

Return on Capital
5%

Expected Growth in EBIT (1-t)
-.30*.05=-.015
-1.5%

Expected Growth
in EBIT (1-t)
-.30*.05=-.015
-1.5%

Stable Growth
g = 2%; Beta = 1.00;
Country Premium= 0%
Cost of capital = 7.13%
ROC= 7.13%; Tax rate=38%
Reinvestment Rate=28.05%

Terminal Value
4
= 868/(.0713-.02) = 16,921

Discount at Cost of Capital (WACC) = 9.58% (.566) + 4.80% (0.434) = 7.50%

On July 23, 2008,
Sears was trading at
$76.25 a share.
b. Dealing with the “downside” of Distress

- A DCF valuation values a firm as a going concern. If there is a significant likelihood of the firm failing before it reaches stable growth and if the assets will then be sold for a value less than the present value of the expected cashflows (a distress sale value), DCF valuations will understate the value of the firm.

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

- The distress sale value of equity is usually best estimated as a percent of book value (and this value will be lower if the economy is doing badly and there are other firms in the same business also in distress).
Adjusting the value of LVS for distress..

- In February 2009, LVS was rated B+ by S&P. Historically, 28.25% of B+ rated bonds default within 10 years. LVS has a 6.375% bond, maturing in February 2015 (7 years), trading at $529. If we discount the expected cash flows on the bond at the riskfree rate, we can back out the probability of distress from the bond price:

\[
529 = \sum_{t=1}^{7} \frac{63.75(1-\Pi_{\text{Distress}})^t}{(1.03)^t} + \frac{1000(1-\Pi_{\text{Distress}})^7}{(1.03)^7}
\]

- Solving for the probability of bankruptcy, we get:

\[
\pi_{\text{Distress}} = \text{Annual probability of default} = 13.54\%
\]

- Cumulative probability of surviving 10 years = \((1 - .1354)^{10} = 23.34\%\)
- Cumulative probability of distress over 10 years = \(1 - .2334 = .7666\) or 76.66%

- If LVS is becomes distressed:
  - Expected distress sale proceeds = $2,769 million < Face value of debt
  - Expected equity value/share = $0.00

- Expected value per share = $8.12 \((1 - .7666) + 0.00 \cdot .7666 = \$1.92\)
The “sunny” side of distress: Equity as a call option to liquidate the firm

Net Payoff on Equity

Value of firm

Face Value of Debt
Application to valuation: A simple example

- Assume that you have a firm whose assets are currently valued at $100 million and that the standard deviation in this asset value is 40%.
- Further, assume that the face value of debt is $80 million (It is zero coupon debt with 10 years left to maturity).
- If the ten-year treasury bond rate is 10%,
  - how much is the equity worth?
  - What should the interest rate on debt be?
The inputs

- Value of the underlying asset = $100 million
- Exercise price = $80 million
- Life of the option = 10 years
- Variance in the value of the underlying asset = 0.16
- Riskless rate = 10%

The output

- The Black-Scholes model provides the following value for the call:
  - $d_1 = 1.5994 \quad N(d_1) = 0.9451$
  - $d_2 = 0.3345 \quad N(d_2) = 0.6310$
- Value of the call = $100 \cdot 0.9451 - 80 \cdot \exp(-0.10)(10) \cdot 0.6310 = $75.94 million
- Value of the outstanding debt = $100 - $75.94 = $24.06 million
- Interest rate on debt = \(\left(\frac{80}{24.06}\right)^{\frac{1}{10}} - 1 = 12.77\%\)
Firm value drops..

- Assume now that a catastrophe wipes out half the value of this firm (the value drops to $50 million), while the face value of the debt remains at $80 million.

- The inputs
  - Value of the underlying asset = $S$ = Value of the firm = $50 million
  - All the other inputs remain unchanged

- The output
  - Based upon these inputs, the Black-Scholes model provides the following value for the call:
    - $d_1 = 1.0515$  \[ N(d_1) = 0.8534 \]
    - $d_2 = -0.2135$  \[ N(d_2) = 0.4155 \]
  - Value of the call = $50 \times 0.8534 - 80 \times e^{-0.10 \times 10} \times 0.4155 = $30.44 million
  - Value of the bond = $50 - $30.44 = $19.56 million
Equity value persists.. As firm value declines..

Value of Equity as Firm Value Changes

![Chart showing the relationship between firm value and equity value](Image)
Real World Approaches to Valuing Equity in Troubled Firms: Getting Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Estimation Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value of the Firm</td>
<td>• Cumulate market values of equity and debt (or)</td>
</tr>
<tr>
<td></td>
<td>• Value the <strong>assets in place</strong> using FCFF and WACC (or)</td>
</tr>
<tr>
<td></td>
<td>• Use cumulated market value of assets, if traded.</td>
</tr>
<tr>
<td>Variance in Firm Value</td>
<td>• If stocks and bonds are traded,</td>
</tr>
<tr>
<td></td>
<td>( \sigma^2_{\text{firm}} = w_e \sigma^2_e + w_d \sigma^2_d + 2 w_e w_d \rho_{ed} \sigma_e \sigma_d )</td>
</tr>
<tr>
<td></td>
<td>where ( \sigma^2_e = \text{variance in the stock price} )</td>
</tr>
<tr>
<td></td>
<td>( w_e = \text{MV weight of Equity} )</td>
</tr>
<tr>
<td></td>
<td>( \sigma^2_d = \text{the variance in the bond price} )</td>
</tr>
<tr>
<td></td>
<td>( w_d = \text{MV weight of debt} )</td>
</tr>
<tr>
<td></td>
<td>• If not traded, use variances of similarly rated bonds.</td>
</tr>
<tr>
<td></td>
<td>• Use average firm value variance from the industry in which company operates.</td>
</tr>
<tr>
<td>Value of the Debt</td>
<td>• If the debt is short term, you can use only the face or book value of the debt.</td>
</tr>
<tr>
<td></td>
<td>• If the debt is long term and coupon bearing, add the cumulated nominal value of</td>
</tr>
<tr>
<td></td>
<td>these coupons to the face value of the debt.</td>
</tr>
<tr>
<td>Maturity of the Debt</td>
<td>• Face value weighted duration of bonds outstanding (or)</td>
</tr>
<tr>
<td></td>
<td>• If not available, use weighted maturity</td>
</tr>
</tbody>
</table>
Valuing Equity as an option - Eurotunnel in early 1998

- Eurotunnel has been a financial disaster since its opening
  - In 1997, Eurotunnel had earnings before interest and taxes of -£56 million and net income of -£685 million
  - At the end of 1997, its book value of equity was -£117 million
- It had £8,865 million in face value of debt outstanding
  - The weighted average duration of this debt was 10.93 years

<table>
<thead>
<tr>
<th>Debt Type</th>
<th>Face Value</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short term</td>
<td>935</td>
<td>0.50</td>
</tr>
<tr>
<td>10 year</td>
<td>2435</td>
<td>6.7</td>
</tr>
<tr>
<td>20 year</td>
<td>3555</td>
<td>12.6</td>
</tr>
<tr>
<td>Longer</td>
<td>1940</td>
<td>18.2</td>
</tr>
<tr>
<td>Total</td>
<td>£8,865 mil</td>
<td>10.93 years</td>
</tr>
</tbody>
</table>
The value of the firm estimated using projected cashflows to the firm, discounted at the weighted average cost of capital was £2,312 million. This was based upon the following assumptions –

- Revenues will grow 5% a year in perpetuity.
- The COGS which is currently 85% of revenues will drop to 65% of revenues in yr 5 and stay at that level.
- Capital spending and depreciation will grow 5% a year in perpetuity.
- There are no working capital requirements.
- The debt ratio, which is currently 95.35%, will drop to 70% after year 5. The cost of debt is 10% in high growth period and 8% after that.
- The beta for the stock will be 1.10 for the next five years, and drop to 0.8 after the next 5 years.
- The long term bond rate is 6%.
Other Inputs

- The stock has been traded on the London Exchange, and the annualized std deviation based upon ln (prices) is 41%.
- There are Eurotunnel bonds, that have been traded; the annualized std deviation in ln(price) for the bonds is 17%.
  - The correlation between stock price and bond price changes has been 0.5. The proportion of debt in the capital structure during the period (1992-1996) was 85%.
  - Annualized variance in firm value
    \[
    = (0.15)^2 (0.41)^2 + (0.85)^2 (0.17)^2 + 2 (0.15) (0.85)(0.5)(0.41)(0.17) = 0.0335
    \]
- The 15-year bond rate is 6%. (I used a bond with a duration of roughly 11 years to match the life of my option)
Valuing Eurotunnel Equity and Debt

Inputs to Model
- Value of the underlying asset = $S$ = Value of the firm = £2,312 million
- Exercise price = $K$ = Face Value of outstanding debt = £8,865 million
- Life of the option = $t$ = Weighted average duration of debt = 10.93 years
- Variance in the value of the underlying asset = $\sigma^2$ = Variance in firm value = 0.0335
- Riskless rate = $r$ = Treasury bond rate corresponding to option life = 6%

Based upon these inputs, the Black-Scholes model provides the following value for the call:

\[
d_1 = -0.8337 \quad N(d_1) = 0.2023
\]
\[
d_2 = -1.4392 \quad N(d_2) = 0.0751
\]

Value of the call = 2312 (0.2023) - 8,865 exp\((-0.06)(10.93)(0.0751)\) = £122 million

Appropriate interest rate on debt = \((8865/2190)^{(1/10.93)}-1\) = 13.65%
IV. Valuing Financial Service Companies

Existing assets are usually financial assets or loans, often marked to market. Earnings do not provide much information on underlying risk.

What are the cashflows from existing assets?

Preferred stock is a significant source of capital.

What is the value added by growth assets?

Defining capital expenditures and working capital is a challenge. Growth can be strongly influenced by regulatory limits and constraints. Both the amount of new investments and the returns on these investments can change with regulatory changes.

How risky are the cash flows from both existing assets and growth assets?

