Valuations

Aswath Damodaran
## Companies Valued

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The equity risk premiums that I have used in the valuations that follow reflect my thinking (and how it has evolved) on the issue.

- Pre-1998 valuations: In the valuations prior to 1998, I use a risk premium of 5.5% for mature markets (close to both the historical and the implied premiums then).
- Between 1998 and Sept 2008: In the valuations between 1998 and September 2008, I used a risk premium of 4% for mature markets, reflecting my belief that risk premiums in mature markets do not change much and revert back to historical norms (at least for implied premiums).
- Valuations done in 2009: After the 2008 crisis and the jump in equity risk premiums to 6.43% in January 2008, I have used a higher equity risk premium (5-6%) for the next 5 years and will assume a reversion back to historical norms (4%) only after year 5.
- In 2010 & 2011: In 2010, I reverted back to a mature market premium of 4.5%, reflecting the drop in equity risk premiums during 2009. In 2011, I plan to use 5%, reflecting again the change in implied premium over the year.
1. CON ED- AUGUST 2008

Test 1: Is the firm paying dividends like a stable growth firm?
Dividend payout ratio is 73%

In trailing 12 months, through June 2008
Earnings per share = $3.17
Dividends per share = $2.32

Value per share today = Expected Dividends per share next year / (Cost of equity - Growth rate)
= 2.32 (1.021)/ (.077 - .021) = $42.30

Cost of Equity = 4.1% + 0.8 (4.5%) = 7.70%

Test 2: Is the stable growth rate consistent with fundamentals?
Retention Ratio = 27%
ROE = Cost of equity = 7.7%
Expected growth = 2.1%

On August 12, 2008 Con Ed was trading at $40.76.

Test 3: Is the firm's risk and cost of equity consistent with a stable growth firm?
Beta of 0.80 is at lower end of the range of stable company betas: 0.8 -1.2

Why a stable growth dividend discount model?
1. Why stable growth: Company is a regulated utility, restricted from investing in new growth markets. Growth is constrained by the fact that the population (and power needs) of its customers in New York are growing at very low rates.
   Growth rate forever = 2%
2. Why equity: Company’s debt ratio has been stable at about 70% equity, 30% debt for decades.
3. Why dividends: Company has paid out about 97% of its FCFE as dividends over the last five years.
Con Ed: Break Even Growth Rates

Con Ed: Value versus Growth Rate

Break even point: Value = Price
Following up on DCF valuation…

- Assume that you believe that your valuation of Con Ed ($42.30) is a fair estimate of the value, 7.70% is a reasonable estimate of Con Ed’s cost of equity and that your expected dividends for next year (2.32*1.021) is a fair estimate, what is the expected stock price a year from now (assuming that the market corrects its mistake?)

- If you bought the stock today at $40.76, what return can you expect to make over the next year (assuming again that the market corrects its mistake)?
2a. ABN AMRO - December 2003

Rationale for model
Why dividends? Because FCFE cannot be estimated
Why 2-stage? Because the expected growth rate in near term is higher than stable growth rate.

Dividends
EPS = 1.85 Eur
* Payout Ratio 48.65%
DPS = 0.90 Eur

Expected Growth
51.35% *
16% = 8.22%

EPS 2.00 Eur 2.17 Eur 2.34Eur 2.54 Eur 2.75 Eur
DPS 0.97 Eur 1.05 Eur 1.14 Eur 1.23 Eur 1.34 Eur

Discount at Cost of Equity
Cost of Equity
4.95% + 0.95 (4%) = 8.15%

Riskfree Rate:
Long term bond rate in Euros
4.35%

Beta 0.95

Risk Premium
4%

Average beta for European banks = 0.95

In December 2003, Amro was trading at 18.55 Euros per share
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**
91.65% * 13.19% = 12.09%

**Retention Ratio**
91.65%

**Terminal Value**
\[ \text{EPS}^10 \times \text{Payout} / (r-g) \]
\[ = (42.03 \times 1.04 \times 0.6) / (0.095 - 0.04) = 476.86 \]

**Discount at Cost of Equity**
\[ \text{Cost of Equity} = 4.10\% + 1.40\% (4.5\%) = 10.4\% \]

**Riskfree Rate**
Treasury bond rate 4.10%

**Beta**
1.40

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

**Risk Premium**
4.5%
Mature Market 4.5%
Country Risk 0%

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

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

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

**Left return on equity at 2008 levels, well below 16% in 2007 and 20% in 2004-2006.**
2c. Wells Fargo: Valuation on October 7, 2008

