Advanced Valuation

Aswath Damodaran

www.damodaran.com
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.
The value of an asset is the present value of the expected cash flows on that asset, over its expected life:

\[
\text{Value of asset} = \frac{E(CF_1)}{(1+r)} + \frac{E(CF_2)}{(1+r)^2} + \frac{E(CF_3)}{(1+r)^3} + \cdots + \frac{E(CF_n)}{(1+r)^n}
\]

Proposition 1: If “it” does not affect the cash flows or alter risk (thus changing discount rates), “it” cannot affect value.

Proposition 2: For an asset to have value, the expected cash flows have to be positive some time over the life of the asset.

Proposition 3: 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><strong>Existing Investments</strong></td>
<td><strong>Debt</strong></td>
</tr>
<tr>
<td>Generate cashflows today</td>
<td>Fixed Claim on cash flows</td>
</tr>
<tr>
<td>Includes long lived (fixed)</td>
<td>Little or No role in management</td>
</tr>
<tr>
<td>and short-lived (working capital) assets</td>
<td>Fixed Maturity</td>
</tr>
<tr>
<td></td>
<td>Tax Deductible</td>
</tr>
<tr>
<td><strong>Assets in Place</strong></td>
<td><strong>Equity</strong></td>
</tr>
<tr>
<td></td>
<td>Residual Claim on cash flows</td>
</tr>
<tr>
<td><strong>Growth Assets</strong></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
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**

- **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 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)**
  Stable growth firm, with no or very limited excess returns
DISCOUNTED CASHFLOW VALUATION

**Cashflow to Firm**

- EBIT \(1-t\)
- (Cap Ex - Depr)
- Change in WC
- \(= FCFF\)

**Expected Growth**

- Reinvestment Rate * Return on Capital

Firm is in stable growth: Grows at constant rate forever

**Terminal Value**

\[ FCFF_{n+1} / (r-g) \]

**Value of Operating Assets**

+ Cash & Non-op Assets

- Value of Firm
- Value of Debt

- Value of Equity

**Discount**

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

**Cost of Equity**

\( (\text{Riskfree Rate} + \text{Default Spread}) (1-t) \)

**Cost of Debt**

\( (\text{Beta} \times \text{Risk Premium}) \)

- Measures market risk
- Premium for average risk investment

**Weights**

Based on Market Value

**Value of Operating Assets**

\[ \text{Value of Operating Assets} + \text{Value of Non-op Assets} \]

\[ = \text{Value of Firm} \]

\[ - \text{Value of Debt} \]

\[ = \text{Value of Equity} \]

**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

**Type of Business**

Operating

Leverage

Financial

Leverage

Base Equity

Premium

Country Risk

Premium
### Current Cashflow to Firm

\[
\text{EBIT}(1-t) = 0.7336(1-0.28) = 0.5058
\]

- \(\text{Nt CpX} = 6443\)
- \(\text{Chg WC} = 37\)
- FCFF = 6408/6058 = 106.98%
- Return on capital = 16.71%

### Expected Growth in EBIT (1-t)

\[0.60\times 0.16 = 0.096\]  
Expected growth = 9.6%

### Stable Growth

- \(\text{g} = 4\%\); \(\text{Beta} = 1.10\);  
- Debt Ratio = 20\%; Tax rate = 35\%;  
- Cost of capital = 8.08\%;  
- ROC = 10.00\%;  
- Reinvestment Rate = 4/10 = 40\%

### Terminal Value

\[\text{Terminal Value} = \frac{7300}{0.0808 - 0.04} = 179,099\]

### Cost of Capital (WACC)

\[\text{WACC} = 11.7\% \times 0.90 + 3.68\% \times 0.10 = 10.90\%\]

### Operations Assets

\[
\begin{align*}
\text{Op. Assets} & = 94,214 \\
\text{Cash} & = 1,283 \\
\text{Debt} & = 8,272 \\
\text{Equity} & = 87,226 \\
\text{Options} & = 479 \\
\text{Value/Share} & = 74.33
\end{align*}
\]

### First 5 years

<table>
<thead>
<tr>
<th>Year</th>
<th>EBIT</th>
<th>EBIT (1-t)</th>
<th>Reinvestment</th>
<th>FCFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$9,221</td>
<td>$6,639</td>
<td>$3,983</td>
<td>$2,656</td>
</tr>
<tr>
<td>2</td>
<td>$10,106</td>
<td>$7,276</td>
<td>$4,366</td>
<td>$2,911</td>
</tr>
<tr>
<td>3</td>
<td>$11,076</td>
<td>$7,975</td>
<td>$4,785</td>
<td>$3,190</td>
</tr>
<tr>
<td>4</td>
<td>$12,140</td>
<td>$8,741</td>
<td>$5,244</td>
<td>$3,496</td>
</tr>
<tr>
<td>5</td>
<td>$13,305</td>
<td>$9,580</td>
<td>$5,748</td>
<td>$3,832</td>
</tr>
<tr>
<td>6</td>
<td>$14,433</td>
<td>$10,392</td>
<td>$5,820</td>
<td>$4,573</td>
</tr>
<tr>
<td>7</td>
<td>$15,496</td>
<td>$11,157</td>
<td>$5,802</td>
<td>$5,355</td>
</tr>
<tr>
<td>8</td>
<td>$16,463</td>
<td>$11,853</td>
<td>$5,482</td>
<td>$6,164</td>
</tr>
<tr>
<td>9</td>
<td>$17,306</td>
<td>$12,460</td>
<td>$5,183</td>
<td>$6,978</td>
</tr>
<tr>
<td>10</td>
<td>$17,998</td>
<td>$12,958</td>
<td>$4,785</td>
<td>$7,775</td>
</tr>
</tbody>
</table>

### Expected Growth decreases gradually to 4%

### Terminal Value

\[\text{Terminal Value} = \frac{7300}{0.0808 - 0.04} = 179,099\]

### Cost of Equity

11.70\%

### Cost of Debt

\[(4.78\% + 0.85\%)(1 - 0.35) = 3.66\%\]

### Weights

\[E = 90\% \quad D = 10\%\]

### Riskfree Rate

Riskfree rate = 4.78\%

### Beta

1.73

\[\text{Beta} \times \text{Risk Premium} = 1.73 \times 4\% = 6.92\%\]

### Unlevered Beta for Sectors

1.59

\[\text{D/E} = \frac{1.106}{1.59} = 0.70\]

### On May 1, 2007, Amgen was trading at $55/share
Valuing Dr. Reddy’s Labs

Current Cashflow to Firm
EBIT(1-t) = 19,332 (1-.2171) = 15,805
- Nt CpX = 9,266
- Chg WC = 6,788
= FCF = -248
Reinvestment Rate = 16,053/15,805 = 101.57%
Return on capital = 28.93%

Expected Growth in EBIT (1-t)
1.0157* .2893 = .0586 = 29.39%

Reinvestment Rate = 16,053/15,805 = 101.57%

Return on Capital = 28.93%

Op. Assets 259,323 + Cash: 5,730 - Debt 20,216 = Equity 244,838

Value/Share Rs 1,444

Cost of Capital (WACC) = 14.28% (0.936) + 4.39% (0.064) = 14.28%

Expected Growth in EBIT (1-t)
1.0157* .2893 = .0586 = 29.39%

First 5 years
Growth decreases gradually to 6%

Year
1 2 3 4 5 6 7 8 9 10
EBIT (1-t) 20450 26460 34235 44296 57313 71475 85792 98965 109532 116104
- Reinvestment 20771 26875 34773 44992 58213 64454 67592 66695 61337 51790
FCFF -321 -416 -538 -696 -900 7020 18201 32270 48195 64314

Term Yr 103,771 37,738 8,551 57,484
Tax rate increases to 35%
Debt ratio stays unchanged
Beta decreases to 1.00

On March 14, 2012, Dr. Reddy’s was trading at Rs 1747
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

**Expected Growth from new inv.**
\[ .70 \times 1.1716 = 0.1201 \]

**Return on Capital**
17.16%

**Terminal Value**
\[ \frac{23493}{0.1039 - 0.05} = Rs 435,686 \]

**Discount at Cost of Capital (WACC)**
\[ 14.00\% \times 0.747 + 8.09\% \times 0.253 = 12.50\% \]

**Cost of Equity**
14.00%

**Cost of Debt**
8.09%

**Weights**
- E: 74.7%
- D: 25.3%

**Riskfree Rate**
5%

**Beta**
1.20

**Mature market premium**
4.5%

**Country Equity Risk Premium**
4.50%

**Country Default Spread**
3%

**Country Premium**
3%

**Hei Equity Mkt Vol**
1.50

**On April 1, 2010**
Tata Motors price = Rs 781
DCF Inputs

“Garbage in, garbage out”
I. Measure earnings right..