For financial service firms, debt is raw material rather than a source of capital. It is not only tough to define but if defined broadly can result in high financial leverage, magnifying the impact of small operating risk changes on equity risk.

When will the firm become a mature firm, and what are the potential roadblocks?

In addition to all the normal constraints, financial service firms also have to worry about maintaining capital ratios that are acceptable to regulators. If they do not, they can be taken over and shut down.

What is the value of equity in the firm?

Preferred stock is a significant source of capital.
2b. Goldman Sachs: August 2008

**Rationale for model**
Why dividends? Because FCFE cannot be estimated
Why 3-stage? Because the firm is behaving (reinvesting, growing) like a firm with potential.

**Dividends**
- EPS = $16.77 *
- Payout Ratio 8.35%
- DPS = $1.40
  (Updated numbers for 2008 financial year ending 11/08)

**Retained Ratio = 91.65%**

**Expected Growth in first 5 years = 91.65% * 13.19% = 12.09%**

**Terminal Value = EPS10 * Payout/(r-g)**

- g = 4%: ROE = 10% (> Cost of equity)
- Beta = 1.20
- Payout = (1 - 4/10) = .60 or 60%

**Values of Equity per share = PV of Dividends & Terminal value = $222.49**

**Cost of Equity**
- 4.10% + 1.40 (4.5%) = 10.4%

**Discount at Cost of Equity**

- In August 2008, Goldman was trading at $169/share.

**Between years 6-10, as growth drops to 4%, payout ratio increases and cost of equity decreases.**

**Riskfree Rate:**
- Treasury bond rate 4.10%

**Beta**
- 1.40

**Risk Premium**
- 4.5%
  - Implied Equity Risk premium in 8/08

**Average beta for investment banks = 1.40**

**Mature Market**
- 4.5%

**Country Risk**
- 0%
Lesson 1: Financial service companies are opaque…

- With financial service firms, we enter into a Faustian bargain. They tell us very little about the quality of their assets (loans, for a bank, for instance are not broken down by default risk status) but we accept that in return for assets being marked to market (by accountants who presumably have access to the information that we don’t have).

- In addition, estimating cash flows for a financial service firm is difficult to do. So, we trust financial service firms to pay out their cash flows as dividends. Hence, the use of the dividend discount model.
Lesson 2: For financial service companies, book value matters…

- The book value of assets and equity is mostly irrelevant when valuing non-financial service companies. After all, the book value of equity is a historical figure and can be nonsensical. (The book value of equity can be negative and is so for more than a 1000 publicly traded US companies)

- With financial service firms, book value of equity is relevant for two reasons:
  - Since financial service firms mark to market, the book value is more likely to reflect what the firms own right now (rather than a historical value)
  - The regulatory capital ratios are based on book equity. Thus, a bank with negative or even low book equity will be shut down by the regulators.

- From a valuation perspective, it therefore makes sense to pay heed to book value. In fact, you can argue that reinvestment for a bank is the amount that it needs to add to book equity to sustain its growth ambitions and safety requirements:
  - FCFE = Net Income – Reinvestment in regulatory capital (book equity)
To estimate the FCFE for a bank, we redefine reinvestment as investment in regulatory capital. Since any dividends paid deplete equity capital and retained earnings increase that capital, the FCFE is:

\[
\text{FCFE}_{\text{Bank}} = \text{Net Income} - \text{Increase in Regulatory Capital (Book Equity)}
\]
2d. Deutsche Bank: March 2009

### Last 2 years
- **2007**
  - Net Income: 3,954 m
  - Dividends: 2,146 m
  - Risk adjusted assets: 312,882 m
  - Book Equity: 31,914 m
- **2008**
  - Net Income: -3,855 m
  - Dividends: 285 m
  - Risk adjusted assets: 312,882 m
  - Book Equity: 31,914 m

### Normalized Net Income
- for base year 3,000 m
- Normalized ROE: 9.4%

### Expected Growth in Asset Base
- G: 3%
- Beta: 1.00
- Cost of equity: 10.20%
- Return on equity: 10.20%
- Reinvestment Rate = g/ROE = 3/10.20% = 29.41%

### Target capital ratio
- 10%

### Target ROE
- 10.2%

### Cashflows
- Terminal Value = $2,823 / (0.102 - 0.03) = $39,209 m

### PV of CF = 31,383 m
- # shares = 581.85
- Value/Share = 53.94 €

### Discount at Cost of equity = 3.60% + 1.162 * 6% + 0.60% = 11.172%

### Riskfree Rate:
- Euro Riskfree Rate: 3.6%
- Beta: 1.162
- Mature market premium: 6%

### Region
- Lambda
- CRP
- Western Europe: 0.68
- United States: 0.42
- Latin America: 0.01
- Africa & Middle East: 0.01
- Asia: 0.11
- Eastern Europe: 0.04
- Deutsche Bank: 0.60

In March 2009
- Deutsche Bank price = 48 Euros/share (down from 89 Euros in early 2008)
V. Valuing Companies with “intangible” assets

- What are the cashflows from existing assets?
- What is the value added by growth assets?
- How risky are the cashflows from both existing assets and growth assets?
- When will the firm become a mature firm, and what are the potential roadblocks?

The capital expenditures associated with acquiring intangible assets (technology, human capital) are mis-categorized as operating expenses, leading to incorrect accounting earnings and measures of operating expenses, it becomes very difficult to assess how much a firm is reinvesting for future growth and how well its investments are doing.

It can be more difficult to borrow against intangible assets than it is against tangible assets. The risk in operations can change depending upon how stable the intangible asset is.

Intangible assets such as brand name and customer loyalty can last for very long periods or dissipate overnight.
Lesson 1: Accounting rules are cluttered with inconsistencies…

- If we start with accounting first principles, capital expenditures are expenditures designed to create benefits over many periods. They should not be used to reduce operating income in the period that they are made, but should be depreciated/amortized over their life. They should show up as assets on the balance sheet.

- Accounting is consistent in its treatment of cap ex with manufacturing firms, but is inconsistent with firms that do not fit the mold.
  - With pharmaceutical and technology firms, R&D is the ultimate cap ex but is treated as an operating expense.
  - With consulting firms and other firms dependent on human capital, recruiting and training expenses are your long term investments that are treated as operating expenses.
  - With brand name consumer product companies, a portion of the advertising expense is to build up brand name and is the real capital expenditure. It is treated as an operating expense.
Step 1: Determining an amortizable life for R & D expenses
How long will it take, on an expected basis, for research to pay off at Amgen? Given the length of the approval process for new drugs by the Food and Drugs Administration, we will assume that this amortizable life is 10 years.

Step 2: Capitalize historical R&D expense

<table>
<thead>
<tr>
<th>Year</th>
<th>R&amp;D Expense</th>
<th>Unamortized portion</th>
<th>Amortization this year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>3030.00</td>
<td>1.00</td>
<td>3030.00</td>
</tr>
<tr>
<td>-1</td>
<td>3266.00</td>
<td>0.90</td>
<td>2939.40</td>
</tr>
<tr>
<td>-2</td>
<td>3366.00</td>
<td>0.80</td>
<td>2692.80</td>
</tr>
<tr>
<td>-3</td>
<td>2314.00</td>
<td>0.70</td>
<td>1619.80</td>
</tr>
<tr>
<td>-4</td>
<td>2028.00</td>
<td>0.60</td>
<td>1216.80</td>
</tr>
<tr>
<td>-5</td>
<td>1655.00</td>
<td>0.50</td>
<td>827.50</td>
</tr>
<tr>
<td>-6</td>
<td>1117.00</td>
<td>0.40</td>
<td>446.80</td>
</tr>
<tr>
<td>-7</td>
<td>864.00</td>
<td>0.30</td>
<td>259.20</td>
</tr>
<tr>
<td>-8</td>
<td>845.00</td>
<td>0.20</td>
<td>169.00</td>
</tr>
<tr>
<td>-9</td>
<td>823.00</td>
<td>0.10</td>
<td>82.30</td>
</tr>
<tr>
<td>-10</td>
<td>663.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>$13283.60</td>
<td></td>
<td>$1694.10</td>
</tr>
</tbody>
</table>

Current year’s R&D expense = Cap ex = $3,030 million
R&D amortization = Depreciation = $1,694 million
Unamortized R&D = Capital invested (R&D) = $13,284 million

Step 3: Restate earnings, book value and return numbers

<table>
<thead>
<tr>
<th></th>
<th>Unadjusted</th>
<th>Adjusted for R&amp;D</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Income</td>
<td>$4,196</td>
<td>4,196 + 3030 − 1694 = $ 5,532</td>
<td>Add current year’s R&amp;D and subtract R&amp;D amortization</td>
</tr>
<tr>
<td>Book value of equity</td>
<td>$17,869</td>
<td>17,869 + 13,284 = $ 31,153</td>
<td>Add unamortized R&amp;D from prior years</td>
</tr>
<tr>
<td>Return on Equity</td>
<td>( \frac{4196}{17869} \approx 23.48% )</td>
<td>( \frac{5532}{31153} \approx 17.75% )</td>
<td>Return on equity drops when book equity is augmented by R&amp;D, even though net income rises.</td>
</tr>
<tr>
<td>Pre-tax Operating Income</td>
<td>$5,594</td>
<td>$5,594 + 3030 − 1694 = $ 6,930</td>
<td>Add current year’s R&amp;D and subtract R&amp;D amortization</td>
</tr>
<tr>
<td>Book value of invested capital</td>
<td>$21,985</td>
<td>$21,985 + 13,284 = $ 35,269</td>
<td>Add unamortized R&amp;D from prior years</td>
</tr>
<tr>
<td>Pre-tax Return on Capital</td>
<td>( \frac{5594}{21985} \approx 25.44% )</td>
<td>( \frac{6930}{35269} \approx 19.65% )</td>
<td>Return on capital drops when capital is augmented by R&amp;D, even though operating income rises.</td>
</tr>
</tbody>
</table>
Lesson 2: And fixing those inconsistencies can alter your view of a company and affect its value

<table>
<thead>
<tr>
<th></th>
<th>No R&amp;D adjustment</th>
<th>R&amp;D adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBIT</td>
<td>$5,071</td>
<td>$7,336</td>
</tr>
<tr>
<td>Invested Capital</td>
<td>$25,277</td>
<td>$33,173</td>
</tr>
<tr>
<td>ROIC</td>
<td>14.58%</td>
<td>18.26%</td>
</tr>
<tr>
<td>Reinvestment Rate</td>
<td>115.68%</td>
<td>106.98%</td>
</tr>
<tr>
<td>Value of firm</td>
<td>$58,617</td>
<td>$95,497</td>
</tr>
<tr>
<td>Value of equity</td>
<td>$50,346</td>
<td>$87,226</td>
</tr>
<tr>
<td>Value/share</td>
<td>$42.73</td>
<td>$74.33</td>
</tr>
</tbody>
</table>
VI. Valuing cyclical and commodity companies

Company growth often comes from movements in the economic cycle, for cyclical firms, or commodity prices, for commodity companies.

