VALUATION: ART, SCIENCE, CRAFT OR MAGIC?
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.

_Aswhath Damodaran_
Approaches to Valuation

- **Intrinsic valuation**, relates the value of an asset to the present value of expected future cashflows on that asset. In its most common form, this takes the form of a discounted cash flow valuation.

- **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.

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Intrinsic Value: Three Basic Propositions

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

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

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

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

3. **The DON’T FREAK OUT Proposition**: 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.

4. **The VALUE IS NOT PRICE Proposition**: The value of an asset may be very different from its price.
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</td>
<td><em>Fixed Maturity</em></td>
</tr>
<tr>
<td>capital) assets</td>
<td><em>Tax Deductible</em></td>
</tr>
<tr>
<td><strong>Assets in Place</strong></td>
<td><strong>Equity</strong></td>
</tr>
<tr>
<td><strong>Growth Assets</strong></td>
<td>Residual Claim on cash flows</td>
</tr>
<tr>
<td><strong>Expected Value that will</strong></td>
<td>Significant Role in management</td>
</tr>
<tr>
<td>be created by future</td>
<td><em>Perpetual Lives</em></td>
</tr>
<tr>
<td>investments</td>
<td></td>
</tr>
</tbody>
</table>

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

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The Drivers of Value…

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

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

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

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

**Length of the high growth period**
Determined by:
- Operating risk of the company
- Default risk of the company
- Mix of debt and equity used in financing

**Cost of financing (debt or capital) to apply to discounting cashflows**

**Terminal Value of firm (equity)**
Stable growth firm, with no or very limited excess returns

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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 = \( \frac{FCFF_{n+1}}{r-g} \)

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

Cost of Equity

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

Weights
- Based on Market Value

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

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

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Current Cashflow to Firm

EBIT(1-t) = 6058
- Nt CpX = 6443
- Chg WC = 37
= FCFF = -423
Reinvestment Rate = 6480/6058 = 106.98%
Return on capital = 16.71%

Expected Growth in EBIT (1-t)

60% * 16% = 0.096
9.6%

Return on Capital

16%

Stable Growth

g = 4%; Beta = 1.10;
Debt Ratio = 20%; Tax rate = 35%
Cost of capital = 8.08%
ROC = 10.00%
Reinvestment Rate = 4/10 = 40%

Terminal Value

10 = 7300/(.0808 - .04) = 179,099

Cost of Capital (WACC) = 11.7% (0.90) + 3.68% (0.10) = 10.90%

Cost of Equity

11.70%

Cost of Debt

(4.78% + .85%)(1-.35) = 3.66%

Weights

E = 90% D = 10%

Riskfree Rate:

Riskfree rate = 4.78%

Beta

1.73

Risk Premium

4%

Unlevered Beta for Sectors: 1.59

D/E = 11.06%

On May 1, 2007, Amgen was trading at $55/share
Tata Motors: April 2010

Current Cashflow to Firm

| EBIT(1-t) : | Rs 20,116 |
| Nt CpX :    | Rs 31,590 |
| Chg WC :    | Rs 2,732  |
| FCFF :      | Rs 14,205 |

Reinv Rate = \( \frac{(31590+2732)}{20116} \) = 170.61%; Tax rate = 21.00%
Return on capital = 17.16%

Return on Capital

- Stable Growth
  - \( g = 5\% \)
  - \( \beta = 1.00 \)
  - Country Premium = 3%
  - Cost of capital = 10.39%
  - Tax rate = 33.99%
  - ROC = 10.39%
  - Reinvestment Rate = \( g / \text{ROC} \) = 5/10.39 = 48.11%

Expected Growth from new inv.

\[ 0.70 \times 17.16\% = 0.1201 \]

Terminal Value

\[ 23493 / (0.1039 - 0.05) = \text{Rs 435,686} \]

Expected Growth

\[ 0.70 \times \text{Expected Growth} \]

Stable Growth

- \( g = 5\% \)
- \( \beta = 1.00 \)
- Country Premium = 3%
- Cost of capital = 10.39%
- Tax rate = 33.99%
- ROC = 10.39%
- Reinvestment Rate = \( g / \text{ROC} \)

Return on Capital

\[ \frac{(31590+2732)}{20116} \times 100 = 170.61\% \]

Reinvest Rate = \( \frac{31590+2732}{20116} \)

Expected Growth from new inv.

\[ 0.70 \times 17.16\% = 0.1201 \]

Terminal Value

\[ 23493 / (0.1039 - 0.05) = \text{Rs 435,686} \]

Growth declines to 5% and cost of capital moves to stable period level.

Op. Assets Rs210,813
+ Cash: 11418
+ Other NO 140576
- Debt 109198
= Equity 253,628

Value/Share Rs 614

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

Cost of Equity

- 14.00\%

Cost of Debt

- (5\% + 4.25\% + 3\%)(1 - 0.3399)
- 8.09\%

Weights

\( E = 74.7\% \)
\( D = 25.3\% \)

On April 1, 2010
Tata Motors price = Rs 781

Riskfree Rate:

- Rs Riskfree Rate = 5%

Beta

- 1.20

Mature market premium

- 4.5\%

Country Default Spread

- 3\%

Unlever Beta for Sectors

- 1.04

Unlever Beta

\[ \text{Firm's D/E Ratio} = 33\% \]

Country Equity Risk Premium

- 4.50\%

Country Default Spread

- 3\%

Riskfree Rate

- 5\%

Lambda

- 0.80

Unlever Beta

- 1.04

Country Equity Risk Premium

- 4.50\%

Unlever Beta

- 1.04

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DCF INPUTS

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

- **Update**
  - Trailing Earnings
  - Unofficial numbers

- **Normalize Earnings**

- **Compare**
  - Firm's history
  - Comparable Firms

- **Operating leases**
  - Convert into debt
  - Adjust operating income

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

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

**Measuring Earnings**
Operating Leases at Amgen in 2007

- Amgen has lease commitments and its cost of debt (based on its 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 expense this year – Depreciation
  = 5,071 m + 69 m - $870/12 = $5,068 million (12 year life for assets)
- Approximate Operating income = stated OI + PV of Lease commitment * Pre-tax cost of debt
  = $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

Adjusted Operating Income = $5,120 + 3,366 - 1,150 = $7,336 million

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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:
  - Accounting Capital Expenditures = $1,218 million
  - - Accounting Depreciation = $ 963 million
  - Accounting Net Cap Ex = $ 255 million

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

- Acquisitions have been a volatile item. Amgen was quiet on the acquisition front in 2004 and 2005 and had a significant acquisition in 2003.
III. The government bond rate is not always the risk free rate

- When valuing Amgen in US dollars, the US$ ten-year bond rate of 4.78% was used as the risk free rate. We assumed that the US treasury was default free.

- When valuing Tata Motors in Indian rupees in 2010, the Indian government bond rate of 7% was not default free. Using the Indian government’s local currency rating of Ba2 yielded a default spread of 3% for India and a riskfree rate of 4% in Indian rupees.