- Firm's history
- Comparable Firms

Normalize Earnings

- 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
Operating Leases at Amgen in 2007

- Amgen has lease commitments and its cost of debt (based on it’s A rating) is 5.63%.

<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
Capitalizing R&D Expenses: Amgen

- R & D was assumed to have a 10-year life.

<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>3366.00</td>
<td>1.00</td>
<td>3366.00</td>
</tr>
<tr>
<td>-1</td>
<td>2314.00</td>
<td>0.90</td>
<td>2082.60</td>
</tr>
<tr>
<td>-2</td>
<td>2028.00</td>
<td>0.80</td>
<td>1622.40</td>
</tr>
<tr>
<td>-3</td>
<td>1655.00</td>
<td>0.70</td>
<td>1158.50</td>
</tr>
<tr>
<td>-4</td>
<td>1117.00</td>
<td>0.60</td>
<td>670.20</td>
</tr>
<tr>
<td>-5</td>
<td>865.00</td>
<td>0.50</td>
<td>432.50</td>
</tr>
<tr>
<td>-6</td>
<td>845.00</td>
<td>0.40</td>
<td>338.00</td>
</tr>
<tr>
<td>-7</td>
<td>823.00</td>
<td>0.30</td>
<td>246.90</td>
</tr>
<tr>
<td>-8</td>
<td>663.00</td>
<td>0.20</td>
<td>132.60</td>
</tr>
<tr>
<td>-9</td>
<td>631.00</td>
<td>0.10</td>
<td>63.10</td>
</tr>
<tr>
<td>-10</td>
<td>558.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Value of Research Asset = $10,112.80 - $1,149.90

Adjusted Operating Income = $5,120 + 3,366 - 1,150 = $7,336 million
II. Get the big picture (not the accounting one) when it comes to cap ex and working capital

- **Capital expenditures should include**
  - Research and development expenses, once they have been re-categorized as capital expenses.
  - Acquisitions of other firms, whether paid for with cash or stock.

- **Working capital should be defined not as the difference between current assets and current liabilities but as the difference between non-cash current assets and non-debt current liabilities.**

- On both items, start with what the company did in the most recent year but do look at the company’s history and at industry averages.
Amgen’s Net Capital Expenditures

- The accounting net cap ex at Amgen is small:
  
  \[
  \text{Accounting Capital Expenditures} = \$1,218 \text{ million} \\
  - \text{Accounting Depreciation} = \$963 \text{ million} \\
  \text{Accounting Net Cap Ex} = \$255 \text{ million}
  \]

- We define capital expenditures broadly to include R&D and acquisitions:
  
  \[
  \text{Accounting Net Cap Ex} = \$255 \text{ million} \\
  \text{Net R&D Cap Ex} = (3366-1150) = \$2,216 \text{ million} \\
  \text{Acquisitions in 2006} = \$3,975 \text{ million} \\
  \text{Total Net Capital Expenditures} = \$6,443 \text{ million}
  \]

- Acquisitions have been a volatile item. Amgen was quiet on the acquisition front in 2004 and 2005 and had a significant acquisition in 2003.
III. Betas do not come from regressions... and are noisy...
Even against local indices…
Look better for some companies, but looks can be deceptive…
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.

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
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.

Implications
1. Firms with high infrastructure needs and rigid cost structures should have higher betas than firms with flexible cost structures.
2. Smaller firms should have higher betas than larger firms.
3. Young firms should have higher betas.

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

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

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

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))

Possible Refinements

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

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

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?
IV. And the past is not always a good indicator of the future

- It is standard practice to use historical premiums as forward looking premiums.:

<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>

- An alternative is to back out the premium from market prices:

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

January 1, 2012  
S&P 500 is at 1257.60  
Adjusted Dividends & Buybacks for 2011 = 59.29  

\[
1257.60 = \frac{63.54}{(1+r)} + \frac{68.11}{(1+r)^2} + \frac{73.00}{(1+r)^3} + \frac{78.24}{(1+r)^4} + \frac{83.86}{(1+r)^5} + (r-0.0187)(1+r)^5
\]

<table>
<thead>
<tr>
<th></th>
<th>63.54</th>
<th>68.11</th>
<th>73.00</th>
<th>78.24</th>
<th>83.86</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected Return on Stocks (1/1/12)</td>
<td>7.91%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T.Bond rate on 1/1/12</td>
<td>1.87%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equity Risk Premium = 8.03% - 3.29%</td>
<td>6.04%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Implied Premiums in the US: 1960-2011

Implied Premium for US Equity Market
The Anatomy of a Crisis: Implied ERP from September 12, 2008 to January 1, 2009

![Graph showing implied equity risk premium from September 12, 2008 to December 31, 2008.]

Average implied ERP: 1960-2007 = 4.80%
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%
An updated implied ERP for India: May 2012

Analysts expect earnings to grow 14.03% in 2012, 13.84% in 2013, 7.5% in 2014 and at 6.5% thereafter, resulting in a compounded annual growth rate of 9.62% over the next 5 years. We will assume that FCFE will grow 9.62% a year for the next 5 years.

After year 5, we will assume that earnings on the index will grow at 6.50%, the same rate as the entire economy (= riskfree rate).

<table>
<thead>
<tr>
<th>Year</th>
<th>FCFE</th>
<th>Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>16200</td>
<td>14.03%</td>
</tr>
<tr>
<td>2013</td>
<td>18046</td>
<td>13.84%</td>
</tr>
<tr>
<td>2014</td>
<td>18551</td>
<td>7.50%</td>
</tr>
<tr>
<td>2015</td>
<td>18866</td>
<td>6.50%</td>
</tr>
<tr>
<td>2016</td>
<td>19102</td>
<td>6.50%</td>
</tr>
<tr>
<td>2017</td>
<td>19363</td>
<td>6.50%</td>
</tr>
<tr>
<td>2018</td>
<td>19643</td>
<td>6.50%</td>
</tr>
<tr>
<td>2019</td>
<td>19942</td>
<td>6.50%</td>
</tr>
<tr>
<td>2020</td>
<td>20258</td>
<td>6.50%</td>
</tr>
</tbody>
</table>

\[
\text{Expected Return on Stocks 5/15/12} = \frac{976.60}{(1+r)} + \frac{1070.65}{(1+r)^2} + \frac{1173.63}{(1+r)^3} + \frac{1286.52}{(1+r)^4} + \frac{1410.26}{(1+r)^5} + \frac{1410.26(1.065)}{(r-0.065)(1+r)^5}
\]

\[
\text{Indian Rs riskfree rate on 5/15/12} = 6.50\%
\]
\[
\text{Equity Risk Premium} = 13.27\% - 6.50\% = 6.77\%
\]
V. There is a downside to globalization…

- Emerging markets offer growth opportunities but they are also riskier. If we want to count the growth, we have to also consider the risk.