What are the cashflows from existing assets?

What is the value added by growth assets?

How risky are the cash flows from both existing assets and growth assets?

When will the firm become a mature firm, and what are the potential roadblocks?

Historical revenue and earnings data are volatile, as the economic cycle and commodity prices change.

Primary risk is from the economy for cyclical firms and from commodity price movements for commodity companies. These risks can stay dormant for long periods of apparent prosperity.

For commodity companies, the fact that there are only finite amounts of the commodity may put a limit on growth forever. For cyclical firms, there is the peril that the next recession may put an end to the firm.
Valuing a Cyclical Company - Toyota in Early 2009

As a cyclical company, Toyota's earnings have been volatile and 2009 earnings reflect the troubled global economy. We will assume that when economic growth returns, the operating margin for Toyota will revert back to the historical average.

Normalized Earnings

Normalized Operating Income = Revenues in 2009 * Average Operating Margin (98--09)

Normalized Operating Income = 22,661 * .0733 = 1,660.7 billion yen

Normalized Cost of capital

The cost of capital is computed using the average beta of automobile companies (1.10), and Toyota's cost of debt (3.25%) and debt ratio (52.9% debt ratio). We use the Japanese marginal tax rate of 40.7% for computing both the after-tax cost of debt and the after-tax operating income.

Cost of capital = 8.65% (.471) + 3.25% (1-.407) (.529) = 5.09%

Stable Growth

Once earnings are normalized, we assume that Toyota, as the largest market-share company, will be able to maintain only stable growth (1.5% in Yen terms)

Operating Assets 19,640
+ Cash 2,288
+ Non-operating assets 6,845
- Debt 11,862
- Minority Interests 583
Value of Equity / No of shares = 3,448
Value per share ¥ 4,735

In early 2009, Toyota Motors had the highest market share in the sector. However, the global economic recession in 2008-09 had pulled earnings down.
Valuing a commodity company - Exxon in Early 2009

Regressing Exxon’s operating income against the oil price per barrel from 1985-2008:

\[
\text{Operating Income} = -6,395 + 911.32 \times \text{(Average Oil Price)}
\]

\[R^2 = 90.2\%
\]

Exxon Mobil's operating income increases about $9.11 billion for every $10 increase in the price per barrel of oil and 90% of the variation in Exxon's earnings over time comes from movements in oil prices.

**Estimate normalized income based on current oil price**

At the time of the valuation, the oil price was $45 a barrel. Exxon’s operating income based on this price is:

Normalized Operating Income = $-6,395 + 911.32 \times ($45) = $34,614

**Estimate return on capital and reinvestment rate based on normalized income**

This operating income translates into a return on capital of approximately 21% and a reinvestment rate of 9.52%, based upon a 2% growth rate.

Reinvestment Rate = \( g / \text{ROC} = 2 / 21\% = 9.52\% \)

**Exxon’s cost of capital**

Exxon has been a predominantly equitied funded company, and is expected to remain so, with a debt ratio of only 2.85%. It’s cost of equity is 8.35% (based on a beta of 0.90) and its pre-tax cost of debt is 3.75% (given AAA rating). The marginal tax rate is 38%.

Cost of capital = 8.35% \((.9715)\) + 3.75% \((1-.38) (.0285)\) = 8.18%.

**Expected growth in operating income**

Since Exxon Mobile is the largest oil company in the world, we will assume an expected growth of only 2% in perpetuity.
Lesson 1: With “macro” companies, it is easy to get lost in “macro” assumptions…

- With cyclical and commodity companies, it is undeniable that the value you arrive at will be affected by your views on the economy or the price of the commodity.
- Consequently, you will feel the urge to take a stand on these macro variables and build them into your valuation. Doing so, though, will create valuations that are jointly impacted by your views on macro variables and your views on the company, and it is difficult to separate the two.
- The best (though not easiest) thing to do is to separate your macro views from your micro views. Use current market based numbers for your valuation, but then provide a separate assessment of what you think about those market numbers.
Lesson 2: Use probabilistic tools to assess value as a function of macro variables…

- If there is a key macro variable affecting the value of your company that you are uncertain about (and who is not), why not quantify the uncertainty in a distribution (rather than a single price) and use that distribution in your valuation.

- That is exactly what you do in a Monte Carlo simulation, where you allow one or more variables to be distributions and compute a distribution of values for the company.

- With a simulation, you get not only everything you would get in a standard valuation (an estimated value for your company) but you will get additional output (on the variation in that value and the likelihood that your firm is under or over valued)
Exxon Mobil Valuation: Simulation
The optionality in commodities: Undeveloped reserves as an option

- Value of estimated reserve of natural resource
- Cost of Developing Reserve
- Net Payoff on Extraction
- Value of estimated reserve of natural resource
Gulf Oil was the target of a takeover in early 1984 at $70 per share (It had 165.30 million shares outstanding, and total debt of $9.9 billion).

- It had estimated reserves of 3038 million barrels of oil and the average cost of developing these reserves was estimated to be $10 a barrel in present value dollars (The development lag is approximately two years).
- The average relinquishment life of the reserves is 12 years.
- The price of oil was $22.38 per barrel, and the production cost, taxes and royalties were estimated at $7 per barrel.
- The bond rate at the time of the analysis was 9.00%.
- Gulf was expected to have net production revenues each year of approximately 5% of the value of the developed reserves. The variance in oil prices is 0.03.
Valuing Undeveloped Reserves

- Inputs for valuing undeveloped reserves
  - Value of underlying asset = Value of estimated reserves discounted back for period of development lag = $42,380.44
  - Exercise price = Estimated development cost of reserves = $30,380 million
  - Time to expiration = Average length of relinquishment option = 12 years
  - Variance in value of asset = Variance in oil prices = 0.03
  - Riskless interest rate = 9%
  - Dividend yield = Net production revenue/ Value of developed reserves = 5%

- Based upon these inputs, the Black-Scholes model provides the following value for the call:
  \[ d_1 = 1.6548 \quad N(d_1) = 0.9510 \]
  \[ d_2 = 1.0548 \quad N(d_2) = 0.8542 \]

- Call Value
  \[ = 42,380.44 \exp^{(-0.05)(12)} (0.9510) - 30,380 \exp^{(-0.09)(12)} (0.8542) \]
  \[ = $13,306 million \]
In addition, Gulf Oil had free cashflows to the firm from its oil and gas production of $915 million from already developed reserves and these cashflows are likely to continue for ten years (the remaining lifetime of developed reserves).

The present value of these developed reserves, discounted at the weighted average cost of capital of 12.5%, yields:

- Value of already developed reserves = $915 \times (1 - 1.125^{-10}) / 0.125 = $5065.83

Adding the value of the developed and undeveloped reserves

- Value of undeveloped reserves = $13,306 million
- Value of production in place = $5,066 million
- Total value of firm = $18,372 million
- Less Outstanding Debt = $9,900 million
- Value of Equity = $8,472 million
- Value per share = $8,472 / 165.3 = $51.25
VII. Valuing Companies across the ownership cycle

Reported income and balance sheet are heavily affected by tax considerations rather than information disclosure requirements. The line between the personal and business expenses is a fine one.

What are the cashflows from existing assets?
- Equity: Cashflows after debt payments
- Firm: Cashflows before debt payments

What is the value added by growth assets?
Equity: Growth in equity earnings/cashflows
Firm: Growth in operating earnings/cashflows

How risky are the cash flows from both existing assets and growth assets?
Equity: Risk in equity in the company
Firm: Risk in the firm’s operations

When will the firm become a mature firm, and what are the potential roadblocks?

Reversing investment mistakes is difficult to do. The need for and the cost of illiquidity has to be incorporated into current

Different buyers can perceive risk differently in the same private business, largely because what they see as risk will be a function of how diversified they are. The fall back positions of using market prices to extract risk measures does not

Many private businesses are finite life enterprises, not expected to last into perpetuity
**Kristin’s Kandy: Valuation in March 2006**

**Current Cashflow to Firm**
- EBIT(1-t): 300
- Nt CpX: 100
- Chg WC: 40
= FCFF: 160
Reinvestment Rate = 46.67%

**Expected Growth in EBIT (1-t)**
\[ .4667 \times .1364 = .0636 \]  
6.36%

**Stable Growth**
- \( g = 4\%; \) Beta = 3.00;  
- ROC = 12.54%
- Reinvestment Rate = 31.90%

**Terminal Value**
\[ 289/(.1254-.04) = 3,403 \]

**Discount at Cost of Capital (WACC)**
\[ 16.26\% \times (.70) + 3.30\% \times (.30) = 12.37\% \]

**Cost of Debt**
\[ (4.5\%+1.00)(1-.40) = 3.30\% \]

**Cost of Equity**
16.26%

**Riskfree Rate**
Riskfree rate = 4.50%  
(10-year T.Bond rate)

**Total Beta**
2.94

**Risk Premium**
4.00%

**Unlevered Beta for Sectors**
0.78

**Market Beta**
0.98

**Firm’s D/E Ratio**
30/70

**Synthetic rating** = A-

**Return on Capital**
13.64%

**Firm Value**
2,571

**Cash**
125

**Debt**
900

**Equity**
1,796

**Adj Value**
1,571

**Illiq Discount**
12.5%

**Weights**
E = 70% D = 30%

**Adjusted for owner non-diversification**
1/3 of risk is market risk

**Country Risk Premium**
0%

**Mature risk premium**
4%
Lesson 1: In private businesses, risk in the eyes of the “beholder” (buyer)

<table>
<thead>
<tr>
<th>Private business owner with entire wealth invested in the business</th>
<th>Venture capitalist, with multiple holdings in the sector.</th>
<th>Public company investor with diversified portfolio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposed to all risk in the company. Total beta measures exposure to total risk. Total Beta = Market Beta/ Correlation of firm with market</td>
<td>Partially diversified. Diversify away some firm specific risk but not all. Beta will fall between total and market beta.</td>
<td>Firm-specific risk is diversified away. Market or macro risk exposure captured in a market beta or betas.</td>
</tr>
</tbody>
</table>
Private Owner versus Publicly Traded Company Perceptions of Risk in an Investment