  Risk free rate in Indian Rupees = 7% - 3% = 4%

- Since LATAM’s numbers are reported in US $, we will be valuing the company in dollars. The risk free rate that we will be using is the US ten-year T.Bond rate.
Risk free rates will vary across currencies
But valuations should not

<table>
<thead>
<tr>
<th></th>
<th>In Indian Rupees</th>
<th>In US $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk free Rate</td>
<td>5.00%</td>
<td>2.00%</td>
</tr>
<tr>
<td>Expected inflation rate</td>
<td>4.00%</td>
<td>1.00%</td>
</tr>
<tr>
<td>Cost of capital</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- High Growth</td>
<td>12.50%</td>
<td>9.25%</td>
</tr>
<tr>
<td>- Stable Growth</td>
<td>10.39%</td>
<td>7.21%</td>
</tr>
<tr>
<td>Expected growth rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- High Growth</td>
<td>12.01%</td>
<td>8.78%</td>
</tr>
<tr>
<td>- Stable Growth</td>
<td>5.00%</td>
<td>2.00%</td>
</tr>
<tr>
<td>Return on Capital</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- High Growth</td>
<td>17.16%</td>
<td>13.78%</td>
</tr>
<tr>
<td>- Stable Growth</td>
<td>10.39%</td>
<td>7.21%</td>
</tr>
<tr>
<td>Value per share</td>
<td>Rs 614</td>
<td>$12.79/share (roughly Rs 614 at current exchange rate)</td>
</tr>
</tbody>
</table>
IV. Betas do not come from regressions... and are noisy...

Aswath Damodaran
Look better for some companies, but only because they are run against narrow indices
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.

  - **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 priced goods/services firms.
    4. Growth firms should have higher betas.

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

  - **Implications**
    1. 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.

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

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

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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 (1 + (1 - .35)(.11)) = 1.73

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 (1 + (1 - .3399)(.3387)) = 1.20
V. 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>1928-2012</td>
<td>7.65%</td>
<td>5.88%</td>
</tr>
<tr>
<td>Std error</td>
<td>2.20%</td>
<td>2.33%</td>
</tr>
<tr>
<td>1962-2012</td>
<td>5.93%</td>
<td>3.91%</td>
</tr>
<tr>
<td>Std error</td>
<td>2.38%</td>
<td>2.66%</td>
</tr>
<tr>
<td>2002-2012</td>
<td>7.06%</td>
<td>3.08%</td>
</tr>
<tr>
<td>Std error</td>
<td>5.82%</td>
<td>8.11%</td>
</tr>
</tbody>
</table>

Analysts expect earnings to grow 7.67% in 2013, 7.28% in 2014, scaling down to 1.76% in 2017, resulting in a compounded annual growth rate of 5.27% over the next 5 years. We will assume that dividends & buybacks will grow 5.27% a year for the next 5 years.

After year 5, we will assume that earnings on the index will grow at 1.76%, the same rate as the entire economy (= riskfree rate).

Data Sources:
Dividends and Buybacks
last year: S&P
Expected growth rate:
S&P, Media reports,
Factset, Thomson-Reuters

Expected Return on Stocks (1/1/13) = 7.54%
T.Bond rate on 1/1/13 = 1.76%
Equity Risk Premium = 7.54% - 1.76% = 5.78%
Implied Premiums in the US: 1960-2012

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The Anatomy of a Crisis: Implied ERP from September 12, 2008 to January 1, 2009

Average implied ERP: 1960-2007 = 4.10%
Implied Premium for India using the Sensex: April 2010

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

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

Solving for the expected return:
- Expected return on Equity = 11.72%
- Implied Equity premium for India = 11.72% - 5% = 6.72%

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VI. 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:
  - **Sovereign Default Spread**: 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 = 4.50%
    - Default Spread for India = 3.00% (based on rating)
    - Equity Risk Premium for India = 4.50% + 3.00%
  - **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 \* \( \frac{\text{Std Deviation}_{\text{Country Equity}}}{\text{Std Deviation}_{\text{Country Bond}}} \)
    - 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% \( \frac{21}{14} \) = 3%
    - Total equity risk premium = US equity risk premium + CRP for India = 6% + 3% = 9%