- Two ways of estimating the country risk premium:
  - *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.
    - Equity Risk Premium for mature market = 4.5%
    - Equity Risk Premium for India = 4.5% + 3% = 7.5%
  - *Adjusted for equity risk*: The country equity risk premium is based upon the volatility of the equity market relative to the government bond rate.
    - Country risk premium = Default Spread $\times \frac{\sigma_{\text{Country Equity}}}{\sigma_{\text{Country Bond}}}$
    - Standard Deviation in Sensex = 21%
    - Standard Deviation in Indian government bond = 14%
    - Default spread on Indian Bond = 2%
    - Additional country risk premium for India = 2% (21/14) = 3%
    - Total equity risk premium = US equity risk premium + CRP for India = 6% + 3% = 9%
Country Risk Premiums
January 2012

Austria [1] 6.00%
Belgium [1] 7.05%
Cyprus [1] 9.00%
Denmark 6.00%
Finland [1] 6.00%
France [1] 6.00%
Germany [1] 6.00%
Greece [1] 16.50%
Iceland 9.00%
Ireland [1] 9.00%
Italy [1] 7.50%
Malta [1] 7.50%
Netherlands [1] 6.00%
Norway 6.00%
Portugal [1] 10.13%
Spain [1] 7.28%
Sweden 6.00%
Switzerland 6.00%
United Kingdom 6.00%

Albania 12.00%
Armenia 10.13%
Azerbaijan 9.60%
Belarus 15.00%
Bosnia and Herzegovina 13.50%
Bulgaria 8.63%
Croatia 9.00%
Czech Republic 7.28%
Estonia 7.28%
Georgia 10.88%
Hungary 9.60%
Kazakhstan 8.63%
Latvia 9.00%
Lithuania 8.25%
Moldova 15.00%
Montenegro 10.88%
Poland 7.50%
Romania 9.00%
Russia 8.25%
Slovakia 7.28%
Slovenia [1] 7.28%
Ukraine 13.50%

Bangladesh 10.88%
Cambodia 13.50%
China 7.05%
Fiji Islands 12.00%
Hong Kong 6.38%
India 9.00%
Indonesia 9.60%
Japan 7.05%
Korea 7.28%
Macao 7.05%
Malaysia 7.73%
Mongolia 12.00%
Pakistan 15.00%
Papua New Guinea 12.00%
Philippines 10.13%
Singapore 6.00%
Sri Lanka 12.00%
Taiwan 7.05%
Thailand 8.25%
Turkey 10.13%
Vietnam 12.00%

Argentina 15.00%
Belize 15.00%
Bolivia 12.00%
Brazil 8.63%
Chile 7.05%
Colombia 9.00%
Costa Rica 9.00%
Ecuador 18.75%
El Salvador 10.13%
Guatemala 9.60%
Honduras 13.50%
Mexico 8.25%
Nicaragua 15.00%
Panama 9.00%
Paraguay 12.00%
Peru 9.00%
Uruguay 9.60%
Venezuela 12.00%
Angola 10.88%
Botswana 7.50%
Egypt 13.50%
Mauritius 8.63%
Morocco 9.60%
Namibia 9.00%
South Africa 7.73%
Tunisia 9.00%

Bahrain 8.25%
Israel 7.28%
Jordan 10.13%
Kuwait 6.75%
Lebanon 12.00%
Oman 7.28%
Qatar 6.75%
Saudi Arabia 7.05%
Senegal 12.00%
United Arab Emirates 6.75%

Australia 6.00%
New Zealand 6.00%

VI. And it is not just emerging market companies that are exposed to this risk.

- If we 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)
  
  \[ E(\text{Return}) = \text{Riskfree Rate} + \beta \text{ (US premium)} + \lambda \text{ (Country ERP)} \]

- The easiest and most accessible data is on revenues. Most companies break their revenues down by region. 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. 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:

\[
\begin{align*}
\lambda_{\text{Tata Motors}} &= \frac{91\%}{80\%} = 1.14 \\
\lambda_{\text{TCS}} &= \frac{7.62\%}{80\%} = 0.09
\end{align*}
\]

- There are two implications
  - A company’s risk exposure is determined by where it does business and not by where it is located
  - Firms might be able to actively manage their country risk exposures
## Estimating lambdas: Tata Motors, Dr. Reddy’s and TCS

<table>
<thead>
<tr>
<th></th>
<th>Tata Motors</th>
<th>Dr. Reddy’s</th>
<th>TCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of production/</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>operations in India</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of revenues in</td>
<td>91.37% (in</td>
<td>Estimated</td>
<td>High (13%)</td>
</tr>
<tr>
<td>India</td>
<td>2009)</td>
<td>70% (in 2010)</td>
<td>7.62%</td>
</tr>
<tr>
<td>Lambda</td>
<td>0.80</td>
<td>0.30</td>
<td>0.20</td>
</tr>
<tr>
<td>Flexibility in</td>
<td>Low.</td>
<td>High.</td>
<td>High. Human</td>
</tr>
<tr>
<td>moving operations</td>
<td>Significant</td>
<td></td>
<td>capital is Mobile.</td>
</tr>
<tr>
<td></td>
<td>physical assets.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
VII. Discount rates can (and often should) change over time…

- The inputs into the cost of capital - the cost of equity (beta), the cost of debt (default risk) and the debt ratio - can change over time. For younger firms, they should change over time.
- At the minimum, they should change when you get to your terminal year to inputs that better reflect a mature firm.
VIII. Growth has to be earned (not endowed or estimated)

Expected Growth

- **Net Income**
  - **Retention Ratio** = \(1 - \frac{\text{Dividends}}{\text{Net Income}}\)
  - **Return on Equity** = \(\frac{\text{Net Income}}{\text{Book Value of Equity}}\)

- **Operating Income**
  - **Reinvestment Rate** = \(\frac{(\text{Net Cap Ex} + \text{Chg in WC})}{\text{EBIT(1-t)}}\)
  - **Return on Capital** = \(\frac{\text{EBIT(1-t)}}{\text{Book Value of Capital}}\)

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

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

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

Adjust book value of debt for:
- a. Capitalized operating leases

Use end of prior year numbers or average over the year but be consistent in your application

Use a marginal tax rate to be safe. A high ROC created by paying low effective taxes is not sustainable.
IX. All good things come to an end..And the terminal value is not an ATM...

\[
\text{Terminal Value}_n = \frac{\text{EBIT}_{n+1} (1 - \text{tax rate}) (1 - \text{Reinvestment Rate})}{\text{Cost of capital - Expected growth rate}}
\]

This tax rate locks in forever. Does it make sense to use an effective tax rate?

Are you reinvesting enough to sustain your stable growth rate? Check
Reinv Rate = \( g / \text{ROC} \)

This is a mature company. It’s cost of capital should reflect that.

This growth rate should be less than the nominal growth rate of the economy.
## 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>
</tr>
<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>
</tr>
<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>
The loose ends in valuation...
The loose ends matter…

<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 | Should there be a discount for illiquidity/ marketability?  
Should there be a discount for minority interests? |
| = Value per share | |

Aswath Damodaran
1. The Value of Cash
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>Argentina</td>
</tr>
</tbody>
</table>

In which of these companies is cash most likely to trade at face value, at a discount and at a premium?
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

- 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>
</tr>
<tr>
<td>Wal-mart</td>
<td>38</td>
<td>244</td>
</tr>
<tr>
<td>Exxon Mobil</td>
<td>86</td>
<td>332</td>
</tr>
<tr>
<td>Pfizer</td>
<td>171</td>
<td>460</td>
</tr>
<tr>
<td>Citigroup</td>
<td>252</td>
<td>1026</td>
</tr>
<tr>
<td>Intel</td>
<td>69</td>
<td>215</td>
</tr>
<tr>
<td>AIG</td>
<td>164</td>
<td>720</td>
</tr>
<tr>
<td>Johnson &amp; Johnson</td>
<td>63</td>
<td>218</td>
</tr>
<tr>
<td>IBM</td>
<td>85</td>
<td>353</td>
</tr>
</tbody>
</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><strong>Operating Income</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Multiple Businesses</td>
<td>Number of businesses (with more than 10% of revenues) =</td>
<td>1</td>
<td>2.00</td>
<td>2</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>2. One-time income and expenses</td>
<td>Percent of operating income =</td>
<td>10%</td>
<td>10.00</td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>3. Income from unspecified sources</td>
<td>Percent of operating income =</td>
<td>0%</td>
<td>10.00</td>
<td>0</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td>4. Items in income statement that are volatile</td>
<td>Percent of operating income =</td>
<td>15%</td>
<td>5.00</td>
<td>0.75</td>
<td>1</td>
</tr>
<tr>
<td><strong>Tax Rate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Income from multiple locales</td>
<td>Percent of revenues from non-domestic locales =</td>
<td>70%</td>
<td>3.00</td>
<td>2.1</td>
<td>1.8</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>2</td>
</tr>
<tr>
<td><strong>Capital Expenditures</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Volatile capital expenditures</td>
<td>Yes or No</td>
<td>Yes</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Frequent and large acquisitions</td>
<td>Yes or No</td>
<td>Yes</td>
<td>4</td>
<td>4</td>
<td></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><strong>Working capital</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Unspecified current assets and current liabilities</td>
<td>Yes or No</td>
<td>Yes</td>
<td>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><strong>Expected Growth rate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></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>Is your return on capital volatile?</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>Is your firm's ROC much higher than industry average?</td>
<td>No</td>
<td>Yes=5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Cost of capital</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Multiple businesses</td>
<td>Number of businesses (more than 10% of revenues) =</td>
<td>1</td>
<td>1.00</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>2. Operations in emerging markets</td>
<td>Percent of revenues =</td>
<td>50%</td>
<td>5.00</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>3. Is the debt market traded?</td>
<td>Yes or No</td>
<td>Yes</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>Yes=5</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td><strong>No-operating assets</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Minority holdings as percent of book assets</td>
<td>Minority holdings as percent of book assets</td>
<td>0%</td>
<td>20.00</td>
<td>0</td>
<td>0.8</td>
</tr>
<tr>
<td><strong>Firm to Equity value</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Consolidation of subsidiaries</td>
<td>Minority interest as percent of book value of equity</td>
<td>63%</td>
<td>20.00</td>
<td>12.6</td>
<td>1.2</td>
</tr>
<tr>
<td><strong>Per share value</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Shares with different voting rights</td>
<td>Does the firm have shares with different voting rights?</td>
<td>Yes</td>
<td>Yes = 10</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>2. Equity options outstanding</td>
<td>Options outstanding as percent of shares</td>
<td>0%</td>
<td>10.00</td>
<td>0</td>
<td>0.25</td>
</tr>
</tbody>
</table>