- **Total Beta** measures all risk:
  - Total Beta = Market Beta / (Portion of the total risk that is market risk)

- **Private owner of business** with 100% of your wealth invested in the business
  - Is exposed to all the risk in the firm
  - Demands a cost of equity that reflects this risk

- **Market Beta** measures just market risk
  - Eliminates firm-specific risk in portfolio
  - Demands a cost of equity that reflects only market risk

- **Publicly traded company** with investors who are diversified
Total Risk versus Market Risk

- Adjust the beta to reflect total risk rather than market risk. This adjustment is a relatively simple one, since the R squared of the regression measures the proportion of the risk that is market risk.

  Total Beta = Market Beta / Correlation of the sector with the market

- To estimate the beta for Kristin Kandy, we begin with the bottom-up unlevered beta of food processing companies:
  - Unlevered beta for publicly traded food processing companies = 0.78
  - Average correlation of food processing companies with market = 0.333
  - Unlevered total beta for Kristin Kandy = 0.78/0.333 = 2.34
  - Debt to equity ratio for Kristin Kandy = 0.3/0.7 (assumed industry average)
  - Total Beta = 2.34 (1 - (1-.40)(30/70)) = 2.94
  - Total Cost of Equity = 4.50% + 2.94 (4%) = 16.26%
Three assessment tools when the buyer falls in the middle…

- **Build up**: Start with cost of equity for a “diversified” investor and add premiums (based upon historical data) for other variables that capture the additional risk borne by “typical” buyer of a private business.
  - Strength: Numbers seem strong because they are backed up by data
  - Weakness: (1) Premiums are all from public markets (2) Double counting

- **Total Beta plus**: Look at potential buyer (what else the buyer has in his or her portfolio), assess the correlation of that portfolio with the market and estimate a “customized” total beta.
  - Strength: Ties the cost of equity to the buyer, as it should.
  - Weaknesses: (1) Buyers are under no obligation to give you this information (2) Treats private markets as extensions of public ones

- **Survey**: Find out what buyers of private businesses are demanding as a rate of return when they value private businesses.
  - Strength: Agnostic on risk and return models
  - Weakness: (1) Wide differences in what “required” means across survey respondents (2) Circular logic (3) Works if private capital markets are separate and unconnected to public markets.
An Intermediate Problem
Private to VC to Public offering…

Assume that you have a private business operating in a sector, where publicly traded companies have an average beta of 1 and where the average correlation of firms with the market is 0.25. Consider the cost of equity at three stages (Riskfree rate = 4%; ERP = 5%):

Stage 1: The nascent business, with a private owner, who is fully invested in that business.
Perceived Beta = 1/0.25 = 4
Cost of Equity = 4% + 4(5%) = 24%

Stage 2: Angel financing provided by specialized venture capitalist, who holds multiple investments, in high technology companies. (Correlation of portfolio with market is 0.5)
Perceived Beta = 1/0.5 = 2
Cost of Equity = 4% + 2(5%) = 14%

Stage 3: Public offering, where investors are retail and institutional investors, with diversified portfolios:
Perceived Beta = 1
Cost of Equity = 4% + 1(5%) = 9%
To value this company…

Assume that this company will be fully owned by its current owner for two years, will access the technology venture capitalist at the start of year 3 and that is expected to either go public or be sold to a publicly traded firm at the end of year 5.

Growth rate 2% forever after year 5

<table>
<thead>
<tr>
<th>E(Cash flow)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Terminal year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$100</td>
<td>$125</td>
<td>$150</td>
<td>$165</td>
<td>$170</td>
<td>$175</td>
</tr>
<tr>
<td>Market beta</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Correlation</td>
<td>0.25</td>
<td>0.25</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>1</td>
</tr>
<tr>
<td>Beta used</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Cost of equity</td>
<td>24.00%</td>
<td>24.00%</td>
<td>14.00%</td>
<td>14.00%</td>
<td>14.00%</td>
<td>9.00%</td>
</tr>
<tr>
<td>Terminal value</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$2,500</td>
</tr>
<tr>
<td>Cumulated COE</td>
<td>1.2400</td>
<td>1.5376</td>
<td>1.7529</td>
<td>1.9983</td>
<td>2.2780</td>
<td>2.4830</td>
</tr>
<tr>
<td>PV</td>
<td>$80.65</td>
<td>$81.30</td>
<td>$85.57</td>
<td>$82.57</td>
<td>$1,172.07</td>
<td></td>
</tr>
</tbody>
</table>

Value of firm $1,502 (Correct value, using changing costs of equity)

Value of firm $1,221 (using 24% as cost of equity forever. You will undervalue firm)

Value of firm $2,165 (Using 9% as cost of equity forever. You will overvalue firm)
Lesson 2: With financials, trust but verify..

- **Different Accounting Standards**: The accounting statements for private firms are often based upon different accounting standards than public firms, which operate under much tighter constraints on what to report and when to report.

- **Intermingling of personal and business expenses**: In the case of private firms, some personal expenses may be reported as business expenses.

- **Separating “Salaries” from “Dividends”**: It is difficult to tell where salaries end and dividends begin in a private firm, since they both end up with the owner.

- **The Key person issue**: In some private businesses, with a personal component, the cashflows may be intertwined with the owner being part of the business.
Lesson 3: Illiquidity is a clear and present danger..

- In private company valuation, illiquidity is a constant theme. All the talk, though, seems to lead to a rule of thumb. The illiquidity discount for a private firm is between 20-30% and does not vary across private firms.

- But illiquidity should vary across:
  - **Companies:** Healthier and larger companies, with more liquid assets, should have smaller discounts than money-losing smaller businesses with more illiquid assets.
  - **Time:** Liquidity is worth more when the economy is doing badly and credit is tough to come by than when markets are booming.
  - **Buyers:** Liquidity is worth more to buyers who have shorter time horizons and greater cash needs than for longer term investors who don’t need the cash and are willing to hold the investment.
The “standard” approaches to estimating illiquidity discounts…

- **Restricted stock**: These are stock issued by publicly traded companies to the market that bypass the SEC registration process but the stock cannot be traded for one year after the issue.

- **Pre-IPO transactions**: These are transactions prior to initial public offerings where equity investors in the private firm buy (sell) each other’s stakes.

In both cases, the discount is estimated to be the difference between the market price of the liquid asset and the observed transaction price of the illiquid asset.

- \( \text{Discount}_{\text{Restricted stock}} = \text{Stock price} - \text{Price on restricted stock offering} \)
- \( \text{Discount}_{\text{IPO}} = \text{IPO offering price} - \text{Price on pre-IPO transaction} \)
The “alternative” approaches

- **Bid-ask spreads**: All traded assets are illiquid. The bid ask spread, measuring the difference between the price at which you can buy and sell the asset at the same point in time is the illiquidity measure. I can extrapolate what we know about bid ask spreads with public companies into the private company space, we could have a more dynamic, complete measure of illiquidity.
  
  - Spread = 0.145 – 0.0022 ln (Annual Revenues) -0.015 (DERN) – 0.016 (Cash/Firm Value) – 0.11 ($ Monthly trading volume/ Firm Value)

- **Option pricing**: Liquidity can be viewed as a put option, where you get the right to sell at the prevailing market price. Illiquidity can therefore be viewed as the loss of this put option.
V. Value, Price and Information: Closing the Deal
Are you valuing or pricing?

**Tools for intrinsic analysis**
- Discounted Cashflow Valuation (DCF)
- Intrinsic multiples
- Book value based approaches
- Excess Return Models

**Tools for "the gap"**
- Behavioral finance
- Price catalysts

**Tools for pricing**
- Multiples and comparables
- Charting and technical indicators
- Pseudo DCF

Value of cashflows, adjusted for time and risk

Drivers of intrinsic value
- Cashflows from existing assets
- Growth in cash flows
- Quality of Growth

Drivers of "the gap"
- Information
- Liquidity
- Corporate governance

Drivers of price
- Market moods & momentum
- Surface stories about fundamentals
### Three views of “the gap”

<table>
<thead>
<tr>
<th>View of the gap</th>
<th>Investment Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Efficient Marketer</td>
<td>Index funds</td>
</tr>
<tr>
<td>The “value” extremist</td>
<td>Buy and hold stocks where value &lt; price</td>
</tr>
<tr>
<td>The pricing extremist</td>
<td>(1) Look for mispriced securities. (2) Get ahead of shifts in demand/momentum.</td>
</tr>
</tbody>
</table>

The gaps between price and value, if they do occur, are random.

You view pricers as dilettantes who will move on to fad and fad. Eventually, the price will converge on value.

Value is only in the heads of the “eggheads”. Even if it exists (and it is questionable), price may never converge on value.
The “pricers” dilemma..

- No anchor: If you do not believe in intrinsic value and make no attempt to estimate it, you have no moorings when you invest. You will therefore be pushed back and forth as the price moves from high to low. In other words, everything becomes relative and you can lose perspective.

- Reactive: Without a core measure of value, your investment strategy will often be reactive rather than proactive.