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<table>
<thead>
<tr>
<th>Country</th>
<th>Country Risk Premium</th>
<th>Total ERP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andorra</td>
<td>1.95%</td>
<td>7.70%</td>
</tr>
<tr>
<td>Austria</td>
<td>0.00%</td>
<td>5.75%</td>
</tr>
<tr>
<td>Belgium</td>
<td>1.20%</td>
<td>6.95%</td>
</tr>
<tr>
<td>Cyprus</td>
<td>16.50%</td>
<td>22.25%</td>
</tr>
<tr>
<td>Denmark</td>
<td>0.00%</td>
<td>5.75%</td>
</tr>
<tr>
<td>Finland</td>
<td>0.00%</td>
<td>5.75%</td>
</tr>
<tr>
<td>France</td>
<td>0.45%</td>
<td>6.20%</td>
</tr>
<tr>
<td>Germany</td>
<td>0.00%</td>
<td>5.75%</td>
</tr>
<tr>
<td>Greece</td>
<td>10.13%</td>
<td>15.88%</td>
</tr>
<tr>
<td>Iceland</td>
<td>3.38%</td>
<td>9.13%</td>
</tr>
<tr>
<td>Ireland</td>
<td>4.13%</td>
<td>9.88%</td>
</tr>
<tr>
<td>Isle of Man</td>
<td>0.00%</td>
<td>5.75%</td>
</tr>
<tr>
<td>Italy</td>
<td>3.00%</td>
<td>8.75%</td>
</tr>
<tr>
<td>Liechtenstein</td>
<td>0.00%</td>
<td>5.75%</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>1.95%</td>
<td>7.20%</td>
</tr>
<tr>
<td>Malta</td>
<td>1.95%</td>
<td>7.20%</td>
</tr>
<tr>
<td>Netherlands</td>
<td>0.00%</td>
<td>5.75%</td>
</tr>
<tr>
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<td>0.00%</td>
<td>5.75%</td>
</tr>
<tr>
<td>Portugal</td>
<td>5.40%</td>
<td>11.15%</td>
</tr>
<tr>
<td>Spain</td>
<td>3.38%</td>
<td>9.13%</td>
</tr>
<tr>
<td>Sweden</td>
<td>0.00%</td>
<td>5.75%</td>
</tr>
<tr>
<td>Switzerland</td>
<td>0.00%</td>
<td>5.75%</td>
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<tr>
<td>Turkey</td>
<td>3.38%</td>
<td>9.13%</td>
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<td>UK</td>
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<td>6.20%</td>
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<td>W. Europe</td>
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<td>Angola</td>
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<td>Benin</td>
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<td>14.00%</td>
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<tr>
<td>Botswana</td>
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<td>7.40%</td>
</tr>
<tr>
<td>Burundi</td>
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<td>14.00%</td>
</tr>
<tr>
<td>Cape Verde</td>
<td>6.75%</td>
<td>12.50%</td>
</tr>
<tr>
<td>Egypt</td>
<td>12.00%</td>
<td>17.75%</td>
</tr>
<tr>
<td>Gabon</td>
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<td>11.15%</td>
</tr>
<tr>
<td>Ghana</td>
<td>6.75%</td>
<td>12.50%</td>
</tr>
<tr>
<td>Kenya</td>
<td>6.75%</td>
<td>12.50%</td>
</tr>
<tr>
<td>Morocco</td>
<td>4.13%</td>
<td>9.88%</td>
</tr>
<tr>
<td>Mozambique</td>
<td>6.75%</td>
<td>12.50%</td>
</tr>
<tr>
<td>Namibia</td>
<td>3.38%</td>
<td>9.13%</td>
</tr>
<tr>
<td>Nigeria</td>
<td>5.40%</td>
<td>11.15%</td>
</tr>
<tr>
<td>Rwanda</td>
<td>8.25%</td>
<td>14.00%</td>
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<tr>
<td>Senegal</td>
<td>6.75%</td>
<td>12.50%</td>
</tr>
<tr>
<td>South Africa</td>
<td>2.55%</td>
<td>8.30%</td>
</tr>
<tr>
<td>Tunisia</td>
<td>4.73%</td>
<td>10.48%</td>
</tr>
<tr>
<td>Zambia</td>
<td>6.75%</td>
<td>12.50%</td>
</tr>
<tr>
<td>Africa</td>
<td>5.90%</td>
<td>11.65%</td>
</tr>
<tr>
<td>Albania</td>
<td>6.75%</td>
<td>12.50%</td>
</tr>
<tr>
<td>Armenia</td>
<td>4.73%</td>
<td>10.48%</td>
</tr>
<tr>
<td>Azerbaijan</td>
<td>3.38%</td>
<td>9.13%</td>
</tr>
<tr>
<td>Belarus</td>
<td>10.13%</td>
<td>15.88%</td>
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<tr>
<td>Bosnia</td>
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<td>15.88%</td>
</tr>
<tr>
<td>Bulgaria</td>
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<td>8.75%</td>
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<tr>
<td>Croatia</td>
<td>4.13%</td>
<td>9.88%</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>1.43%</td>
<td>7.18%</td>
</tr>
<tr>
<td>Estonia</td>
<td>1.43%</td>
<td>7.18%</td>
</tr>
<tr>
<td>Georgia</td>
<td>5.40%</td>
<td>11.15%</td>
</tr>
<tr>
<td>Hungary</td>
<td>4.13%</td>
<td>9.88%</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>3.00%</td>
<td>8.75%</td>
</tr>
<tr>
<td>Latvia</td>
<td>3.00%</td>
<td>8.75%</td>
</tr>
<tr>
<td>Lithuania</td>
<td>2.55%</td>
<td>8.30%</td>
</tr>
<tr>
<td>Macedonia</td>
<td>5.40%</td>
<td>11.15%</td>
</tr>
<tr>
<td>Moldova</td>
<td>10.13%</td>
<td>15.88%</td>
</tr>
<tr>
<td>Montenegro</td>
<td>5.40%</td>
<td>11.15%</td>
</tr>
<tr>
<td>Poland</td>
<td>1.65%</td>
<td>7.40%</td>
</tr>
<tr>
<td>Romania</td>
<td>3.38%</td>
<td>9.13%</td>
</tr>
<tr>
<td>Russia</td>
<td>2.55%</td>
<td>8.30%</td>
</tr>
<tr>
<td>Serbia</td>
<td>5.40%</td>
<td>11.15%</td>
</tr>
<tr>
<td>Slovakia</td>
<td>1.65%</td>
<td>7.40%</td>
</tr>
<tr>
<td>Slovenia</td>
<td>4.13%</td>
<td>9.88%</td>
</tr>
<tr>
<td>Uganda</td>
<td>6.75%</td>
<td>12.50%</td>
</tr>
<tr>
<td>Ukraine</td>
<td>10.13%</td>
<td>15.88%</td>
</tr>
<tr>
<td>E. Europe/Russia</td>
<td>3.13%</td>
<td>8.88%</td>
</tr>
<tr>
<td>Bahrain</td>
<td>2.55%</td>
<td>8.30%</td>
</tr>
<tr>
<td>Belarus</td>
<td>1.43%</td>
<td>7.18%</td>
</tr>
<tr>
<td>Israel</td>
<td>6.75%</td>
<td>12.50%</td>
</tr>
<tr>
<td>Kuwait</td>
<td>0.90%</td>
<td>6.65%</td>
</tr>
<tr>
<td>Lebanon</td>
<td>6.75%</td>
<td>12.50%</td>
</tr>
<tr>
<td>Oman</td>
<td>1.43%</td>
<td>7.18%</td>
</tr>
<tr>
<td>Qatar</td>
<td>0.90%</td>
<td>6.65%</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>1.20%</td>
<td>6.95%</td>
</tr>
<tr>
<td>UAE</td>
<td>0.90%</td>
<td>6.65%</td>
</tr>
<tr>
<td>Middle East</td>
<td>1.38%</td>
<td>7.13%</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>5.40%</td>
<td>11.15%</td>
</tr>
<tr>
<td>Cambodia</td>
<td>8.25%</td>
<td>14.00%</td>
</tr>
<tr>
<td>China</td>
<td>1.20%</td>
<td>6.95%</td>
</tr>
<tr>
<td>Fiji</td>
<td>6.75%</td>
<td>12.50%</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>6.65%</td>
<td>12.50%</td>
</tr>
<tr>
<td>India</td>
<td>3.38%</td>
<td>9.13%</td>
</tr>
<tr>
<td>Indonesia</td>
<td>3.38%</td>
<td>9.13%</td>
</tr>
<tr>
<td>Japan</td>
<td>1.20%</td>
<td>6.95%</td>
</tr>
<tr>
<td>Korea</td>
<td>1.20%</td>
<td>6.95%</td>
</tr>
<tr>
<td>Malaysia</td>
<td>1.95%</td>
<td>7.70%</td>
</tr>
<tr>
<td>Mauritius</td>
<td>2.55%</td>
<td>8.30%</td>
</tr>
<tr>
<td>Mongolia</td>
<td>6.75%</td>
<td>12.50%</td>
</tr>
<tr>
<td>Pakistan</td>
<td>12.00%</td>
<td>17.75%</td>
</tr>
<tr>
<td>Papua NG</td>
<td>6.75%</td>
<td>12.50%</td>
</tr>
<tr>
<td>Philippines</td>
<td>4.13%</td>
<td>9.88%</td>
</tr>
<tr>
<td>Singapore</td>
<td>0.00%</td>
<td>5.75%</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>6.75%</td>
<td>12.50%</td>
</tr>
<tr>
<td>Taiwan</td>
<td>1.20%</td>
<td>6.95%</td>
</tr>
<tr>
<td>Thailand</td>
<td>2.55%</td>
<td>8.30%</td>
</tr>
<tr>
<td>Vietnam</td>
<td>8.25%</td>
<td>14.00%</td>
</tr>
<tr>
<td>Asia</td>
<td>1.77%</td>
<td>7.52%</td>
</tr>
<tr>
<td>Australia</td>
<td>0.00%</td>
<td>5.75%</td>
</tr>
<tr>
<td>Cook Islands</td>
<td>6.75%</td>
<td>12.50%</td>
</tr>
<tr>
<td>New Zealand</td>
<td>0.00%</td>
<td>5.75%</td>
</tr>
<tr>
<td>Australia &amp; NZ</td>
<td>0.00%</td>
<td>5.75%</td>
</tr>
</tbody>
</table>
VII. And it is not just emerging market companies that are exposed to this risk..