Complexity Score = 48.95

Aswath Damodaran
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:

\[ PBV = 0.65 + 15.31 \text{ ROE} - 0.55 \text{ Beta} + 3.04 \text{ Expected growth rate} - 0.003 \times \text{# Pages in 10K} \]
5. 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
- Longer growth period
- Higher reinvestment
- Higher growth rate

Economies of Scale
- Cost savings in current operations
- 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
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>
<th>Notes</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>
<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>$17,185</td>
</tr>
</tbody>
</table>

Aswath Damodaran

53
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.
## 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>
<tr>
<td>Stable Growth Period</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Growth rate in steady state =</td>
<td>4.00%</td>
<td>4.00%</td>
</tr>
<tr>
<td>Return on capital =</td>
<td>7.65%</td>
<td>7.65%</td>
</tr>
<tr>
<td>Reinvestment Rate =</td>
<td>52.28%</td>
<td>52.28%</td>
</tr>
<tr>
<td>Cost of Capital =</td>
<td>7.65%</td>
<td>7.65%</td>
</tr>
<tr>
<td><strong>Value of Firm =</strong></td>
<td><strong>$79,611.25</strong></td>
<td><strong>$15,371.24</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
But 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.

\[
\text{Value of Gaining Control} = \text{Present Value (Value of Company with change in control - Value of company without change in control)} + \text{Side Benefits of Control}\]
Increase Cash Flows

- 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

Reduce the cost of capital

- Make your product/service less discretionary
  - Reduce Operating leverage
    - Reduce beta
- Cost of Equity * (Equity/Capital) + Pre-tax Cost of Debt (1-t) * Debt/Capital
  - Live off past over-investment
  - Better inventory management and tighter credit policies
  - Match your financing to your assets: Reduce your default risk and cost of debt
  - Change financing mix to reduce cost of capital

Firm Value

Increase Expected Growth

- Reinvest more in projects
- Increase operating margins
- Reinvestment Rate
  * Return on Capital
  = Expected Growth Rate

- Do acquisitions
  - Increase capital turnover ratio
  - Increase expected growth

Increase length of growth period

- Build on existing competitive advantages
- Create new competitive advantages
Aswath Damodaran

Aswath Damodaran

Adris Grupa (Status Quo): 4/2010

Current Cashflow to Firm

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

Reinv Rate = (3-118)/436= -26.35%

Tax rate = 17.35%

Return on capital = 8.72%

**Expected Growth**

- **Reinvestment Rate :** 70.83%
- **Return on Capital :** 9.69%

**Expected Growth from new inv.**

0.7083*0.0969 = 0.0686 or 6.86%

**Terminal Value**

5 = 365/(.0992-.04) = 6170 HRK

**HKR Cashflows**

<table>
<thead>
<tr>
<th>Year</th>
<th>EBIT (1-t)</th>
<th>Reinvestment</th>
<th>FCFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HRK 466</td>
<td>HRK 330</td>
<td>HRK 136</td>
</tr>
<tr>
<td>2</td>
<td>HRK 498</td>
<td>HRK 363</td>
<td>HRK 145</td>
</tr>
<tr>
<td>3</td>
<td>HRK 532</td>
<td>HRK 377</td>
<td>HRK 155</td>
</tr>
<tr>
<td>4</td>
<td>HRK 569</td>
<td>HRK 403</td>
<td>HRK 166</td>
</tr>
<tr>
<td>5</td>
<td>HRK 608</td>
<td>HRK 431</td>
<td>HRK 177</td>
</tr>
</tbody>
</table>

**Discount at $ Cost of Capital (WACC) = 10.7% (.974) + 5.40% (0.026) = 10.55%**

**On May 1, 2010**

AG Pfd price = 279 HRK
AG Common = 345 HRK

**Riskfree Rate:**

HRK Riskfree Rate = 4.25%

**Beta:** 0.70

**Mature market premium:** 4.5%

**Unlevered Beta for Sectors:** 0.68

**Firm’s D/E Ratio:** 2.70%

**Country Default Spread 2%**

**Country Premium:** 2%

**Beta:** 0.80

**Cost of capital = 9.92%**

**Return on capital (ROC) = 9.92%**

**Reinvestment Rate = g/ROC = 4/9.92 = 40.32%**

Cost of Equity 10.70%

Cost of Debt

(4.25%+ 0.5%+2%(1-.20) = 5.40 %

Weights

E = 97.4% D = 2.6%

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(4.25%+ 0.5%+2%(1-.20) = 5.40 %

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E = 97.4% D = 2.6%

**Unlevered Beta for Sectors:** 0.68

**CRP for Croatia**

Lambda 0.68 X 0.68

CRP for Central Europe

Lambda 0.42 X 0.68

CRP for Croatia

Country Default Spread 2%

Country Default Spread 2%

Country Default Spread 2%

Country Default Spread 2%

Country Default Spread 2%
### Current Cashflow to Firm

Average from 2004-09

<table>
<thead>
<tr>
<th>EBIT(1-t)</th>
<th>436 HRK</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Nt CpX</td>
<td>3 HRK</td>
</tr>
<tr>
<td>- Chg WC</td>
<td>-118 HRK</td>
</tr>
</tbody>
</table>

= FCFF 551 HRK

Reinv Rate = (3-118)/436 = -26.35%;
Return on capital = 8.72%

### Expected Growth from new inv.

\[ 0.7083 \times 0.01054 = 0. \]

or 6.86%

### Terminal Value

\[ 551 / (0.0965 - 0.04) = 6508 \text{ HRK} \]

### Discount at $ Cost of Capital (WACC) = 11.12% (.90) + 8.20% (0.10) = 10.55%

### Adris Grupa: 4/2010 (Restructured)

### 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\%

### Lambda

\[ \begin{array}{c}
\text{Beta} \\
\text{Mature market premium} \\
\text{Country Default Spread}
\end{array} \times \begin{array}{c}
\lambda_1 \\
\lambda_2 \\
\lambda_3
\end{array} \]

\[ \begin{array}{c}
0.75 \\
4.5\% \\
2\%
\end{array} \times \begin{array}{c}
0.68 \\
4.2 \\
0.68
\end{array} \]

\[ \begin{array}{c}
\text{Firm's D/E Ratio: 11.1\%} \\
\text{Rel Equity Mkt Vol: 1.50}
\end{array} \]

### On May 1, 2010

AG Pfd price = 279 HRK
AG Common = 345 HRK

### Change in mix of debt and equity to optimal
Value of Control and the Value of Voting Rights

- The value of control at Adris Grupa can be computed as the difference between the status quo value (5469) and the optimal value (5735).
- 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
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?
The Dark Side of Valuation…

- 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?
- What is the value added by growth assets?
- How risky are the cash flows from both existing assets and growth assets?
  - Limited historical data on earnings, and no market prices for securities makes it difficult to assess risk.
- 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