- Crowds are fickle and tough to get a read on: The key to being successful as a pricer is to be able to read the crowd mood and to detect shifts in that mood early in the process. By their nature, crowds are tough to read and almost impossible to model systematically.
The valuer’s dilemma and ways of dealing with it...

- Uncertainty about the magnitude of the gap:
  - Margin of safety: Many value investors swear by the notion of the “margin of safety” as protection against risk/uncertainty.
  - Collect more information: Collecting more information about the company is viewed as one way to make your investment less risky.
  - Ask what if questions: Doing scenario analysis or what if analysis gives you a sense of whether you should invest.
  - Confront uncertainty: Face up to the uncertainty, bring it into the analysis and deal with the consequences.

- Uncertainty about gap closing: This is tougher and you can reduce your exposure to it by
  - Lengthening your time horizon
  - Providing or looking for a catalyst that will cause the gap to close.
Option 1: Margin of Safety

The margin of safety (MOS) is a buffer that you build into your investment decisions to protect yourself from investment mistakes. Thus, if your margin of safety is 30%, you will buy a stock only if the price is more than 30% below its “intrinsic” value.

While value investors use the “margin of safety” as a shield against risk, keep in mind that:

- MOS comes into play at the end of the investment process, not at the beginning.
- MOS does not substitute for risk assessment and intrinsic valuation, but augments them.
- The MOS cannot and should not be a fixed number, but should be reflective of the uncertainty in the assessment of intrinsic value.
- Being too conservative can be damaging to your long term investment prospects. Too high a MOS can hurt you as an investor.
There is a widely held view among value investors that they are not as exposed to risk as the rest of the market, because they do their homework, poring over financial statements or using ratios to screen for risky stocks. Put simply, they are assuming that the more they know about an investment, the less risky it becomes.

That may be true from some peripheral risks and a few firm specific risks, but it definitely is not for the macro risks. You cannot make a cyclical company less cyclical by studying it more or take the nationalization risk out of Venezuelan company by doing more research.

Implication 1: The need for diversification does not decrease just because you are a value investor who picks stocks with much research and care.

Implication 2: There is a law of diminishing returns to information. At a point, additional information will only serve to distract you.
Option 3: Build What-if analyses

A valuation is a function of the inputs you feed into the valuation. To the degree that you are pessimistic or optimistic on any of the inputs, your valuation will reflect it.

There are three ways in which you can do what-if analyses

- Best-case, Worst-case analyses, where you set all the inputs at their most optimistic and most pessimistic levels
- Plausible scenarios: Here, you define what you feel are the most plausible scenarios (allowing for the interaction across variables) and value the company under these scenarios
- Sensitivity to specific inputs: Change specific and key inputs to see the effect on value, or look at the impact of a large event (FDA approval for a drug company, loss in a lawsuit for a tobacco company) on value.

Proposition 1: As a general rule, what-if analyses will yield large ranges for value, with the actual price somewhere within the range.
Option 4: Confront uncertainty
Simulations – The Amgen valuation

Correlation = 0.4
The Simulated Values of Amgen: What do I do with this output?

[Graph showing a distribution of simulated values]
Strategies for managing the risk in the “closing” of the gap

- The “karmic” approach: In this one, you buy (sell short) under (over) valued companies and sit back and wait for the gap to close. You are implicitly assuming that given time, the market will see the error of its ways and fix that error.

- The catalyst approach: For the gap to close, the price has to converge on value. For that convergence to occur, there usually has to be a catalyst.
  - If you are an activist investor, you may be the catalyst yourself. In fact, your act of buying the stock may be a sufficient signal for the market to reassess the price.
  - If you are not, you have to look for other catalysts. Here are some to watch for: a new CEO or management team, a “blockbuster” new product or an acquisition bid where the firm is targeted.
VI. Relative Valuation
The Essence of relative valuation?

- In relative valuation, the value of an asset is compared to the values assessed by the market for similar or comparable assets.
- To do relative valuation then,
  - we need to identify comparable assets and obtain market values for these assets
  - convert these market values into standardized values, since the absolute prices cannot be compared. This process of standardizing creates price multiples.
  - compare the standardized value or multiple for the asset being analyzed to the standardized values for comparable asset, controlling for any differences between the firms that might affect the multiple, to judge whether the asset is under or over valued
Relative valuation is pervasive...

- Most asset valuations are relative.
- Most equity valuations on Wall Street are relative valuations.
  - Almost 85% of equity research reports are based upon a multiple and comparables.
  - More than 50% of all acquisition valuations are based upon multiples
  - Rules of thumb based on multiples are not only common but are often the basis for final valuation judgments.
- While there are more discounted cashflow valuations in consulting and corporate finance, they are often relative valuations masquerading as discounted cash flow valuations.
  - The objective in many discounted cashflow valuations is to back into a number that has been obtained by using a multiple.
  - The terminal value in a significant number of discounted cashflow valuations is estimated using a multiple.
The Reasons for the allure…

“If you think I’m crazy, you should see the guy who lives across the hall”
Jerry Seinfeld talking about Kramer in a Seinfeld episode

“A little inaccuracy sometimes saves tons of explanation”
H.H. Munro

“If you are going to screw up, make sure that you have lots of company”
Ex-portfolio manager
Relative valuation is much more likely to reflect market perceptions and moods than discounted cash flow valuation. This can be an advantage when it is important that the price reflect these perceptions as is the case when

- the objective is to sell a security at that price today (as in the case of an IPO)
- investing on “momentum” based strategies

With relative valuation, there will always be a significant proportion of securities that are under valued and over valued.

Since portfolio managers are judged based upon how they perform on a relative basis (to the market and other money managers), relative valuation is more tailored to their needs.

Relative valuation generally requires less information than discounted cash flow valuation (especially when multiples are used as screens).
The Four Steps to Deconstructing Multiples

- Define the multiple
  - In use, the same multiple can be defined in different ways by different users. When comparing and using multiples, estimated by someone else, it is critical that we understand how the multiples have been estimated.

- Describe the multiple
  - Too many people who use a multiple have no idea what its cross sectional distribution is. If you do not know what the cross sectional distribution of a multiple is, it is difficult to look at a number and pass judgment on whether it is too high or low.

- Analyze the multiple
  - It is critical that we understand the fundamentals that drive each multiple, and the nature of the relationship between the multiple and each variable.

- Apply the multiple
  - Defining the comparable universe and controlling for differences is far more difficult in practice than it is in theory.
Definitional Tests

- Is the multiple consistently defined?
  - Proposition 1: Both the value (the numerator) and the standardizing variable (the denominator) should be to the same claimholders in the firm. In other words, the value of equity should be divided by equity earnings or equity book value, and firm value should be divided by firm earnings or book value.

- Is the multiple uniformly estimated?
  - The variables used in defining the multiple should be estimated uniformly across assets in the “comparable firm” list.
  - If earnings-based multiples are used, the accounting rules to measure earnings should be applied consistently across assets. The same rule applies with book-value based multiples.
Example 1: Price Earnings Ratio: Definition

**PE = Market Price per Share / Earnings per Share**

- There are a number of variants on the basic PE ratio in use. They are based upon how the price and the earnings are defined.
- **Price:**
  - is usually the current price
  - is sometimes the average price for the year
- **EPS:**
  - earnings per share in most recent financial year
  - earnings per share in trailing 12 months (Trailing PE)
  - forecasted earnings per share next year (Forward PE)
  - forecasted earnings per share in future year
Example 2: Enterprise Value /EBITDA Multiple

- The enterprise value to EBITDA multiple is obtained by netting cash out against debt to arrive at enterprise value and dividing by EBITDA.

\[
\frac{\text{Enterprise Value}}{\text{EBITDA}} = \frac{\text{Market Value of Equity} + \text{Market Value of Debt} - \text{Cash}}{\text{Earnings before Interest, Taxes and Depreciation}}
\]

- Why do we net out cash from firm value?
- What happens if a firm has cross holdings which are categorized as:
  - Minority interests?
  - Majority active interests?
Descriptive Tests

- What is the average and standard deviation for this multiple, across the universe (market)?
- What is the median for this multiple?
  - The median for this multiple is often a more reliable comparison point.
- How large are the outliers to the distribution, and how do we deal with the outliers?
  - Throwing out the outliers may seem like an obvious solution, but if the outliers all lie on one side of the distribution (they usually are large positive numbers), this can lead to a biased estimate.
- Are there cases where the multiple cannot be estimated? Will ignoring these cases lead to a biased estimate of the multiple?
- How has this multiple changed over time?
1. Multiples have skewed distributions…
2. Making statistics “dicey”

<table>
<thead>
<tr>
<th></th>
<th>Current PE</th>
<th>Trailing PE</th>
<th>Forward PE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total firms</td>
<td>5891</td>
<td>5891</td>
<td>5891</td>
</tr>
<tr>
<td>Number of firms with PE</td>
<td>3456</td>
<td>3375</td>
<td>2311</td>
</tr>
<tr>
<td>Average</td>
<td>42.56</td>
<td>33.67</td>
<td>18.28</td>
</tr>
<tr>
<td>Median</td>
<td>15.94</td>
<td>14.56</td>
<td>13.74</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.1</td>
<td>0.2</td>
<td>0.44</td>
</tr>
<tr>
<td>25th percentile</td>
<td>10.11</td>
<td>10</td>
<td>10.34</td>
</tr>
<tr>
<td>75th percentile</td>
<td>25.34</td>
<td>22.34</td>
<td>18.69</td>
</tr>
<tr>
<td>Maximum</td>
<td>18358</td>
<td>5083</td>
<td>780</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>7.26</td>
<td>3.00</td>
<td>0.62</td>
</tr>
<tr>
<td>Skewness</td>
<td>33.40</td>
<td>21.86</td>
<td>15.98</td>
</tr>
</tbody>
</table>
3. Markets have a lot in common