- The “default” approach in valuation has been to assign country risk based upon your country of incorporation. Thus, if you are incorporated in a developed market, the assumption has been that you are not exposed to emerging market risks. If you are incorporated in an emerging market, you are saddled with the entire country risk.

- As companies globalize and look for revenues in foreign markets, this practice will under estimate the costs of equity of developed market companies with significant emerging market risk exposure and over estimate the costs of equity of emerging market companies with significant developed market risk exposure.
Globalization’s flip side: Operation-based ERP

- Developed market companies are not immune from emerging market risk:

<table>
<thead>
<tr>
<th>Region</th>
<th>Revenues</th>
<th>Total ERP</th>
<th>CRP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Europe</td>
<td>19%</td>
<td>6.67%</td>
<td>0.67%</td>
</tr>
<tr>
<td>Eastern Europe &amp; Russia</td>
<td>5%</td>
<td>8.60%</td>
<td>2.60%</td>
</tr>
<tr>
<td>Asia</td>
<td>15%</td>
<td>7.63%</td>
<td>1.63%</td>
</tr>
<tr>
<td>Latin America</td>
<td>15%</td>
<td>9.42%</td>
<td>3.42%</td>
</tr>
<tr>
<td>Australia</td>
<td>4%</td>
<td>6.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Africa</td>
<td>4%</td>
<td>9.82%</td>
<td>3.82%</td>
</tr>
<tr>
<td>North America</td>
<td>40%</td>
<td>6.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Coca Cola</td>
<td>100%</td>
<td>7.14%</td>
<td>1.14%</td>
</tr>
</tbody>
</table>

- And emerging market companies are not all made equal.

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

Aswath Damodaran
VIII. Growth has to be earned (not endowed or estimated)

Expected Growth

Net Income

\[ \text{Retention Ratio} = 1 - \frac{\text{Dividends}}{\text{Net Income}} \]

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

Operating Income

\[ \text{Reinvestment Rate} = \frac{(\text{Net Cap Ex} + \text{Chg in WC})}{\text{EBIT} (1-t)} \]

\[ \text{Return on Capital} = \frac{\text{EBIT} (1-t)}{\text{Book Value of Capital}} \]

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

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

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

Adjust book equity for
- Capitalized R&D
- Acquisition Debris (Goodwill)

Adjust book value of debt for
- Capitalized operating leases

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

Return Spreads: January 2013

- ROC lower than cost of capital by >5%
- ROC lower than cost of capital between 2%-5%
- ROC within 2% of cost of capital
- ROC higher than the cost of capital between 2%-5%
- ROC higher than the cost of capital by >5%

Aswath Damodaran
IX. All good things come to an end..And the terminal value is not an ATM...

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

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?
Reinv Rate = g/ ROC
Is the ROC that of a stable company?

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>435,686र</td>
</tr>
<tr>
<td>1%</td>
<td>$154,479</td>
<td>435,686र</td>
</tr>
<tr>
<td>2%</td>
<td>$160,194</td>
<td>435,686र</td>
</tr>
<tr>
<td>3%</td>
<td>$167,784</td>
<td>435,686र</td>
</tr>
<tr>
<td>4%</td>
<td>$179,099</td>
<td>435,686र</td>
</tr>
<tr>
<td>5%</td>
<td></td>
<td>435,686र</td>
</tr>
</tbody>
</table>

| Riskfree rate      | 4.78%   | 5%          |
| ROIC               | 10%     | 10.39%      |
| Cost of capital    | 8.08%   | 10.39%      |
THE LOOSE ENDS IN VALUATION...
Getting from DCF to value per share: The Loose Ends

Discount FCFF at Cost of capital = Operating Asset Value

The adjustments to get to firm value
+ Cash & Marketable Securities
  Discount? Premium?
+ Value of Cross holdings
  Book value? Market value?
+ Value of other non-operating assets
What should be here? What should not?

Intangible assets (Brand Name) Premium
Synergy Premium

Value of business (firm)
Complexity discount

Value of Equity
- Debt
  Underfunded pension/health care obligations?
  Lawsuits & Contingent liabilities?
- Minority Discount
- Distress discount
- Liquidity discount

Value per share
Option Overhang
Differences in cashflow/voting rights across shares
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?

Aswath Damodaran
Cash: Discount or Premium?

*Market Value of $1 in cash: Estimates obtained by regressing Enterprise Value against Cash Balances*
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 estimate 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, 13,572₹
- Tata Chemicals, 2,431₹
- Other publicly held Tata Companies, 12,335₹
- Non-public Tata companies, 112,238₹
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 cash flows, you cannot count the market value of the asset in your value.
4. Brand name, great management, superb product ... Don’t double count!

- There is often a temptation to add on premiums for intangibles. Here are a few examples.
  - 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>Value of Firm =</td>
<td>$79,611.25</td>
<td>$15,371.24</td>
</tr>
</tbody>
</table>

Aswath Damodaran
5. The Value of Control: It’s not always worth 20%!!

- 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.

- Value of Gaining Control = Present Value (Value of Company with change in control - Value of company without change in control) + Side Benefits of Control

Aswath Damodaran
Revenues

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

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

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

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- tax rate) * Debt/Capital

Match your financing to your assets: Reduce your default risk and cost of debt

Shift interest expenses to higher tax locales

Change financing mix to reduce cost of capital

Increase Cash Flows

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
Adris Grupa (Status Quo): 4/2010

**Current Cashflow to Firm**

\[
\begin{align*}
\text{EBIT}(1-t) & : 436 \text{ HRK} \\
\text{- Nt CpX} & : 3 \text{ HRK} \\
\text{- Chg WC} & : -118 \text{ HRK} \\
\text{FCFF} & : 551 \text{ HRK} \\
\text{Reinv Rate} & = (3-118)/436 = -26.35\% \\
\text{Tax rate} & = 17.35\% \\
\text{Return on capital} & = 8.72\% \\
\end{align*}
\]

**Expected Growth**

\[
\begin{align*}
\text{Reinvestment Rate} & = 70.83\% \\
\text{Return on Capital} & = 9.69\% \\
\text{Expected Growth from new inv.} & \approx 0.0686 \text{ or } 6.86\% \\
\end{align*}
\]

**Terminal Value**

\[
\text{5} = 365/(0.0992-.04) = 6170 \text{ HRK}
\]

**Cost of Equity**

10.70%

**Cost of Debt**

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

**Weights**

\[
E = 97.4\% \quad D = 2.6\%
\]

**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%

**CRP for Croatia**

(3%)

\[
\begin{align*}
\text{Lambda} & = 0.68 \\
\text{Beta} & = 0.70 \\
\text{Mature market premium} & = 4.5\% \\
\end{align*}
\]