**Return on Equity:** 17.56%

**Dividends (Trailing 12 months)**

- EPS = $2.16 * Payout Ratio 54.63%
- DPS = $1.18

**Retention Ratio = 45.37%**

**Expected Growth**

- 45.37% * 13.5% = 6.13%

**EPS**

- $2.29
- $2.43
- $2.58
- $2.74
- $2.91

**DPS**

- $1.25
- $1.33
- $1.41
- $1.50
- $1.59

**Value of Equity per Share**

= PV of Dividends & Terminal value at 9.6% = $30.29

**Discount at Cost of Equity**

- Cost of Equity
  - 3.60% + 1.20 (5%) = 9.60%

**Terminal Value**

= EPS6 * Payout/(r-g)

= ($3.00 * 0.6055) / (0.076 - 0.03) = $39.41

**Value of Equity per Share**

- $30.29

**Risk Free Rate:**

- Long term treasury bond rate 3.60%

**Beta**

- 1.20

**Risk Premium**

- 5%

Updated in October 2008

**Average beta for US Banks over last year:** 1.20

**Mature Market**

- 5%

**Country Risk**

- 0%

Assuming that Wells will have to increase its capital base by about 30% to reflect tighter regulatory concerns. (.1756/1.3 = .135

**ROE = 13.5%**

**Rationale for model**

- Why dividends? Because FCFE cannot be estimated
- Why 2-stage? Because the expected growth rate in near term is higher than stable growth rate.

In October 2008, Wells Fargo was trading at $33 per share
2d. Deutsche Bank: March 2009

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

Normalized Net Income for base year 3,000 m
Normalized ROE = 9.4%

Expected growth in asset base 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/ROE = 3/10.20% = 29.41%

Cashflows

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

Terminal Value = 2,823 / (1.02 - .03) = 39,209 m

Discount at Cost of equity = 3.60% + 1.162 * 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
  - 1.162

Beta for commercial & Investment banking

Beta + Mature market premium
- 1.162
- 6%

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

CRP
- 0.00%
- 0.00%
- 4.50%
- 7.00%
- 3.50%
- 3.00%
- 0.60%
Present Value Mechanics – when discount rates are changing…

Consider the costs of equity for Goldman Sachs over the next 10 years.

<table>
<thead>
<tr>
<th>Year</th>
<th>1-5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10 on…</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of equity</td>
<td>10.4%</td>
<td>10.22%</td>
<td>10.04%</td>
<td>9.86%</td>
<td>9.68%</td>
<td>9.50%</td>
</tr>
</tbody>
</table>

In estimating the terminal value, we used the 9.50% cost of equity in stable growth, to arrive at a terminal value of $476.86. What is the present value of this terminal value?

Intuitively, explain why.
The Value of Growth

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

\[
P_0 = \left( \sum_{t=1}^{t=n} \frac{DPS_t}{(1+r)^t} + \frac{P_n}{(1+r)^n} \right) - \frac{DPS_0(1+g_n)}{(r-g_n)} \right) + \left( \frac{DPS_0(1+g_n)}{(r-g_n)} - \frac{DPS_0}{r} \right) + \frac{DPS_0}{r}
\]

Value of High Growth \hspace{1cm} Value of Stable Growth
Assets in \hspace{1cm} Place

\[DPS_t = \text{Expected dividends per share in year } t\]
\[r = \text{Cost of Equity}\]
\[P_n = \text{Price at the end of year } n\]
\[g_n = \text{Growth rate forever after year } n\]
### ABN Amro and Goldman Sachs: Decomposing Value

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</tr>
</thead>
<tbody>
<tr>
<td><strong>Assets in place</strong></td>
<td>0.90/.0835 = $10.78</td>
<td>39.02%</td>
<td>1.40/.095 = $14.74</td>
<td>6.62%</td>
</tr>
<tr>
<td><strong>Stable Growth</strong></td>
<td>0.90*1.04/(.0835-.04) = $10.74</td>
<td>38.88%</td>
<td>1.40*1.04/(.095-.04) = $11.74</td>
<td>5.27%</td>
</tr>
<tr>
<td><strong>Growth Assets</strong></td>
<td>27.62-10.78-10.74 = $6.10</td>
<td>22.10%</td>
<td>222.49-14.74-11.74 = $196.02</td>
<td>88.10%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$27.62</td>
<td></td>
<td>$222.49</td>
<td></td>
</tr>
</tbody>
</table>
Aswath Damodaran


Rationale for model
Why dividends? Because it is the only tangible cash flow, right?
Why 2-stage? Because the expected growth rate in near term is higher than stable growth rate.