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

Sales Turnover Ratio: 3.00
Revenue Growth: 42%
Expected Margin: -> 10.00%

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenues</th>
<th>EBIT</th>
<th>EBIT (1-t)</th>
<th>FCFF</th>
<th>Cost of Debt</th>
<th>Cost of Equity</th>
<th>Cost of Capital</th>
<th>Reinvestment</th>
<th>AT cost of Debt</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$2,793</td>
<td>-$373</td>
<td>-$559</td>
<td>-$931</td>
<td>8.00%</td>
<td>12.90%</td>
<td>12.84%</td>
<td>$559</td>
<td>8.00%</td>
</tr>
<tr>
<td>2</td>
<td>5,585</td>
<td>-$94</td>
<td>$931</td>
<td>$1,024</td>
<td>8.00%</td>
<td>12.90%</td>
<td>12.84%</td>
<td>$1,024</td>
<td>8.00%</td>
</tr>
<tr>
<td>3</td>
<td>9,774</td>
<td>$407</td>
<td>$1,396</td>
<td>$1,924</td>
<td>8.00%</td>
<td>12.90%</td>
<td>12.84%</td>
<td>$1,924</td>
<td>8.00%</td>
</tr>
<tr>
<td>4</td>
<td>14,661</td>
<td>$1,038</td>
<td>$1,629</td>
<td>$1,629</td>
<td>8.00%</td>
<td>12.90%</td>
<td>12.84%</td>
<td>$1,629</td>
<td>8.00%</td>
</tr>
<tr>
<td>5</td>
<td>19,059</td>
<td>$1,628</td>
<td>$1,466</td>
<td>$1,601</td>
<td>8.00%</td>
<td>12.90%</td>
<td>12.84%</td>
<td>$1,601</td>
<td>8.00%</td>
</tr>
<tr>
<td>6</td>
<td>23,862</td>
<td>$2,212</td>
<td>$1,348</td>
<td>$1,212</td>
<td>8.00%</td>
<td>12.90%</td>
<td>12.84%</td>
<td>$1,212</td>
<td>8.00%</td>
</tr>
<tr>
<td>7</td>
<td>28,729</td>
<td>$2,768</td>
<td>$1,799</td>
<td>$1,799</td>
<td>8.00%</td>
<td>12.90%</td>
<td>12.84%</td>
<td>$1,799</td>
<td>8.00%</td>
</tr>
<tr>
<td>8</td>
<td>33,211</td>
<td>$3,261</td>
<td>$2,119</td>
<td>$2,119</td>
<td>8.00%</td>
<td>12.90%</td>
<td>12.84%</td>
<td>$2,119</td>
<td>8.00%</td>
</tr>
<tr>
<td>9</td>
<td>36,798</td>
<td>$3,361</td>
<td>$2,370</td>
<td>$2,370</td>
<td>8.00%</td>
<td>12.90%</td>
<td>12.84%</td>
<td>$2,370</td>
<td>8.00%</td>
</tr>
<tr>
<td>10</td>
<td>39,006</td>
<td>$3,883</td>
<td>$2,524</td>
<td>$2,524</td>
<td>8.00%</td>
<td>12.90%</td>
<td>12.84%</td>
<td>$2,524</td>
<td>8.00%</td>
</tr>
</tbody>
</table>

Terminal Value = \( \frac{1881}{0.0961 - 0.06} \) = 52,148

Value of Op Assets $14,910 + Cash $26 = Value of Firm $14,936 - Value of Debt $349 = Value of Equity $14,587 - Equity Options $2,892 = Value per share $34.32

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.

Post-IPO growth
Median of new issues from 1965 to 2005

Source: Andrew Metrick
The New York Times
Lesson 4: Don’t forget to pay for growth…

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenue Growth</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>$1,676</td>
<td>$559</td>
<td>3.00</td>
<td>-76.62%</td>
</tr>
<tr>
<td>2</td>
<td>100.00%</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>$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>$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>$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>$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>$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>$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>$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>$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 6: 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).
And the market is often “more wrong”….
An “option premium” for some young companies: The option to expand into a new product/market.
An Example of an Expansion Option

- You have complete 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 decided 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

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

\textbf{Call Value} = $56 \text{ Million}

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

Is the first investment necessary for the second investment?

<table>
<thead>
<tr>
<th>Not necessary</th>
<th>Pre-Requisit</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Zero competitive advantage on Second Investment</td>
<td>An Exclusive Right to Second Investment</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No option value</th>
<th>100% of option value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option has no value</td>
<td>Option has high value</td>
</tr>
</tbody>
</table>

Second Investment has zero excess returns

Second investment has large sustainable excess return

Increasing competitive advantage/ barriers to entry

<table>
<thead>
<tr>
<th>First-Mover Edge</th>
<th>Brand Name</th>
<th>Telecom Licenses</th>
<th>Pharmaceutical patents</th>
</tr>
</thead>
</table>

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**

- **What are the cashflows from existing assets?**
  - Equity claims can vary in voting rights and dividends.
- **What is the value of equity in the firm?**
- **How risky are the cash flows from both existing assets and growth assets?**
  - Operating risk should be stable, but the firm can change its financial leverage. This can affect both the cost of equity and capital.
- **What is the value added by growth assets?**
- **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.

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.

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Trailing 12 months</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>1</td>
<td>$315</td>
<td></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>2</td>
<td>$324</td>
<td></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>3</td>
<td>$333</td>
<td></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>4</td>
<td>$342</td>
<td></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>Beyond</td>
<td>$350</td>
<td></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
(Subtract) Debt: $491
(Subtract) 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

<table>
<thead>
<tr>
<th>Year</th>
<th>Trailing 12 months</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>1</td>
<td>$315</td>
<td></td>
<td>5.60%</td>
<td>14.00%</td>
<td>40.00%</td>
<td>$133</td>
<td>$200</td>
<td>6.63%</td>
<td>$187</td>
</tr>
<tr>
<td>2</td>
<td>$331</td>
<td></td>
<td>5.60%</td>
<td>14.00%</td>
<td>40.00%</td>
<td>$141</td>
<td>$211</td>
<td>6.63%</td>
<td>$185</td>
</tr>
<tr>
<td>3</td>
<td>$351</td>
<td></td>
<td>5.60%</td>
<td>14.00%</td>
<td>40.00%</td>
<td>$148</td>
<td>$223</td>
<td>6.63%</td>
<td>$184</td>
</tr>
<tr>
<td>4</td>
<td>$371</td>
<td></td>
<td>5.60%</td>
<td>14.00%</td>
<td>40.00%</td>
<td>$148</td>
<td>$223</td>
<td>6.63%</td>
<td>$182</td>
</tr>
<tr>
<td>5</td>
<td>$414</td>
<td></td>
<td>5.60%</td>
<td>14.00%</td>
<td>40.00%</td>
<td>$148</td>
<td>$223</td>
<td>6.63%</td>
<td>$180</td>
</tr>
<tr>
<td>Beyond</td>
<td>$423</td>
<td></td>
<td>2.35%</td>
<td>6.74%</td>
<td>34.87%</td>
<td>$148</td>
<td>$6,282</td>
<td>6.74%</td>
<td>$4,557</td>
</tr>
</tbody>
</table>

Value of operating assets: $5,475
(Add) Cash: $155
(Subtract) Debt: $491
(Subtract) Management Options: $53
Value of equity in common stock: $5,085
Value per share: $37.80

Financial restructuring

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.

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.
Lesson 1: Cost cutting and increased efficiency are easier accomplished on paper than in practice…
Lesson 2: Increasing growth is not always an option (or at least not a good option)
Lesson 3: Financial leverage is a double-edged sword.

**Exhibit 7.1: Optimal Financing Mix: Hormel Foods in January 2009**

- As debt ratio increases, equity becomes riskier (higher beta) and cost of equity goes up. 
- As firm borrows more money, its ratings drop and cost of debt rises.
- Debt ratio is percent of overall market value of firm that comes from debt financing.
- At debt ratios > 80%, firm does not have enough operating income to cover interest expenses. Tax rate goes down to reflect lost tax benefits.
- As cost of capital drops, firm value rises (as operating cash flows remain unchanged).