<table>
<thead>
<tr>
<th>Region</th>
<th>Mean</th>
<th>25th percentile</th>
<th>Median</th>
<th>75th percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia, NZ &amp; Canada</td>
<td>43.13</td>
<td>6.66</td>
<td>11.85</td>
<td>22.64</td>
</tr>
<tr>
<td>Developed Europe</td>
<td>42.40</td>
<td>6.97</td>
<td>12.67</td>
<td>24.19</td>
</tr>
<tr>
<td>Emerging Markets</td>
<td>62.76</td>
<td>7.03</td>
<td>12.40</td>
<td>23.42</td>
</tr>
<tr>
<td>Japan</td>
<td>49.07</td>
<td>7.34</td>
<td>12.32</td>
<td>23.99</td>
</tr>
<tr>
<td>US</td>
<td>45.01</td>
<td>6.69</td>
<td>12.45</td>
<td>25.84</td>
</tr>
</tbody>
</table>
4. Simplistic rules almost always break down…6 times EBITDA may not be cheap…
Or it may be…

![Graph showing EV/EBIT & EV/EBITDA for US companies in January 2012]
Analytical Tests

- What are the fundamentals that determine and drive these multiples?
  - Proposition 2: Embedded in every multiple are all of the variables that drive every discounted cash flow valuation - growth, risk and cash flow patterns.
  - In fact, using a simple discounted cash flow model and basic algebra should yield the fundamentals that drive a multiple

- How do changes in these fundamentals change the multiple?
  - The relationship between a fundamental (like growth) and a multiple (such as PE) is seldom linear. For example, if firm A has twice the growth rate of firm B, it will generally not trade at twice its PE ratio
  - Proposition 3: It is impossible to properly compare firms on a multiple, if we do not know the nature of the relationship between fundamentals and the multiple.
To understand the fundamentals, start with a basic equity discounted cash flow model.

With the dividend discount model,

\[ P_0 = \frac{DPS_1}{r - g_n} \]

Dividing both sides by the current earnings per share,

\[ \frac{P_0}{EPS_0} = \frac{PE}{r - g_n} = \text{Payout Ratio} \times \frac{1 + g_n}{r - g_n} \]

If this had been a FCFE Model,

\[ P_0 = \frac{FCFE_1}{r - g_n} \]

\[ \frac{P_0}{EPS_0} = \frac{PE}{r - g_n} = \text{(FCFE/Earnings)} \times \frac{1 + g_n}{r - g_n} \]
Using the Fundamental Model to Estimate PE For a High Growth Firm

The price-earnings ratio for a high growth firm can also be related to fundamentals. In the special case of the two-stage dividend discount model, this relationship can be made explicit fairly simply:

\[
P_0 = \frac{\text{EPS}_0 \times \text{Payout Ratio} \times (1 + g) \times \left( 1 - \frac{(1 + g)^n}{(1 + r)^n} \right)}{r - g} + \frac{\text{EPS}_0 \times \text{Payout Ratio}_n \times (1 + g)^n \times (1 + g_n)}{(r - g_n)(1 + r)^n}
\]

- For a firm that does not pay what it can afford to in dividends, substitute FCFE/Earnings for the payout ratio.

Dividing both sides by the earnings per share:

\[
\frac{P_0}{\text{EPS}_0} = \frac{\text{Payout Ratio} \times (1 + g) \times \left( 1 - \frac{(1 + g)^n}{(1 + r)^n} \right)}{r - g} + \frac{\text{Payout Ratio}_n \times (1 + g)^n \times (1 + g_n)}{(r - g_n)(1 + r)^n}
\]
A Simple Example

Assume that you have been asked to estimate the PE ratio for a firm which has the following characteristics:

<table>
<thead>
<tr>
<th>Variable</th>
<th>High Growth Phase</th>
<th>Stable Growth Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected Growth Rate</td>
<td>25%</td>
<td>8%</td>
</tr>
<tr>
<td>Payout Ratio</td>
<td>20%</td>
<td>50%</td>
</tr>
<tr>
<td>Beta</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Number of years</td>
<td>5 years</td>
<td>Forever after year 5</td>
</tr>
</tbody>
</table>

- Riskfree rate = T.Bond Rate = 6%
- Required rate of return = 6% + 1(5.5%) = 11.5%

\[
\text{PE} = \frac{20 \times (1.25) \times \left(1 - \frac{(1.25)^5}{(1.115)^5}\right)}{(.115 - .25)} + \frac{50 \times (1.25)^5 \times (1.08)}{(.115 - .08) (1.115)^5} = 28.75
\]
a. PE and Growth: Firm grows at x% for 5 years, 8% thereafter

PE Ratios and Expected Growth: Interest Rate Scenarios

- PE Ratio
- Expected Growth Rate

Scenarios:
- r = 4%
- r = 6%
- r = 8%
- r = 10%
b. PE and Risk: A Follow up Example

PE Ratios and Beta: Growth Scenarios

- PE Ratio
- Beta
- g=25%
- g=20%
- g=15%
- g=8%
Comparisons of PE across time: PE Ratio for the S&P 500
Is low (high) PE cheap (expensive)?

- A market strategist argues that stocks are cheap because the PE ratio today is low relative to the average PE ratio across time. Do you agree?
  - Yes
  - No
- If you do not agree, what factors might explain the higher PE ratio today?
E/P Ratios, T.Bond Rates and Term Structure
Regression Results

- There is a strong positive relationship between E/P ratios and T.Bond rates, as evidenced by the correlation of 0.69 between the two variables.
- In addition, there is evidence that the term structure also affects the PE ratio.
- In the following regression, using 1960-2011 data, we regress E/P ratios against the level of T.Bond rates and a term structure variable (T.Bond - T.Bill rate)

\[
E/P = 3.16\% + 0.597 \text{T.Bond Rate} - 0.213 (\text{T.Bond Rate} - \text{T.Bill Rate})
\]

\[
(3.98) \quad (5.71) \quad (-0.92)
\]

R squared = 40.92%

Given the treasury bond rate and treasury bill rate today, is the market under or over valued today?
The Determinants of Multiples…

\[
\text{Value of Stock} = \frac{\text{DPS}}{k_e - g}
\]

\[
\text{PE} = \frac{\text{Payout Ratio}}{1+g/(r-g)}
\]

\[
\text{PEG} = \frac{\text{Payout ratio}}{1+g/g(r-g)}
\]

\[
\text{PBV} = \frac{\text{ROE (Payout ratio)}}{1+g/(r-g)}
\]

\[
\text{PS} = \frac{\text{Net Margin (Payout ratio)}}{1+g/(r-g)}
\]

**Equity Multiples**

**Firm Multiples**

\[
\text{Value/FCFF} = f(g, \text{WACC})
\]

\[
\text{Value/FCFF} = \frac{(1+g)}{(WACC-g)}
\]

\[
\text{Value/EBIT(1-t)} = f(g, \text{RIR, WACC})
\]

\[
\text{Value/EBIT(1-t)} = \frac{1+g}{1- \text{RIR} / (WACC-g)}
\]

\[
\text{Value/EBIT} = f(g, \text{RIR, WACC, t})
\]

\[
\text{Value/EBIT} = \frac{(1+g)}{(1- \text{RIR})(WACC-g)}
\]

\[
\text{VS} = f(\text{Oper Mgn, RIR, g, WACC})
\]

\[
\text{VS} = \text{Oper Margin (1-RIR)} (1+g)/(WACC-g)
\]

\[
\text{Value of Firm} = \frac{\text{FCFF}}{WACC - g}
\]
Application Tests

- Given the firm that we are valuing, what is a “comparable” firm?
  - While traditional analysis is built on the premise that firms in the same sector are comparable firms, valuation theory would suggest that a comparable firm is one which is similar to the one being analyzed in terms of fundamentals.
  - Proposition 4: There is no reason why a firm cannot be compared with another firm in a very different business, if the two firms have the same risk, growth and cash flow characteristics.

- Given the comparable firms, how do we adjust for differences across firms on the fundamentals?
  - Proposition 5: It is impossible to find an exactly identical firm to the one you are valuing.
I. Comparing PE Ratios across a Sector: PE

<table>
<thead>
<tr>
<th>Company Name</th>
<th>PE</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT Indosat ADR</td>
<td>7.8</td>
<td>0.06</td>
</tr>
<tr>
<td>Telebras ADR</td>
<td>8.9</td>
<td>0.075</td>
</tr>
<tr>
<td>Telecom Corporation of New Zealand ADR</td>
<td>11.2</td>
<td>0.11</td>
</tr>
<tr>
<td>Telecom Argentina Stet - France Telecom SA ADR B</td>
<td>12.5</td>
<td>0.08</td>
</tr>
<tr>
<td>Hellenic Telecommunication Organization SA ADR</td>
<td>12.8</td>
<td>0.12</td>
</tr>
<tr>
<td>Telecomunicaciones de Chile ADR</td>
<td>16.6</td>
<td>0.08</td>
</tr>
<tr>
<td>Swisscom AG ADR</td>
<td>18.3</td>
<td>0.11</td>
</tr>
<tr>
<td>Asia Satellite Telecom Holdings ADR</td>
<td>19.6</td>
<td>0.16</td>
</tr>
<tr>
<td>Portugal Telecom SA ADR</td>
<td>20.8</td>
<td>0.13</td>
</tr>
<tr>
<td>Telefonos de Mexico ADR L</td>
<td>21.1</td>
<td>0.14</td>
</tr>
<tr>
<td>Matav RT ADR</td>
<td>21.5</td>
<td>0.22</td>
</tr>
<tr>
<td>Telstra ADR</td>
<td>21.7</td>
<td>0.12</td>
</tr>
<tr>
<td>Gilat Communications</td>
<td>22.7</td>
<td>0.31</td>
</tr>
<tr>
<td>Deutsche Telekom AG ADR</td>
<td>24.6</td>
<td>0.11</td>
</tr>
<tr>
<td>British Telecommunications PLC ADR</td>
<td>25.7</td>
<td>0.07</td>
</tr>
<tr>
<td>Tele Danmark AS ADR</td>
<td>27</td>
<td>0.09</td>
</tr>
<tr>
<td>Telekomunikasi Indonesia ADR</td>
<td>28.4</td>
<td>0.32</td>
</tr>
<tr>
<td>Cable &amp; Wireless PLC ADR</td>
<td>29.8</td>
<td>0.14</td>
</tr>
<tr>
<td>APT Satellite Holdings ADR</td>
<td>31</td>
<td>0.33</td>
</tr>
<tr>
<td>Telefonica SA ADR</td>
<td>32.5</td>
<td>0.18</td>
</tr>
<tr>
<td>Royal KPN NV ADR</td>
<td>35.7</td>
<td>0.13</td>
</tr>
<tr>
<td>Telecom Italia SPA ADR</td>
<td>42.2</td>
<td>0.14</td>
</tr>
<tr>
<td>Nippon Telegraph &amp; Telephone ADR</td>
<td>44.3</td>
<td>0.2</td>
</tr>
<tr>
<td>France Telecom SA ADR</td>
<td>45.2</td>
<td>0.19</td>
</tr>
<tr>
<td>Korea Telecom ADR</td>
<td>71.3</td>
<td>0.44</td>
</tr>
</tbody>
</table>
### PE, Growth and Risk