Dividends
$ Dividends in trailing 12 months = 26.31

Expected Growth
Analyst estimate for growth over next 5 years = 7.18%

\[ g = \text{Riskfree rate} = 1.87\% \]
Assume that earnings on the index will grow at same rate as economy.

\[ \text{Terminal Value} = \frac{\text{DPS in year 6}}{r-g} = \frac{37.18 \times 1.0187}{0.0687 - 0.0187} = 757.41 \]

Cost of Equity
1.87% + 1.00 (5%) = 6.87%

Discount at Cost of Equity

Value of Equity per share = PV of Dividends & Terminal Value at 6.87% = 675.89

Riskfree Rate:
Treasury bond rate 1.87%

Beta 1.00

Risk Premium
5%
Higher than 40-year average but close to pre-crisis value.

S&P 500 is a good reflection of overall market

On January 1, 2012, the S&P 500 index was trading at 1257.60
### 3b. S&P 500: Augmented Dividends - January 2012

**Rationale for model**

Why dividends and buybacks? Because more and more companies are choosing to return cash with buybacks. Why 2-stage? Because the expected growth rate in near term is higher than stable growth rate.

**Dividends**

$ Dividends + Buybacks in based upon average over last 10 years = 59.30

**Expected Growth**

Analyst estimate for growth over next 5 years = 7.18%

\[ g = \text{Riskfree rate} = 1.87\% \]

Assume that earnings on the index will grow at same rate as economy.

\[ \text{Terminal Value} = \frac{\text{DPS in year 6}}{r-g} = \frac{83.88 \times 1.0187}{0.0687 - 0.0187} = 1708.89 \]

**Value of Equity per share = PV of Dividends & Terminal value at 6.87\% = 1524.94**

**Cost of Equity**

1.87\% + 1.00 (5\%) = 6.87\%

**Riskfree Rate:**

Treasury bond rate 1.87\%

**Beta**

1.00

**Risk Premium**

5\%

Higher than 40-year average but close to pre-crisis value.

On January 1, 2012, the S&P 500 index was trading at 1257.60

**Rationale for model**

Why dividends and buybacks? Because more and more companies are choosing to return cash with buybacks.

Why fundamental growth? Because growth cannot be invented, it has to be earned.

Why 2-stage? Because the expected growth rate in near term is higher than stable growth rate.

**Dividends**

$ Dividends + Buybacks in based upon average over last 10 years = 59.30

**Expected Growth**

Retention ratio * 
ROE = .39*.162 = 6.30%

**Terminal Value**

\[ \text{Terminal Value} = \frac{\text{DPS in year 6}}{(r-g)} \]
\[ = \frac{(80.49*1.0187)/(.0687-.0187)} = 1639.87 \]

**Value of Equity per share = PV of Dividends & Terminal value at 6.87% = 1468.13**

**Cost of Equity**

1.87% + 1.00 (5%) = 6.87%

**Riskfree Rate**

Treasury bond rate 1.87%

**Beta**

1.00

**Risk Premium**

5%

Higher than 40-year average but close to pre-crisis value.

S&P 500 is a good reflection of overall market.

On January 1, 2012, the S&P 500 index was trading at 1257.60
Why FCFE? Company has negative FCFE

Why 3-stage? High growth

In 2001, stock was trading at 10.10 Yuan per share
Decomposing value at Tsingtao Breweries…

- Breaking down the value today of Tsingtao Breweries, you arrive at the following:
  - PV of Cashflows to Equity over first 10 years = -187 million
  - PV of Terminal Value of Equity = 4783 million
  - Value of equity today = 4596 million

  More than 100% of the value of equity today comes from the terminal value.

a. Is this a reason for concern?

b. How would you intuitively explain what this means for an equity investor in the firm?
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**

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

\[
= 22,661 \times 0.0733 = 1,660.7 \text{ billion yen}
\]