<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>$4,655</td>
</tr>
<tr>
<td><strong>10.39%</strong></td>
<td><strong>0.83</strong></td>
<td><strong>7.33%</strong></td>
<td><strong>AAA</strong></td>
<td><strong>3.60%</strong></td>
<td><strong>40.00%</strong></td>
<td><strong>2.16%</strong></td>
<td><strong>6.79%</strong></td>
<td><strong>$4,680</strong></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>

Optimal: Cost of capital lowest between 20 and 30%.
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.

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.

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.

What is the value of equity in the firm?

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.
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**

<table>
<thead>
<tr>
<th>EBIT (1-t) :</th>
<th>1,183</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Nt CpX   :</td>
<td>18</td>
</tr>
<tr>
<td>- Chg WC   :</td>
<td>67</td>
</tr>
<tr>
<td>= FCFF     :</td>
<td>1,268</td>
</tr>
</tbody>
</table>

Reinvestment Rate = -75/1183
Return on capital = 4.99%

**Expected Growth in EBIT (1-t)**

-30% * .05 = -0.15
-1.5%

**Return on Capital**

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**

\[ \frac{868}{0.0713 - 0.02} = 16,921 \]

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

\[ 9.58\% \times 0.566 + 4.80\% \times 0.434 = 7.50\% \]

**Cost of Equity**

9.58%

**Cost of Debt**

\[ (4.09\% + 3.65\%)(1 - 0.38) = 4.80\% \]

**Weights**

\( E = 56.6\% \)
\( D = 43.4\% \)

**Beta**

\( 1.22 \)

**Risk Free Rate**

4.09%

**Risk Premium**

4.00%

**Unlevered Beta for Sectors**

0.77

**Firm’s D/E Ratio**

93.1%

**Mature risk premium**

4%

**Country Equity Prem**

0%

---

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 \( (1 - \text{Probability of distress}) \) + Distress sale value of equity \( \text{Probability of distress} \)

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).
Reinvestment:
Capital expenditures include cost of new casinos and working capital

Extended reinvestment break, due to investment in past

Expected Margin: -> 17%

Terminal Value = 758(.0743-.03) = $17,129

Cost of Equity
21.82%

Cost of Debt
3% + 6% = 9%
9% (1-.38) = 5.58%

Weights
Debt = 73.5% -> 50%

Cost of Capital
9.88%
9.88% 9.88% 9.88% 9.79% 9.50% 9.01% 8.32% 7.43%

Beta
3.14 -> 1.20

Risk Premium
6%

Casino
1.15

Current D/E: 277%
Base Equity Premium
Country Risk Premium

Las Vegas Sands
February 2009
Trading @ $4.25
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:

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

- 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 (.7666) = $1.92
The “sunny” side of distress: Equity as a call option to liquidate the firm

Value of firm

Net Payoff on Equity

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?
Model Parameters & Valuation

The inputs
- Value of the underlying asset = $S = Value of the firm = $100 million
- Exercise price = $K = Face Value of outstanding debt = $80 million
- Life of the option = $t = Life of zero-coupon debt = 10 years
- Variance in the value of the underlying asset = $\sigma^2 = Variance in firm value = 0.16
- Riskless rate = $r = Treasury bond rate corresponding to option life = 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 \times 0.9451 - 80 \times \exp(-0.10)(10) \times 0.6310 = $75.94 million
- Value of the outstanding debt = $100 - $75.94 = $24.06 million
- Interest rate on debt = ($80 / $24.06)^{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:
    - \( d_1 = 1.0515 \quad N(d_1) = 0.8534 \)
    - \( d_2 = -0.2135 \quad N(d_2) = 0.4155 \)
  - Value of the call = 50 (0.8534) - 80 \( \exp^{-0.10} \) (0.4155) = $30.44 million
  - Value of the bond= $50 - $30.44 = $19.56 million
Equity value persists .. As firm value declines..

![Graph showing the value of equity as firm value changes.](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 assets in place 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, [ \sigma_{\text{firm}}^2 = w_e^2 \sigma_{\text{e}}^2 + w_d^2 \sigma_{\text{d}}^2 + 2 w_e w_d \rho_{\text{ed}} \sigma_{\text{e}} \sigma_{\text{d}} ] where ( \sigma_{\text{e}}^2 ) = variance in the stock price, ( \sigma_{\text{d}}^2 ) = variance in the bond price</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. [ \text{Face value weighted duration of bonds outstanding (or)} ]</td>
</tr>
<tr>
<td></td>
<td>• If the debt is long term and coupon bearing, add the cumulated nominal value of 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><strong>Total</strong></td>
<td><strong>£8,865 mil</strong></td>
<td><strong>10.93 years</strong></td>
</tr>
</tbody>
</table>
The Basic DCF Valuation

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
    
    \[ \text{Annualized variance} = (0.15)^2 (0.41)^2 + (0.85)^2 (0.17)^2 + 2 (0.15) (0.85)(0.5)(0.41)(0.17) = 0.0335 \]

- 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 = \(2312 \times (0.2023) - 8,865 \times \exp^{-0.06 \times 10.93} \times (0.0751) = £122 million\)

- Appropriate interest rate on debt = \((8865/2190)^{\frac{1}{10.93}} - 1 = 13.65\%\)
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.

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.

What are the cashflows from existing assets?

Preferred stock is a significant source of capital.

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.

What is the value added by growth assets?

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)

#### Expected Growth in first 5 years =
- $16.77 * 8.35% = 12.09%

#### Terminal Value =
- $42.03 * 8.35% = 12.09%
- $42.03 + $1.40 = $43.43

#### Discount at Cost of Equity
- Cost of Equity = 4.10% + 1.40% (4.5%) = 10.4%

#### 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

#### Value of Equity per share = PV of Dividends & Terminal value = $222.49

### Left return on equity at 2008 levels, well below 16% in 2007 and 20% in 2004-2006.

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.
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)
2d. Deutsche Bank: March 2009

**Last 2 years**

<table>
<thead>
<tr>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Income</td>
<td>3,954 m</td>
</tr>
<tr>
<td>Dividends</td>
<td>2,146 m</td>
</tr>
<tr>
<td>Risk adjusted assets</td>
<td>312,882 m</td>
</tr>
<tr>
<td>Book Equity</td>
<td>31,914 m</td>
</tr>
</tbody>
</table>

**Normalized Net Income for base year 3,000 m**

<table>
<thead>
<tr>
<th>Year</th>
<th>Normalized ROE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9.4%</td>
</tr>
</tbody>
</table>

**Expected growth in asset base 4%**

**Target capital ratio 10%**

**Target ROE 10.2%**

---

**Stable Growth**

- $g = 3\%$; $\beta = 1.00$
- Cost of equity = $10.20\%$
- Return on equity = $10.20\%$
- Reinvestment Rate = $g/\text{ROE} = 3/10.20\% = 29.41\%$

**Terminal Value**

$$\text{Terminal Value} = \frac{2,823}{(1.102 - 0.03)} = 39,209 \text{ m}$$

**Cashflows**

<table>
<thead>
<tr>
<th>Year</th>
<th>Asset Base</th>
<th>Capital Ratio</th>
<th>Regulatory Capital</th>
<th>Change in capital</th>
<th>ROE</th>
<th>Net Income</th>
<th>Reinvestment</th>
<th>FCFE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>325,398 €</td>
<td>10.16%</td>
<td>33,060 €</td>
<td>1,146 €</td>
<td>9.56%</td>
<td>3,161 €</td>
<td>1,146 €</td>
<td>2,014 €</td>
</tr>
<tr>
<td>2</td>
<td>338,414 €</td>
<td>10.12%</td>
<td>34,247 €</td>
<td>1,187 €</td>
<td>9.72%</td>
<td>3,329 €</td>
<td>1,187 €</td>
<td>2,142 €</td>
</tr>
<tr>
<td>3</td>
<td>351,950 €</td>
<td>10.08%</td>
<td>35,477 €</td>
<td>1,229 €</td>
<td>9.88%</td>
<td>3,505 €</td>
<td>1,229 €</td>
<td>2,278 €</td>
</tr>
<tr>
<td>4</td>
<td>366,028 €</td>
<td>10.04%</td>
<td>36,749 €</td>
<td>1,273 €</td>
<td>10.04%</td>
<td>3,690 €</td>
<td>1,273 €</td>
<td>2,417 €</td>
</tr>
<tr>
<td>5</td>
<td>380,669 €</td>
<td>10.00%</td>
<td>38,067 €</td>
<td>1,318 €</td>
<td>10.20%</td>
<td>3,883 €</td>
<td>1,318 €</td>
<td>2,565 €</td>
</tr>
</tbody>
</table>