**CRP for Central Europe**

(3%)

\[
\begin{align*}
\text{Lambda} & = 0.42 \\
\text{Beta} & = 0.70 \\
\text{Country Default Spread} & = 2\% \\
\text{Rel Equity Mkt Vol} & = 1.50
\end{align*}
\]

**On May 1, 2010**

AG Pfd price = 279 HRK
AG Common = 345 HRK

**Discount at $ Cost of Capital (WACC) = 10.7\% (.974) + 5.40\% (0.026) = 10.55\%**
Adris Grupa: 4/2010 (Restructured)

Current Cashflow to Firm

EBIT(1-t) : 436 HRK
- Nt 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 from new inv.
.7083*.01054=0. or 6.86%

Return on Capital 10.54%

Terminal Value5= 367/(.0965-.04) =6508 HRK

Cost of Equity 11.12%
Cost of Debt (4.25%+ 4%+2%)(1-.20)
= 8.20%
Weights E = 90 % D = 10 %

Riskfree Rate: HRK Riskfree Rate= 4.25%

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

Aswath Damodaran
Adris Grupa has two classes of shares outstanding: 9.616 million voting shares and 6.748 million non-voting shares.

To value a non-voting share, we assume that all non-voting shares essentially have to settle for status quo value. All shareholders, common and preferred, get an equal share of the status quo value.

- Status Quo Value of Equity = 5,484 million HKR
- Value for a non-voting share = 5484/(9.616+6.748) = 334 HKR/share

To value a voting share, we first value control in Adris Grupa as the difference between the optimal and the status quo value:
- Value of control at Adris Grupa = 5,735 – 5484 = 249 million HKR
- Value per voting share =334 HKR + 249/9.616 = 362 HKR
THE DARK SIDE OF VALUATION:
VALUING DIFFICULT-TO-VALUE COMPANIES
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)
I. The challenge with young companies...

Figure 5.2: Estimation Issues - Young and Start-up Companies

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

Cash flows from existing assets non-existent or negative.

What are the cashflows from existing assets?

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

What is the value of equity in the firm?

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

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

What is the value added by growth assets?

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

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

- When valuing a business, we generally draw on three sources of information
  - The firm’s current financial statement
    - How much did the firm sell?
    - How much did it earn?
  - The firm’s financial history, usually summarized in its financial statements.
    - How fast have the firm’s revenues and earnings grown over time?
    - What can we learn about cost structure and profitability from these trends?
    - Susceptibility to macro-economic factors (recessions and cyclical firms)
  - The industry and comparable firm data
    - What happens to firms as they mature? (Margins.. Revenue growth... Reinvestment needs... Risk)

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

From previous years

Value of Op Assets $15,170
+ Cash $26
= Value of Firm $15,196
- Value of Debt $349
= Value of Equity $14,847
- Equity Options $2,892
Value per share $35.08

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

Cost of Equity 12.90%

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

Riskfree Rate: T. Bond rate = 6.5%

+ Beta 1.60 -> 1.00 x Risk Premium 4%

Dot.com retailers for first 5 years
Conventional retailers after year 5

Cost of Debt 6.5%+1.5%=8.0% Tax rate = 0% -> 35%

Cost of Capital 12.84% -> 12.84% 12.84% 12.83% 12.81% 12.13% 11.62% 11.08% 10.49% 9.61%

Revenue Growth 150.00% 100.00% 75.00% 50.00% 30.00% 25.20% 20.40% 15.60% 10.80% 6.00%
Revenues $2,793 $5,585 $9,774 $14,661 $19,059 $23,862 $28,729 $33,211 $36,798 $39,006
Operating Margin -13.35% -1.68% 4.16% 7.08% 8.54% 9.27% 9.64% 9.82% 9.91% 9.95%
EBIT $-573 $-94 $407 $1,038 $1,628 $2,212 $2,768 $3,261 $3,646 $3,883
EBIT(1-t) $-573 $-94 $407 $1,038 $1,628 $2,212 $2,768 $3,261 $3,646 $3,883
- Reinvestment $600 $967 $1,420 $1,663 $1,543 $1,688 $1,721 $1,619 $1,363 $961
FCFF $-931 $1,024 $-939 $-758 $-408 $-163 $177 $625 $1,174 $1,788

Term. Year
6% $41,346
10.00% $4,135
7.80% $4,135
7.75% $4,135
7.67% $4,135
7.50% $4,135
7.00% $4,135

Amazon was trading at $84 in January 2000.

Pushed debt ratio to retail industry average of 15%.
### Starting numbers

<table>
<thead>
<tr>
<th></th>
<th>Last 10K</th>
<th>Trailing 12 month</th>
</tr>
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<tbody>
<tr>
<td>Revenues</td>
<td>$316.93</td>
<td>$534.46</td>
</tr>
<tr>
<td>Operating income</td>
<td>-$77.06</td>
<td>-$134.91</td>
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<tr>
<td>Adjusted Operating Income</td>
<td>$7.67</td>
<td></td>
</tr>
<tr>
<td>Invested Capital</td>
<td>$955.00</td>
<td></td>
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<tr>
<td>Adjusted Operating Margin</td>
<td>1.44%</td>
<td></td>
</tr>
<tr>
<td>Sales/ Invested Capital</td>
<td>0.56</td>
<td></td>
</tr>
<tr>
<td>Interest expenses</td>
<td>$2.49</td>
<td>$5.30</td>
</tr>
</tbody>
</table>

### Revenue
- **Revenues**
- **Operating income**
- **Invested Capital**
- **Adjusted Operating Income**
- **Adjustment for operations**
- **Value of equity**
- **Interest expenses**

### Management
- **Cost of Debt**
- **Cost of Equity**
- **Risk Free Rate**
- **Cost of Capital**
- **Beta**
- **Risk Free Rate**
- **Stable Growth**
- **Terminal Value**

### Twitter Pre-IPO Valuation: October 27, 2013

**Terminal Value**
- **Terminal Value**
- **EBIT**
- **Reinvestment**
- **FCFF**
- **Cost of Capital**
- **Risk premium**
- **Operating assets**
- **Value of equity**
- **Value in stock**
- **IPO Proceeds**
- **Operating Margin**
- **Sales to capital ratio**
- **Growth rate**
- **Beta**
- **Cost of capital**
- **ROC**
- **Reinvestment Rate**
- **Weights**