Dependent variable is:  \( PE \)

\[ R^2 = 66.2\% \quad R^2 \text{ (adjusted)} = 63.1\% \]

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>SE</th>
<th>t-ratio</th>
<th>prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>13.1151</td>
<td>3.471</td>
<td>3.78</td>
<td>0.0010</td>
</tr>
<tr>
<td>Growth rate</td>
<td>121.223</td>
<td>19.27</td>
<td>6.29</td>
<td>≤ 0.0001</td>
</tr>
<tr>
<td>Emerging Market</td>
<td>-13.8531</td>
<td>3.606</td>
<td>-3.84</td>
<td>0.0009</td>
</tr>
</tbody>
</table>

Emerging Market is a dummy: 1 if emerging market
0 if not
Is Telebras under valued?

- Predicted PE = 13.12 + 121.22 (.075) - 13.85 (1) = 8.35
- At an actual price to earnings ratio of 8.9, Telebras is slightly overvalued.
II. Price to Book vs ROE: Largest Market Cap Firms in the United States: January 2010
Missing growth?
PBV, ROE and Risk: Large Cap US firms
### Bringing it all together… Largest US stocks

#### Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.819(^a)</td>
<td>.670</td>
<td>.661</td>
<td>1.19253</td>
</tr>
</tbody>
</table>

\(^a\) Predictors: (Constant), ROE, Expected Growth in EPS: next 5 years, Regression Beta

#### Coefficients\(^a\)

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td>.406</td>
<td>.424</td>
<td>.958</td>
<td>.340</td>
</tr>
<tr>
<td>Regression Beta</td>
<td>-.065</td>
<td>.253</td>
<td>-.256</td>
<td>.799</td>
</tr>
<tr>
<td>Expected Growth in EPS: next 5 years</td>
<td>9.340</td>
<td>2.366</td>
<td>.3947</td>
<td>.000</td>
</tr>
<tr>
<td>ROE</td>
<td>10.546</td>
<td>.771</td>
<td>13.672</td>
<td>.000</td>
</tr>
</tbody>
</table>

\(^a\) Dependent Variable: PBV Ratio
Updated PBV Ratios – Largest Market Cap US companies
Updated to January 2011
## III. Value/EBITDA Multiple: Trucking Companies

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Value</th>
<th>EBITDA</th>
<th>Value/EBITDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>KLLM Trans. Svcs.</td>
<td>$114.32</td>
<td>$48.81</td>
<td>2.34</td>
</tr>
<tr>
<td>Ryder System</td>
<td>$5,158.04</td>
<td>$1,838.26</td>
<td>2.81</td>
</tr>
<tr>
<td>Rollins Truck Leasing</td>
<td>$1,368.35</td>
<td>$447.67</td>
<td>3.06</td>
</tr>
<tr>
<td>Cannon Express Inc.</td>
<td>$83.57</td>
<td>$27.05</td>
<td>3.09</td>
</tr>
<tr>
<td>Hunt (J.B.)</td>
<td>$982.67</td>
<td>$310.22</td>
<td>3.17</td>
</tr>
<tr>
<td>Yellow Corp.</td>
<td>$931.47</td>
<td>$292.82</td>
<td>3.18</td>
</tr>
<tr>
<td>Roadway Express</td>
<td>$554.96</td>
<td>$169.38</td>
<td>3.28</td>
</tr>
<tr>
<td>Marten Transport Ltd.</td>
<td>$116.93</td>
<td>$35.62</td>
<td>3.28</td>
</tr>
<tr>
<td>Kenan Transport Co.</td>
<td>$67.66</td>
<td>$19.44</td>
<td>3.48</td>
</tr>
<tr>
<td>M.S. Carriers</td>
<td>$344.93</td>
<td>$97.85</td>
<td>3.53</td>
</tr>
<tr>
<td>Old Dominion Freight</td>
<td>$170.42</td>
<td>$45.13</td>
<td>3.78</td>
</tr>
<tr>
<td>Trimac Ltd.</td>
<td>$661.18</td>
<td>$174.28</td>
<td>3.79</td>
</tr>
<tr>
<td>Matlack Systems</td>
<td>$112.42</td>
<td>$28.91</td>
<td>3.88</td>
</tr>
<tr>
<td>Covenant Transport Inc.</td>
<td>$259.16</td>
<td>$64.35</td>
<td>4.03</td>
</tr>
<tr>
<td>Builders Transport</td>
<td>$221.09</td>
<td>$51.44</td>
<td>4.30</td>
</tr>
<tr>
<td>Werner Enterprises</td>
<td>$844.39</td>
<td>$196.15</td>
<td>4.30</td>
</tr>
<tr>
<td>Landstar Sys.</td>
<td>$422.79</td>
<td>$95.20</td>
<td>4.44</td>
</tr>
<tr>
<td>AMERCO</td>
<td>$1,632.30</td>
<td>$345.78</td>
<td>4.72</td>
</tr>
<tr>
<td>USA Truck</td>
<td>$141.77</td>
<td>$28.91</td>
<td>4.74</td>
</tr>
<tr>
<td>Frozen Food Express</td>
<td>$164.17</td>
<td>$34.10</td>
<td>4.75</td>
</tr>
<tr>
<td>Arnold Inds.</td>
<td>$422.27</td>
<td>$96.88</td>
<td>4.47</td>
</tr>
<tr>
<td>Greyhound Lines Inc.</td>
<td>$437.71</td>
<td>$88.61</td>
<td>4.88</td>
</tr>
<tr>
<td>USF Freightways</td>
<td>$983.86</td>
<td>$198.91</td>
<td>4.95</td>
</tr>
<tr>
<td>Golden Eagle Group Inc.</td>
<td>$12.50</td>
<td>$2.33</td>
<td>5.37</td>
</tr>
<tr>
<td>Arkansas Best</td>
<td>$578.78</td>
<td>$109.75</td>
<td>5.30</td>
</tr>
<tr>
<td>Airlease Ltd.</td>
<td>$73.64</td>
<td>$13.48</td>
<td>5.46</td>
</tr>
<tr>
<td>Celadon Group</td>
<td>$182.30</td>
<td>$32.72</td>
<td>5.57</td>
</tr>
<tr>
<td>Amer. Freightways</td>
<td>$716.15</td>
<td>$120.94</td>
<td>5.92</td>
</tr>
<tr>
<td>Transfinancial Holdings</td>
<td>$76.32</td>
<td>$6.79</td>
<td>11.36</td>
</tr>
<tr>
<td>Vitran Corp. 'A'</td>
<td>$140.68</td>
<td>$21.51</td>
<td>6.54</td>
</tr>
<tr>
<td>Interpool Inc.</td>
<td>$1,002.20</td>
<td>$151.18</td>
<td>6.63</td>
</tr>
<tr>
<td>InterTel Inc.</td>
<td>$70.59</td>
<td>$10.38</td>
<td>6.77</td>
</tr>
<tr>
<td>Swift Transportation</td>
<td>$835.58</td>
<td>$121.34</td>
<td>6.89</td>
</tr>
<tr>
<td>Landar Services</td>
<td>$212.95</td>
<td>$30.38</td>
<td>7.01</td>
</tr>
<tr>
<td>CNE Transportation</td>
<td>$2,700.69</td>
<td>$350.99</td>
<td>7.76</td>
</tr>
<tr>
<td>Budget Group Inc.</td>
<td>$1,247.30</td>
<td>$166.71</td>
<td>7.48</td>
</tr>
<tr>
<td>Caliber System</td>
<td>$2,514.99</td>
<td>$333.13</td>
<td>7.55</td>
</tr>
<tr>
<td>Knight Transportation Inc.</td>
<td>$269.01</td>
<td>$28.20</td>
<td>9.54</td>
</tr>
<tr>
<td>Heartland Express</td>
<td>$727.50</td>
<td>$64.62</td>
<td>11.26</td>
</tr>
<tr>
<td>Greyhound CDA Transn Corp.</td>
<td>$83.25</td>
<td>$6.99</td>
<td>11.91</td>
</tr>
<tr>
<td>Mark V8</td>
<td>$160.45</td>
<td>$12.96</td>
<td>12.38</td>
</tr>
<tr>
<td>Coach USA Inc.</td>
<td>$678.38</td>
<td>$17.76</td>
<td>38.90</td>
</tr>
<tr>
<td>US 1 Inds Inc.</td>
<td>$5.60</td>
<td>(0.17)</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td></td>
<td></td>
<td><strong>5.61</strong></td>
</tr>
</tbody>
</table>
A Test on EBITDA

- Ryder System looks very cheap on a Value/EBITDA multiple basis, relative to the rest of the sector. What explanation (other than misvaluation) might there be for this difference?

Whole Foods: In 2007: Net Margin was 3.41% and Price/ Sales ratio was 1.41
Predicted Price to Sales = 0.07 + 10.49 (0.0341) = 0.43
Whole Foods: In 2009, Net Margin had dropped to 2.77% and Price to Sales ratio was down to 0.31.