**PV of CF = 31,383 m**

- # shares = 581.85
- Value/Share = 53.94 €

**Discount at Cost of equity = 3.60% + 1.162 \times 6% + -0.60\% = 11.172\%**

---

**In March 2009**

- Deutsche Bank price = 48 Euros/share (down from 89 Euros in early 2008)

---

**Riskfree Rate:**

- Euro Riskfree Rate = 3.6% 

**Beta**

- Beta for commercial & investment banking: 1.162

**Mature market premium 6%**

---

**Region**

<table>
<thead>
<tr>
<th>Region</th>
<th>Lambda</th>
<th>CRP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Europe</td>
<td>0.68</td>
<td>0.00%</td>
</tr>
<tr>
<td>United States</td>
<td>0.42</td>
<td>0.00%</td>
</tr>
<tr>
<td>Latin America</td>
<td>0.01</td>
<td>4.50%</td>
</tr>
<tr>
<td>Africa &amp; Middle East</td>
<td>0.01</td>
<td>7.00%</td>
</tr>
<tr>
<td>Asia</td>
<td>0.11</td>
<td>3.50%</td>
</tr>
<tr>
<td>Eastern Europe</td>
<td>0.04</td>
<td>3.00%</td>
</tr>
<tr>
<td>Deutschce Bank</td>
<td>0.04</td>
<td>0.60%</td>
</tr>
</tbody>
</table>
V. Valuing Companies with “intangible” assets

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.

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?

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.
Exhibit 11.1: Converting R&D expenses to R&D assets - Amgen

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>3,030.00</td>
<td>1.00</td>
<td>3,030.00</td>
</tr>
<tr>
<td>-1</td>
<td>3,266.00</td>
<td>0.90</td>
<td>2,939.40</td>
</tr>
<tr>
<td>-2</td>
<td>3,366.00</td>
<td>0.80</td>
<td>2,692.80</td>
</tr>
<tr>
<td>-3</td>
<td>2,314.00</td>
<td>0.70</td>
<td>1,619.80</td>
</tr>
<tr>
<td>-4</td>
<td>2,028.00</td>
<td>0.60</td>
<td>1,216.80</td>
</tr>
<tr>
<td>-5</td>
<td>1,655.00</td>
<td>0.50</td>
<td>827.50</td>
</tr>
<tr>
<td>-6</td>
<td>1,117.00</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>
</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 + 3,030 - 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>4196 / 17869 = 23.48%</td>
<td>5532 / 31153 = 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 + 3,030 - 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>5594 / 21985 = 25.44%</td>
<td>5930 / 35269 = 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 Operating Income = Revenues in 2009 * Average Operating Margin (98--09) = 22661 * .0733 =1660.7 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%

Normalized Return on capital and Reinvestment

Once earnings bounce back to normal, we assume that Toyota will be able to earn a return on capital equal to its cost of capital (5.09%). This is a sector, where earning excess returns has proved to be difficult even for the best of firms. To sustain a 1.5% growth rate, the reinvestment rate has to be:

Reinvestment rate = 1.5%/5.09% = 29.46%

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)

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenues</th>
<th>Operating Income</th>
<th>EBITDA</th>
<th>Operating Margin</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY1 1992</td>
<td>¥10,163,380</td>
<td>¥218,511</td>
<td>¥218,511</td>
<td>2.15%</td>
</tr>
<tr>
<td>FY1 1993</td>
<td>¥10,210,750</td>
<td>¥181,897</td>
<td>¥181,897</td>
<td>1.78%</td>
</tr>
<tr>
<td>FY1 1994</td>
<td>¥9,362,732</td>
<td>¥136,226</td>
<td>¥136,226</td>
<td>1.45%</td>
</tr>
<tr>
<td>FY1 1995</td>
<td>¥8,120,975</td>
<td>¥255,719</td>
<td>¥255,719</td>
<td>3.15%</td>
</tr>
<tr>
<td>FY1 1996</td>
<td>¥10,718,740</td>
<td>¥348,069</td>
<td>¥348,069</td>
<td>3.25%</td>
</tr>
<tr>
<td>FY1 1997</td>
<td>¥12,243,830</td>
<td>¥665,110</td>
<td>¥665,110</td>
<td>5.43%</td>
</tr>
<tr>
<td>FY1 1998</td>
<td>¥11,678,400</td>
<td>¥779,800</td>
<td>¥1,382,950</td>
<td>6.68%</td>
</tr>
<tr>
<td>FY1 1999</td>
<td>¥12,749,010</td>
<td>¥774,947</td>
<td>¥1,415,997</td>
<td>6.08%</td>
</tr>
<tr>
<td>FY1 2000</td>
<td>¥12,879,560</td>
<td>¥775,982</td>
<td>¥1,430,982</td>
<td>6.02%</td>
</tr>
<tr>
<td>FY1 2001</td>
<td>¥13,424,420</td>
<td>¥870,131</td>
<td>¥1,542,631</td>
<td>6.48%</td>
</tr>
<tr>
<td>FY1 2002</td>
<td>¥15,106,300</td>
<td>¥1,123,475</td>
<td>¥1,822,975</td>
<td>7.44%</td>
</tr>
<tr>
<td>FY1 2003</td>
<td>¥16,054,290</td>
<td>¥1,363,680</td>
<td>¥2,101,780</td>
<td>8.49%</td>
</tr>
<tr>
<td>FY1 2004</td>
<td>¥17,294,760</td>
<td>¥1,666,894</td>
<td>¥2,454,994</td>
<td>9.64%</td>
</tr>
<tr>
<td>FY1 2005</td>
<td>¥18,551,530</td>
<td>¥1,672,187</td>
<td>¥2,447,987</td>
<td>9.01%</td>
</tr>
<tr>
<td>FY1 2006</td>
<td>¥21,036,910</td>
<td>¥1,878,342</td>
<td>¥2,769,742</td>
<td>8.93%</td>
</tr>
<tr>
<td>FY1 2007</td>
<td>¥23,948,090</td>
<td>¥2,238,683</td>
<td>¥3,185,683</td>
<td>9.35%</td>
</tr>
<tr>
<td>FY1 2008</td>
<td>¥26,289,240</td>
<td>¥2,707,375</td>
<td>¥3,110,804</td>
<td>8.64%</td>
</tr>
<tr>
<td>FY1 2009 (Estimate)</td>
<td>¥22,661,325</td>
<td>¥267,904</td>
<td>¥1,310,304</td>
<td>1.18%</td>
</tr>
</tbody>
</table>

Operating Assets = 19,640 billion
+ Cash = 2,288 billion
+ Non-operating assets = 6,845 billion
- Debt = 11,862 billion
- Minority Interests = 583 billion
Value of Equity / No of shares = ¥3,448 billion
Value per share = ¥4735

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

**Historical data:** Exxon Operating Income vs Oil Price

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

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

\[ R^2 = 90.2\% \]

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 thisi price is

\[ \text{Normalized Operating Income} = -6,395 + 911.32 \times 45 = 34,614 \]

**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.

**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 equity funded company, and is expected to remain so, with a deb 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%.

\[ \text{Cost of capital} = 8.35\% \times (0.9715) + 3.75\% \times (1-0.38) \times (0.0285) = 8.18\% \]

**Value of operating assets**

\[ \text{Value of operating assets} = \frac{34,614 \times (1-.38)(1-.0952)}{(0.0818-.02)} = 320,472 \text{ million} \]
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

Net Payoff on Extraction

Cost of Developing Reserve
Valuing Gulf Oil

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 = $22.38 - $7 / 1.05^2 = $42,380.44
  - Exercise price = Estimated development cost of reserves = 3038 * $10 = $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:
  
  \[
  \begin{align*}
  d_1 &= 1.6548 \quad N(d_1) = 0.9510 \\
  d_2 &= 1.0548 \quad N(d_2) = 0.8542 \\
  \text{Call Value} &= 42,380.44 \exp(-0.05)(12) (0.9510) - 30,380 \exp(-0.09)(12) (0.8542) \\
  &= \$13,306 \text{ million}
  \end{align*}
  \]
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:

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

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

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?