**Cost of capital decreases to 8% from years 6-10**
1. Less is more

Use “auto pilot” approaches to estimate future years

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenue Growth</th>
<th>Sales</th>
<th>Operating Margin</th>
<th>EBIT</th>
<th>EBIT (1-t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tr 12 mths</td>
<td></td>
<td>$1,117</td>
<td>-36.71%</td>
<td>-$410</td>
<td>-$410</td>
</tr>
<tr>
<td>1</td>
<td>150.00%</td>
<td>$2,793</td>
<td>-13.35%</td>
<td>-$373</td>
<td>-$373</td>
</tr>
<tr>
<td>2</td>
<td>100.00%</td>
<td>$5,585</td>
<td>-1.68%</td>
<td>-$94</td>
<td>-$94</td>
</tr>
<tr>
<td>3</td>
<td>75.00%</td>
<td>$9,774</td>
<td>4.16%</td>
<td>$407</td>
<td>$407</td>
</tr>
<tr>
<td>4</td>
<td>50.00%</td>
<td>$14,661</td>
<td>7.08%</td>
<td>$1,038</td>
<td>$871</td>
</tr>
<tr>
<td>5</td>
<td>30.00%</td>
<td>$19,059</td>
<td>8.54%</td>
<td>$1,628</td>
<td>$1,058</td>
</tr>
<tr>
<td>6</td>
<td>25.20%</td>
<td>$23,862</td>
<td>9.27%</td>
<td>$2,212</td>
<td>$1,438</td>
</tr>
<tr>
<td>7</td>
<td>20.40%</td>
<td>$28,729</td>
<td>9.64%</td>
<td>$2,768</td>
<td>$1,799</td>
</tr>
<tr>
<td>8</td>
<td>15.60%</td>
<td>$33,211</td>
<td>9.82%</td>
<td>$3,261</td>
<td>$2,119</td>
</tr>
<tr>
<td>9</td>
<td>10.80%</td>
<td>$36,798</td>
<td>9.91%</td>
<td>$3,646</td>
<td>$2,370</td>
</tr>
<tr>
<td>10</td>
<td>6.00%</td>
<td>$39,006</td>
<td>9.95%</td>
<td>$3,883</td>
<td>$2,524</td>
</tr>
<tr>
<td>TY</td>
<td>6.00%</td>
<td>$41,346</td>
<td>10.00%</td>
<td>$4,135</td>
<td>$2,688</td>
</tr>
</tbody>
</table>

Principle of parsimony: Estimate fewer inputs when faced with uncertainty.
A tougher task at Twitter

Aswath Damodaran

My estimate for 2023: Overall market will be close to $200 billion and Twitter will about 5.7% ($11.5 billion)

My estimate for Twitter: Operating margin of 25% in year 10

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>$</td>
<td>%</td>
<td>$</td>
</tr>
<tr>
<td>Google</td>
<td>32.09%</td>
<td>$27.74</td>
<td>31.46%</td>
</tr>
<tr>
<td>Facebook</td>
<td>3.65%</td>
<td>$3.15</td>
<td>4.11%</td>
</tr>
<tr>
<td>Yahoo!</td>
<td>3.95%</td>
<td>$3.41</td>
<td>3.37%</td>
</tr>
<tr>
<td>Microsoft</td>
<td>1.27%</td>
<td>$1.10</td>
<td>1.63%</td>
</tr>
<tr>
<td>IAC</td>
<td>1.15%</td>
<td>$0.99</td>
<td>1.39%</td>
</tr>
<tr>
<td>AOL</td>
<td>1.17%</td>
<td>$1.01</td>
<td>1.02%</td>
</tr>
<tr>
<td>Amazon</td>
<td>0.48%</td>
<td>$0.41</td>
<td>0.59%</td>
</tr>
<tr>
<td>Pandora</td>
<td>0.28%</td>
<td>$0.24</td>
<td>0.36%</td>
</tr>
<tr>
<td>Twitter</td>
<td>0.16%</td>
<td>$0.14</td>
<td>0.28%</td>
</tr>
<tr>
<td>LinkedIn</td>
<td>0.18%</td>
<td>$0.16</td>
<td>0.25%</td>
</tr>
<tr>
<td>Millennial Media</td>
<td>0.05%</td>
<td>$0.04</td>
<td>0.07%</td>
</tr>
<tr>
<td>Other</td>
<td>55.59%</td>
<td>$48.05</td>
<td>55.47%</td>
</tr>
<tr>
<td>Total &amp; nbsp;Market</td>
<td>100.00%</td>
<td>$86.43</td>
<td>100.00%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Company</th>
<th>Operating Margin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Google Inc. (NasdaqGS:GOOG)</td>
<td>22.82%</td>
</tr>
<tr>
<td>Facebook, Inc. (NasdaqGS:FB)</td>
<td>29.99%</td>
</tr>
<tr>
<td>Yahoo! Inc. (NasdaqGS:YHOO)</td>
<td>13.79%</td>
</tr>
<tr>
<td>Netflix</td>
<td>3.16%</td>
</tr>
<tr>
<td>Groupon</td>
<td>2.53%</td>
</tr>
<tr>
<td>LinkedIn Corporation (NYSE:LNKD)</td>
<td>5.18%</td>
</tr>
<tr>
<td>Pandora Media, Inc. (NYSE:P)</td>
<td>-9.13%</td>
</tr>
<tr>
<td>Yelp, Inc. (NYSE:YELP)</td>
<td>-6.19%</td>
</tr>
<tr>
<td>OpenTable, Inc. (NasdaqGS:OPEN)</td>
<td>24.90%</td>
</tr>
<tr>
<td>RetailMeNot</td>
<td>45.40%</td>
</tr>
<tr>
<td>Travelzoo Inc. (NasdaqGS:TZOO)</td>
<td>15.66%</td>
</tr>
<tr>
<td>Zillow, Inc. (NasdaqGS:Z)</td>
<td>-66.60%</td>
</tr>
<tr>
<td>Trulia, Inc. (NYSE:TRLA)</td>
<td>-6.79%</td>
</tr>
<tr>
<td>Aggregate</td>
<td>20.40%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Online advertising share of market</th>
<th>2.00%</th>
<th>2.50%</th>
<th>3.00%</th>
<th>3.50%</th>
<th>4.00%</th>
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<tbody>
<tr>
<td>20%</td>
<td>$124.78</td>
<td>$131.03</td>
<td>$137.56</td>
<td>$144.39</td>
<td>$151.52</td>
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<tr>
<td>25%</td>
<td>$155.97</td>
<td>$163.79</td>
<td>$171.95</td>
<td>$180.49</td>
<td>$189.40</td>
</tr>
<tr>
<td>30%</td>
<td>$187.16</td>
<td>$196.54</td>
<td>$206.34</td>
<td>$216.58</td>
<td>$227.28</td>
</tr>
<tr>
<td>35%</td>
<td>$218.36</td>
<td>$229.30</td>
<td>$240.74</td>
<td>$252.68</td>
<td>$265.16</td>
</tr>
<tr>
<td>40%</td>
<td>$249.55</td>
<td>$262.06</td>
<td>$275.13</td>
<td>$288.78</td>
<td>$303.04</td>
</tr>
</tbody>
</table>
2. Build in “internal” checks for reasonableness...

Check total revenues, relative to the market that it serves…
Your market share obviously cannot exceed 100% but there may be tighter constraints.

Are the margins and imputed returns on capital ‘reasonable’ in the outer years?

Aswath Damodaran
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.