Predicted Price to Sales = 0.07 + 10.49 (.0277) = 0.36
And again in 2010..

Whole Foods: In 2010, Net Margin had dropped to 1.44% and Price to Sales ratio increased to 0.50. Predicted Price to Sales = 0.06 + 11.43 (.0144) = 0.22
Here is 2011...

\[
PS \text{ Ratio} = -0.585 + 55.50 (\text{Net Margin}) \quad R^2 = 48.2\%
\]

PS Ratio for WFMI = \(-0.585 + 55.50 (0.0273)\) = 0.93

At a PS ratio of 0.98, WFMI is slightly over valued.
V. Nothing’s working!!! Internet Stocks in early 2000
PS Ratios and Margins are not highly correlated

- Regressing PS ratios against current margins yields the following:
  \[ PS = 81.36 - 7.54(\text{Net Margin}) \quad R^2 = 0.04 \]
  \( (0.49) \)

- This is not surprising. These firms are priced based upon expected margins, rather than current margins.
Solution 1: Use proxies for survival and growth: Amazon in early 2000

- Hypothesizing that firms with higher revenue growth and higher cash balances should have a greater chance of surviving and becoming profitable, we ran the following regression: (The level of revenues was used to control for size)

\[ PS = 30.61 - 2.77 \ln(\text{Rev}) + 6.42 \times (\text{Rev Growth}) + 5.11 \times (\text{Cash/Rev}) \]

\[ (0.66) \quad (2.63) \quad (3.49) \]

R squared = 31.8%

Predicted PS = 30.61 - 2.77(7.1039) + 6.42(1.9946) + 5.11 (.3069) = 30.42

Actual PS = 25.63

Stock is undervalued, relative to other internet stocks.
Solution 2: Use forward multiples

- Global Crossing lost $1.9 billion in 2001 and is expected to continue to lose money for the next 3 years. In a discounted cashflow valuation (see notes on DCF valuation) of Global Crossing, we estimated an expected EBITDA for Global Crossing in five years of $1,371 million.
- The average enterprise value/EBITDA multiple for healthy telecomm firms is 7.2 currently.
- Applying this multiple to Global Crossing’s EBITDA in year 5, yields a value in year 5 of
  - Enterprise Value in year 5 = 1371 * 7.2 = $9,871 million
  - Enterprise Value today = $9,871 million/1.138^5 = $5,172 million
    (The cost of capital for Global Crossing is 13.80%)
  - The probability that Global Crossing will not make it as a going concern is 77%.
  - Expected Enterprise value today = 0.23 (5172) = $1,190 million
Comparisons to the entire market: Why not?

- In contrast to the 'comparable firm' approach, the information in the entire cross-section of firms can be used to predict PE ratios.
- The simplest way of summarizing this information is with a multiple regression, with the PE ratio as the dependent variable, and proxies for risk, growth and payout forming the independent variables.
PE versus Expected EPS Growth: January 2012

Expected Growth in EPS: next 5 years

Current PE
### Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.340$^a$</td>
<td>.116</td>
<td>.114</td>
<td>1068.79044</td>
</tr>
</tbody>
</table>

$a$. Predictors: (Constant), Payout Ratio, 3-yr Regression Beta, Expected Growth in EPS: next 5 years

### Coefficients$^{a,b}$

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>1 (Constant)</td>
<td>13.477</td>
<td>.760</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expected Growth in EPS: next 5 years</td>
<td>40.841</td>
<td>2.627</td>
<td>.354</td>
<td>15.545</td>
</tr>
<tr>
<td>3-yr Regression Beta</td>
<td>-2.006</td>
<td>.499</td>
<td>-.092</td>
<td>-4.023</td>
</tr>
<tr>
<td>Payout Ratio</td>
<td>2.881</td>
<td>.992</td>
<td>.066</td>
<td>2.905</td>
</tr>
</tbody>
</table>

$a$. Dependent Variable: Current PE  
$b$. Weighted Least Squares Regression – Weighted by Market Cap
The value of growth

<table>
<thead>
<tr>
<th>Time Period</th>
<th>PE Value of extra 1% of growth</th>
<th>Equity Risk Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 2012</td>
<td>0.408</td>
<td>6.04%</td>
</tr>
<tr>
<td>January 2011</td>
<td>0.836</td>
<td>5.20%</td>
</tr>
<tr>
<td>January 2010</td>
<td>0.550</td>
<td>4.36%</td>
</tr>
<tr>
<td>January 2009</td>
<td>0.780</td>
<td>6.43%</td>
</tr>
<tr>
<td>January 2008</td>
<td>1.427</td>
<td>4.37%</td>
</tr>
<tr>
<td>January 2007</td>
<td>1.178</td>
<td>4.16%</td>
</tr>
<tr>
<td>January 2006</td>
<td>1.131</td>
<td>4.07%</td>
</tr>
<tr>
<td>January 2005</td>
<td>0.914</td>
<td>3.65%</td>
</tr>
<tr>
<td>January 2004</td>
<td>0.812</td>
<td>3.69%</td>
</tr>
<tr>
<td>January 2003</td>
<td>2.621</td>
<td>4.10%</td>
</tr>
<tr>
<td>January 2002</td>
<td>1.003</td>
<td>3.62%</td>
</tr>
<tr>
<td>January 2001</td>
<td>1.457</td>
<td>2.75%</td>
</tr>
<tr>
<td>January 2000</td>
<td>2.105</td>
<td>2.05%</td>
</tr>
</tbody>
</table>
Fundamentals hold in every market: PBV regressions across markets- January 2012

<table>
<thead>
<tr>
<th>Region</th>
<th>Regression – January 2012</th>
<th>R squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia, NZ &amp; Canada</td>
<td>PBV = 0.90 + 0.92 Payout – 0.18 Beta + 5.43 ROE</td>
<td>38.6%</td>
</tr>
<tr>
<td>Europe</td>
<td>PBV = 1.14 + 0.76 Payout – 0.67 Beta + 7.56 ROE</td>
<td>47.2%</td>
</tr>
<tr>
<td>Japan</td>
<td>PBV = 1.21 + 0.67 Payout – 0.40 Beta + 3.26 ROE</td>
<td>22.1%</td>
</tr>
<tr>
<td>Emerging Markets</td>
<td>PBV = 0.77 + 1.16 Payout – 0.17 Beta + 5.78 ROE</td>
<td>20.8%</td>
</tr>
<tr>
<td>US</td>
<td>PBV = 1.30 + 0.06 Payout – 0.32 Beta + 9.56 ROE</td>
<td>52.7%</td>
</tr>
</tbody>
</table>
Relative Valuation: Some closing propositions

- **Proposition 1:** In a relative valuation, all that you are concluding is that a stock is under or over valued, relative to your comparable group.
  - Your relative valuation judgment can be right and your stock can be hopelessly over valued at the same time.

- **Proposition 2:** In asset valuation, there are no similar assets. Every asset is unique.
  - If you don’t control for fundamental differences in risk, cashflows and growth across firms when comparing how they are priced, your valuation conclusions will reflect your flawed judgments rather than market misvaluations.
Choosing Between the Multiples

- As presented in this section, there are dozens of multiples that can be potentially used to value an individual firm.
- In addition, relative valuation can be relative to a sector (or comparable firms) or to the entire market (using the regressions, for instance)
- Since there can be only one final estimate of value, there are three choices at this stage:
  - Use a simple average of the valuations obtained using a number of different multiples
  - Use a weighted average of the valuations obtained using a number of different multiples
  - Choose one of the multiples and base your valuation on that multiple
Picking one Multiple

This is usually the best way to approach this issue. While a range of values can be obtained from a number of multiples, the “best estimate” value is obtained using one multiple.

The multiple that is used can be chosen in one of two ways:

- Use the multiple that best fits your objective. Thus, if you want the company to be undervalued, you pick the multiple that yields the highest value.
- Use the multiple that has the highest R-squared in the sector when regressed against fundamentals. Thus, if you have tried PE, PBV, PS, etc. and run regressions of these multiples against fundamentals, use the multiple that works best at explaining differences across firms in that sector.
- Use the multiple that seems to make the most sense for that sector, given how value is measured and created.
Managers in every sector tend to focus on specific variables when analyzing strategy and performance. The multiple used will generally reflect this focus. Consider three examples:

• In retailing: The focus is usually on same store sales (turnover) and profit margins. Not surprisingly, the revenue multiple is most common in this sector.

• In financial services: The emphasis is usually on return on equity. Book Equity is often viewed as a scarce resource, since capital ratios are based upon it. Price to book ratios dominate.

• In technology: Growth is usually the dominant theme. PEG ratios were invented in this sector.
## Conventional usage…

<table>
<thead>
<tr>
<th>Sector</th>
<th>Multiple Used</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyclical Manufacturing</td>
<td>PE, Relative PE</td>
<td>Often with normalized earnings</td>
</tr>
<tr>
<td>Growth firms</td>
<td>PEG ratio</td>
<td>Big differences in growth rates</td>
</tr>
<tr>
<td>Young growth firms w/ losses</td>
<td>Revenue Multiples</td>
<td>What choice do you have?</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>EV/EBITDA</td>
<td>Early losses, big DA</td>
</tr>
<tr>
<td>REIT</td>
<td>P/CFE (where CFE = Net income + Depreciation)</td>
<td>Big depreciation charges on real estate</td>
</tr>
<tr>
<td>Financial Services</td>
<td>Price/ Book equity</td>
<td>Marked to market?</td>
</tr>
<tr>
<td>Retailing</td>
<td>Revenue multiples</td>
<td>Margins equalize sooner or later</td>
</tr>
</tbody>
</table>
Reviewing: The Four Steps to Understanding Multiples

- Define the multiple
  - Check for consistency
  - Make sure that they are estimated uniformly

- Describe the multiple
  - Multiples have skewed distributions: The averages are seldom good indicators of typical multiples
  - Check for bias, if the multiple cannot be estimated

- Analyze the multiple
  - Identify the companion variable that drives the multiple
  - Examine the nature of the relationship

- Apply the multiple
A closing thought…