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.

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
- Net Cpx : 100
- Chg WC : 40
= FCFF : 160
Reinvestment Rate = 46.67%

### Expected Growth in EBIT (1-t)
-46.67% \times 13.64\% = 0.0636
6.36%

### Terminal Value
\[ \frac{289}{0.1254 - 0.04} = 3,403 \]

### Cost of Equity
16.26%

### Cost of Debt
(4.5\% + 1.00\%) \times (1 - 0.40) = 3.30%

### Weights
E = 70\%  D = 30\%

### Discount at Cost of Capital (WACC)
16.26\% \times (0.70) + 3.30\% \times (0.30) = 12.37\%

### Riskfree Rate:
Riskfree rate = 4.50\%
(10-year T.Bond rate)

### Total Beta
2.94

### Risk Premium
4.00\%

### Market Beta:
0.98

### Unlevered Beta for Sectors:
0.78

### Firm’s D/E Ratio:
30/70

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

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

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

Is exposed to all the risk in the firm

Demands a cost of equity that reflects this risk

Private owner of business with 100% of your wealth invested in the business

80 units of firm specific risk

20 units of market risk

Market Beta measures just market risk

Eliminates firm-specific risk in portfolio

Publicly traded company with investors who are diversified

Demands a cost of equity that reflects only market risk
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.
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 few 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 = $0.145 - 0.0022 \ln (\text{Annual Revenues}) - 0.015 (\text{DERN}) - 0.016 (\text{Cash/Firm Value}) - 0.11 (\text{Monthly trading volume/ Firm Value})$

- **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.
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>
3a. And India is not exempt…
4. Simplistic rules almost always break down…6 times EBITDA may not be cheap…
Or it may be…
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.
PE Ratio: Understanding the Fundamentals

- 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,

\[
\frac{P_0}{\text{EPS}_0} = \frac{\text{Payout Ratio} \times (1 + g_n)}{r - g_n}
\]

- If this had been a FCFE Model,

\[
P_0 = \frac{\text{FCFE}_1}{r - g_n}
\]

\[
\frac{P_0}{\text{EPS}_0} = \frac{(\text{FCFE}/\text{Earnings}) \times (1 + g_n)}{r - g_n}
\]
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%

\[
PE = \frac{0.2 \times (1.25) \times \left(\frac{1 - (1.25)^5}{(1.115)^5}\right)}{(0.115 - 0.25)} + \frac{0.5 \times (1.25)^5 \times (1.08)}{(0.115 - 0.08) (1.115)^5} = 28.75
\]
a. PE and Growth: Firm grows at x% for 5 years, 8% thereafter
b. PE and Risk: A Follow up Example

![Graph showing PE ratios and beta for different growth scenarios.]

- **PE Ratios and Beta: Growth Scenarios**
- **PE Ratio**
  - 0.75: g=25%
  - 1.00: g=20%
  - 1.25: g=15%
  - 1.50: g=8%
- **Beta**
  - 0.75
  - 1.00
  - 1.25
  - 1.50
  - 1.75
  - 2.00
III. 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 expensive because the PE ratio today is high 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)

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

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>T-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.16%</td>
<td>3.98</td>
</tr>
<tr>
<td>0.597</td>
<td>5.71</td>
</tr>
<tr>
<td>-0.213</td>
<td>-0.92</td>
</tr>
</tbody>
</table>

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…

Value of Stock = \( \frac{\text{DPS}}{\text{WACC} - g} \)

- **PE**: Payout Ratio = \( \frac{1+g}{r-g} \)
  - \( \text{PE} = f(g, \text{payout, risk}) \)

- **PEG**: Payout ratio = \( \frac{(1+g)}{g(r-g)} \)
  - \( \text{PEG} = f(g, \text{payout, risk}) \)

- **PBV**: ROE (Payout ratio) = \( \frac{1+g}{r-g} \)
  - \( \text{PBV} = f(\text{ROE, payout, g, risk}) \)

- **PS**: Net Margin (Payout ratio) = \( \frac{1+g}{r-g} \)
  - \( \text{PS} = f(\text{Net Mgn, payout, g, risk}) \)

**Equity Multiples**

**Firm Multiples**

- **Value/FCFF** = \( f(g, \text{WACC}) \)
  - Value/FCFF = \( \frac{1+g}{(\text{WACC}-g)} \)

- **Value/EBIT(1-t)** = \( f(g, \text{RIR, WACC}) \)
  - Value/EBIT(1-t) = \( \frac{(1+g)}{(1- \text{RIR})(\text{WACC}-g)} \)

- **V/EBIT** = \( f(g, \text{RIR, WACC, t}) \)
  - V/EBIT = \( \frac{(1+g)(1-\text{RIR})(\text{WACC}-g)}{(1-t)(\text{WACC}-g)} \)

- **VS** = \( f(\text{Oper Mgn, RIR, g, WACC}) \)
  - VS = \( \text{Oper Margin (1- \text{RIR}) (1+g)/(WACC-g)} \)

Value of Firm = \( \frac{\text{FCFF}}{\text{WACC} - g} \)
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>
Dependent variable is: PE

R squared = 66.2%  R squared (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>.819a</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**

<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</td>
<td>(Constant)</td>
<td>.406</td>
<td>.424</td>
<td>.958</td>
</tr>
<tr>
<td></td>
<td>Regression Beta</td>
<td>-.065</td>
<td>.253</td>
<td>-.015</td>
</tr>
<tr>
<td></td>
<td>Expected Growth in EPS: next 5 years</td>
<td>9.340</td>
<td>2.366</td>
<td>.228</td>
</tr>
<tr>
<td></td>
<td>ROE</td>
<td>10.546</td>
<td>.771</td>
<td>.777</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>MFS Systems</td>
<td>$112.42</td>
<td>$28.94</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 Systems</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>$141.27</td>
<td>$29.36</td>
<td>4.74</td>
</tr>
<tr>
<td>Frozen Food Express</td>
<td>$164.17</td>
<td>$34.10</td>
<td>4.81</td>
</tr>
<tr>
<td>Arnold Inds.</td>
<td>$472.27</td>
<td>$96.88</td>
<td>4.87</td>
</tr>
<tr>
<td>Greyhound Lines Inc.</td>
<td>$437.71</td>
<td>$88.61</td>
<td>4.88</td>
</tr>
<tr>
<td>USFreightways</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>$578.76</td>
<td>$107.15</td>
<td>5.40</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. Freighways</td>
<td>$716.15</td>
<td>$120.94</td>
<td>5.92</td>
</tr>
<tr>
<td>Transfinancial Holdings</td>
<td>$56.32</td>
<td>$6.79</td>
<td>8.47</td>
</tr>
<tr>
<td>Swift Transportation</td>
<td>$835.58</td>
<td>$121.34</td>
<td>6.89</td>
</tr>
<tr>
<td>Landair Services</td>
<td>$212.95</td>
<td>$30.38</td>
<td>7.01</td>
</tr>
<tr>
<td>CNF Transportation</td>
<td>$2,700.69</td>
<td>$366.99</td>
<td>7.36</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>$6.89</td>
<td>11.91</td>
</tr>
<tr>
<td>Mark IV</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>$51.76</td>
<td>13.11</td>
</tr>
<tr>
<td>US 1 Inds Inc.</td>
<td>$5.60</td>
<td>(0.17)</td>
<td>NA</td>
</tr>
</tbody>
</table>

**Average** | 5.61
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?
**IV: Price to Sales Multiples: Grocery Stores - US in January 2007**

**Whole Foods:** In 2007: Net Margin was 3.41% and Price/ Sales ratio was 1.41

\[
\text{Predicted Price to Sales} = 0.07 + 10.49 (0.0341) = 0.43
\]
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 (0.0277) = 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 (0.0144) = 0.22
Here is 2011...

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

\[ PS\text{ Ratio for WFMI} = -0.585 + 55.50 \times 0.0273 = 0.93 \]

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
  \[ PS = 81.36 - 7.54(\text{Net Margin}) \]
  \[ R^2 = 0.04 \]
  (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)

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

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

- \( R \) 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/ 1.1385 = $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
### 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>0.340a</td>
<td>0.116</td>
<td>0.114</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

<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>13.477</td>
<td>.760</td>
<td>.354</td>
<td>17.734</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…