![Graph showing the decline of Post-IPO growth over time.](image)

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

Aswath Damodaran

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenues</th>
<th>Δ Revenue</th>
<th>Sales/Cap</th>
<th>Δ Investment</th>
<th>Invested Capital</th>
<th>EBIT (1-t)</th>
<th>Imputed ROC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tr 12 mths</td>
<td>$1,117</td>
<td></td>
<td></td>
<td>$487</td>
<td>-$410</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>$2,793</td>
<td>$1,676</td>
<td>3.00</td>
<td>$559</td>
<td>$1,045</td>
<td>-$373</td>
<td>-76.62%</td>
</tr>
<tr>
<td>2</td>
<td>$5,585</td>
<td>$2,793</td>
<td>3.00</td>
<td>$931</td>
<td>$1,976</td>
<td>-$94</td>
<td>-8.96%</td>
</tr>
<tr>
<td>3</td>
<td>$9,774</td>
<td>$4,189</td>
<td>3.00</td>
<td>$1,396</td>
<td>$3,372</td>
<td>$407</td>
<td>20.59%</td>
</tr>
<tr>
<td>4</td>
<td>$14,661</td>
<td>$4,887</td>
<td>3.00</td>
<td>$1,629</td>
<td>$5,001</td>
<td>$871</td>
<td>25.82%</td>
</tr>
<tr>
<td>5</td>
<td>$19,059</td>
<td>$4,398</td>
<td>3.00</td>
<td>$1,466</td>
<td>$6,467</td>
<td>$1,058</td>
<td>21.16%</td>
</tr>
<tr>
<td>6</td>
<td>$23,862</td>
<td>$4,803</td>
<td>3.00</td>
<td>$1,601</td>
<td>$8,068</td>
<td>$1,438</td>
<td>22.23%</td>
</tr>
<tr>
<td>7</td>
<td>$28,729</td>
<td>$4,868</td>
<td>3.00</td>
<td>$1,623</td>
<td>$9,691</td>
<td>$1,799</td>
<td>22.30%</td>
</tr>
<tr>
<td>8</td>
<td>$33,211</td>
<td>$4,482</td>
<td>3.00</td>
<td>$1,494</td>
<td>$11,185</td>
<td>$2,119</td>
<td>21.87%</td>
</tr>
<tr>
<td>9</td>
<td>$36,798</td>
<td>$3,587</td>
<td>3.00</td>
<td>$1,196</td>
<td>$12,380</td>
<td>$2,370</td>
<td>21.19%</td>
</tr>
<tr>
<td>10</td>
<td>$39,006</td>
<td>$2,208</td>
<td>3.00</td>
<td>$736</td>
<td>$13,116</td>
<td>$2,524</td>
<td>20.39%</td>
</tr>
<tr>
<td>TY</td>
<td>$41,346</td>
<td>$2,340</td>
<td>NA</td>
<td>Assumed to be = 20.00%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Lesson 5: There are always scenarios where the market price can be justified...

<table>
<thead>
<tr>
<th>Compounded annual Revenue Growth rate</th>
<th>Target pre-tax Operating Margin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6%</td>
</tr>
<tr>
<td>30%</td>
<td>$ (1.94)</td>
</tr>
<tr>
<td>35%</td>
<td>$ 1.41</td>
</tr>
<tr>
<td>40%</td>
<td>$ 6.10</td>
</tr>
<tr>
<td>45%</td>
<td>$ 12.59</td>
</tr>
<tr>
<td>50%</td>
<td>$ 21.47</td>
</tr>
<tr>
<td>55%</td>
<td>$ 33.47</td>
</tr>
<tr>
<td>60%</td>
<td>$ 49.53</td>
</tr>
</tbody>
</table>
Lesson 6: Don’t forget to mop up...

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

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

- No matter how careful you are in getting your inputs and how well structured your model is, your estimate of value will change both as new information comes out about the company, the business and the economy.

- As information comes out, you will have to adjust and adapt your model to reflect the information. Rather than be defensive about the resulting changes in value, recognize that this is the essence of risk.

- A test: If your valuations are unbiased, you should find yourself increasing estimated values as often as you are decreasing values. In other words, there should be equal doses of good and bad news affecting valuations (at least over time).
And the market is often “more wrong”....

Amazon: Value and Price

<table>
<thead>
<tr>
<th>Time of analysis</th>
<th>Value per share</th>
<th>Price per share</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Aswath Damodaran
II. 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 the 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?

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.

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

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.

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

What is the value of equity in the firm?
Reinvestment: Capital expenditures include cost of new casinos and working capital

Extended reinvestment break, due to investment in past

Expected Margin: -> 17%

EBIT $209m

Revenues $4,434 $4,523 $5,427 $6,513 $7,815 $8,206 $8,616 $9,047 $9,499 $9,974
Oper margin 5.81% 6.86% 7.90% 8.95% 10% 11.40% 12.80% 14.20% 15.60% 17%
EBIT $258 $310 $429 $583 $782 $935 $1,103 $1,285 $1,482 $1,696
Tax rate 26.0% 26.0% 26.0% 26.0% 26.0% 28.4% 30.8% 33.2% 35.6% 38.00%
EBIT * (1-t) $191 $229 $317 $431 $578 $670 $763 $858 $954 $1,051
- Reinvestment -$19 -$11 $0 $22 $58 $67 $153 $215 $286 $350
FCFF $210 $241 $317 $410 $520 $603 $611 $644 $668 $701

Value of Op Assets $9,793
+ Cash & Non-op $3,040
= Value of Firm $12,833
- Value of Debt $7,565
= Value of Equity $5,268
Value per share $8.12

Cost of Equity 21.82%
Cost of Debt 3%+6%= 9%
9% (1-.38)=5.58%
Weights
Debt= 73.5% ->50%

Riskfree Rate:
T. Bond rate = 3%
Beta 3.14-> 1.20
Risk Premium 6%
Casino 1.15
Current D/E: 277%
Base Equity Premium
Country Risk Premium

Aswath Damodaran

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:

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

- Solving for the probability of bankruptcy, we get:
  - \(\pi_{\text{Distress}}\) = 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

Aswath Damodaran
The “sunny” side of distress: Equity as a call option to liquidate the firm

Aswath Damodaran
Value Jet India as an Option

- **The inputs**
  - Value of the underlying asset = $S = Value of the firm = Rs 6,164 crores (from a DCF valuation of the operating assets)
  - Exercise price = $K = Face Value of outstanding debt = Rs 11430 crores (face value of the debt)
  - Life of the option = $t = Life of zero-coupon debt = 4.5 year (average maturity of debt)
  - Variance in the value of the underlying asset = $\sigma^2 = Variance in firm value = 0.2153 (average variance in firm value across airlines)
  - Riskless rate = $r = Risk free rate over option live= 8% (Rupee risk free rate)

- **The output**
  - The Black-Scholes model provides the following value for the call:
    - $d1 = 0.2308 \quad N(d1) = 0.5913$
    - $d2 = -0.7535 \quad N(d2) = 0.2256$
  - Value of the call = Rs 1,846 1 crores
  - Probability of default = 1 - 0.2256 = 77.44%
III. 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 cashflows 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.

Aswath Damodaran
Valuing a Cyclical Company - Toyota in Early 2009

Normalized Earnings
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.

\[
\text{Normalized Operating Income} = \text{Revenues in 2009} \times \text{Average Operating Margin (98--09)}
\]

\[
= 22661 \times .0733 = 1660.7 \text{ billion yen}
\]

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.

\[
\text{Cost of capital} = 8.65\% \times (1 - .407) + 3.25\% \times (1 - .407) \times .529 = 5.09\%
\]

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

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:

\[
\text{Reinvestment rate} = \frac{1.5\%}{5.09\%} = 29.46\%
\]

Operating Assets 19,640 + Cash 2,288 + Non-operating assets 6,845 - Debt 11,862 - Minority Interests 583

Value of Equity / No of shares /3,448

Value per share ¥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.

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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:

\[
\text{Operating Income} = -6,395 + 911.32 \times \text{Average Oil Price} \quad R^2 = 90.2\% \\
(2.95) \quad (14.59)
\]

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

Estimate normalized income based on current oil price

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

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

Estimate return on capital and reinvestment rate based on normalized income

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

\[
\text{Reinvestment Rate} = \frac{g}{\text{ROC}} = \frac{2}{21\%} = 9.52\%
\]

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.

Exxon’s cost of capital

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

\[
\text{Cost of capital} = 0.90 \times 8.35\% + 3.75\% (1-.38) \times 0.0285 = 8.18\%
\]
Exxon Mobil Valuation: Simulation
IV. Valuing Companies across the ownership cycle

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

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

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

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

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

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

Reversing investment mistakes is difficult to do. The need for and the cost of illiquidity has to be incorporated into current...
Kristin’s Kandy: Valuation in March 2006

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

**Expected Growth in EBIT (1-t)**
- \(0.4667 \times 0.1364 = 0.0636\)
- 6.36%

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

**Terminal Value**
- \(5 = 289 / (0.1254 - 0.04) = 3,403\)

**Cost of Equity**
- 16.26%

**Cost of Debt**
- \((4.5\% + 1.00)(1 - .40)\)
- 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

**Adjusted for owner non-diversification**
- 1/3 of risk is market risk
- Market Beta: 0.98

**Synthetic rating = A-**

**Firm Value**
- 2,571
+ Cash 125
- Debt: 900
= Equity 1,796
- Illiq Discount 12.5%
Adj Value 1,571

**Risk Premium**
- 4.00%

**Mature risk premium**
- 4%

**Country Risk Premium**
- 0%
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%
RELATIVE VALUATION

Aswath Damodaran
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.

Aswath Damodaran
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

Aswath Damodaran
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.

Aswath Damodaran
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:  EPS in most recent financial year
   - EPS in trailing 12 months (Trailing PE)
   - Forecasted EPS in next year (Forward PE)
   - Forecasted EPS 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.

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

- 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 number of firms</td>
<td>7871</td>
<td>7871</td>
<td>7871</td>
</tr>
<tr>
<td>Number of firms with PE</td>
<td>3337</td>
<td>3278</td>
<td>2674</td>
</tr>
<tr>
<td>Average</td>
<td>83.86</td>
<td>43.88</td>
<td>24.45</td>
</tr>
<tr>
<td>Median</td>
<td>16.38</td>
<td>15.79</td>
<td>14.87</td>
</tr>
<tr>
<td>Maximum</td>
<td>50,463.64</td>
<td>8,840.31</td>
<td>3,192.76</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>1,299.9</td>
<td>250.87</td>
<td>83.5</td>
</tr>
<tr>
<td>Standard Error</td>
<td>22.5</td>
<td>4.38</td>
<td>1.61</td>
</tr>
<tr>
<td>Skewness</td>
<td>34.26</td>
<td>22.02</td>
<td>28.92</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>1,250.28</td>
<td>620.81</td>
<td>995.61</td>
</tr>
<tr>
<td>25th Percentile</td>
<td>10.56</td>
<td>10.17</td>
<td>11.52</td>
</tr>
<tr>
<td>75th Percentile</td>
<td>26.15</td>
<td>24.15</td>
<td>20.2</td>
</tr>
</tbody>
</table>
3. Markets have a lot in common

PE Ratios: Global comparison – January 2013

<table>
<thead>
<tr>
<th>Region</th>
<th>25th percentile</th>
<th>Median</th>
<th>75th percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>10.56</td>
<td>16.38</td>
<td>26.15</td>
</tr>
<tr>
<td>Europe</td>
<td>9.00</td>
<td>13.93</td>
<td>22.94</td>
</tr>
<tr>
<td>Japan</td>
<td>8.40</td>
<td>12.77</td>
<td>20.14</td>
</tr>
<tr>
<td>Aus, NZ &amp; Canada</td>
<td>7.57</td>
<td>13.35</td>
<td>22.14</td>
</tr>
<tr>
<td>Emerging Markets</td>
<td>7.87</td>
<td>14.42</td>
<td>28.81</td>
</tr>
<tr>
<td>Global</td>
<td>8.39</td>
<td>14.36</td>
<td>25.88</td>
</tr>
</tbody>
</table>
4. Simplistic rules almost always break down...6 times EBITDA may not be cheap...
Or it may be...

EV/EBITDA Multiples: US companies in January 2013

<table>
<thead>
<tr>
<th>Percentile</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>25th percentile</td>
<td>6.08</td>
</tr>
<tr>
<td>Median</td>
<td>9.11</td>
</tr>
<tr>
<td>75th percentile</td>
<td>14.17</td>
</tr>
</tbody>
</table>
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,

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

- If this had been a FCFE Model,

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

\[ \frac{P_0}{EPS_0} = PE = \frac{(FCFE/Earnings) \times (1 + g_n)}{r - g_n} \]
The Determinants of Multiples...

Value of Stock = DPS \( \frac{1}{(k_e - g)} \)

- **PE** = Payout Ratio \( \frac{1+g}{r-g} \)
- **PEG** = Payout ratio \( \frac{1+g}{g(r-g)} \)
- **PBV** = ROE (Payout ratio) \( \frac{1+g}{r-g} \)
- **PS** = Net Margin (Payout ratio) \( \frac{1+g}{r-g} \)

**Equity Multiples**

- **Value of Firm** = FCFF \( \frac{1}{(WACC - g)} \)

**Firm Multiples**

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

Aswath Damodaran
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.
An Example: Comparing PE Ratios across a Sector: PE

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

- Dependent variable is: PE
- R 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>Probability</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>
<tr>
<td>Emerging Market is a dummy:</td>
<td>1 if emerging market</td>
<td>0 if not</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PE regressions across markets...

<table>
<thead>
<tr>
<th>Region</th>
<th>Regression – January 2013</th>
<th>R squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>$\text{PE} = 11.39 + 50.75 \text{ Expected Growth in EPS for next 5 years} + 8.53 \text{ Payout} - 2.77 \text{ Beta}$</td>
<td>31.9%</td>
</tr>
<tr>
<td>Japan</td>
<td>$\text{PE} = 8.29 + 31.39 \text{ Expected Growth in EPS for next 5 years} + 17.98 \text{ Payout}$</td>
<td>44.9%</td>
</tr>
<tr>
<td>Emerging Markets</td>
<td>$\text{PE} = 15.22 + 43.52 \text{ Expected Growth in EPS for next 5 years} + 2.01 \text{ Payout} - 3.67 \text{ Beta}$</td>
<td>32.9%</td>
</tr>
</tbody>
</table>
## 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>
A closing thought...