**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.

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

**Stable Growth**

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

**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:

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

**Value of operating assets**

\[
\text{Value of operating assets} = \frac{1,660.7 \times (1.015) (1 - .407) (1 - .2946)}{(0.0509 - .015)} = 19,640 \text{ billion yen}
\]

**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.**

**Operating data**

<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>FY 1992</td>
<td>¥10,163,380</td>
<td>¥218,511</td>
<td>¥218,511</td>
<td>2.15%</td>
</tr>
<tr>
<td>FY 1993</td>
<td>¥10,210,750</td>
<td>¥181,897</td>
<td>¥181,897</td>
<td>1.78%</td>
</tr>
<tr>
<td>FY 1994</td>
<td>¥9,362,732</td>
<td>¥136,226</td>
<td>¥136,226</td>
<td>1.45%</td>
</tr>
<tr>
<td>FY 1995</td>
<td>¥8,120,975</td>
<td>¥255,719</td>
<td>¥255,719</td>
<td>3.15%</td>
</tr>
<tr>
<td>FY 1996</td>
<td>¥10,718,740</td>
<td>¥348,069</td>
<td>¥348,069</td>
<td>3.25%</td>
</tr>
<tr>
<td>FY 1997</td>
<td>¥12,243,830</td>
<td>¥665,110</td>
<td>¥665,110</td>
<td>5.43%</td>
</tr>
<tr>
<td>FY 1998</td>
<td>¥11,678,400</td>
<td>¥779,800</td>
<td>¥1,382,950</td>
<td>6.68%</td>
</tr>
<tr>
<td>FY 1999</td>
<td>¥12,749,010</td>
<td>¥774,947</td>
<td>¥1,415,997</td>
<td>6.08%</td>
</tr>
<tr>
<td>FY 2000</td>
<td>¥12,879,560</td>
<td>¥775,982</td>
<td>¥1,430,982</td>
<td>6.02%</td>
</tr>
<tr>
<td>FY 2001</td>
<td>¥13,424,420</td>
<td>¥870,131</td>
<td>¥1,542,631</td>
<td>6.48%</td>
</tr>
<tr>
<td>FY 2002</td>
<td>¥15,106,300</td>
<td>¥1,123,475</td>
<td>¥1,822,975</td>
<td>7.44%</td>
</tr>
<tr>
<td>FY 2003</td>
<td>¥16,054,290</td>
<td>¥1,363,680</td>
<td>¥2,101,780</td>
<td>8.49%</td>
</tr>
<tr>
<td>FY 2004</td>
<td>¥17,294,760</td>
<td>¥1,666,894</td>
<td>¥2,454,994</td>
<td>9.64%</td>
</tr>
<tr>
<td>FY 2005</td>
<td>¥18,551,530</td>
<td>¥1,672,187</td>
<td>¥2,447,987</td>
<td>9.01%</td>
</tr>
<tr>
<td>FY 2006</td>
<td>¥21,036,910</td>
<td>¥1,878,342</td>
<td>¥2,769,742</td>
<td>8.93%</td>
</tr>
<tr>
<td>FY 2007</td>
<td>¥23,948,090</td>
<td>¥2,238,683</td>
<td>¥3,185,683</td>
<td>9.35%</td>
</tr>
<tr>
<td>FY 2008</td>
<td>¥26,289,240</td>
<td>¥2,707,375</td>
<td>¥3,312,775</td>
<td>8.64%</td>
</tr>
<tr>
<td>FY 2009 (Est)</td>
<td>¥22,661,325</td>
<td>¥267,904</td>
<td>¥1,310,304</td>
<td>1.18%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>¥1,306,867</td>
<td></td>
<td>7.33%</td>
</tr>
</tbody>
</table>

**Value of Equity**

\[
\text{Value of Equity} = \frac{\text{Value of operating assets}}{\text{No of shares}} = \frac{19,640}{3,448} = ¥4,735
\]
Circular Reasoning in FCFF Valuation

- In discounting FCFF, we use the cost of capital, which is calculated using the market values of equity and debt. We then use the present value of the FCFF as our value for the firm and derive an estimated value for equity. (For instance, in the Toyota valuation, we used the current market value of equity of 3200 yen/share to arrive at the debt ratio of 52.9% which we used in the cost of capital. However, we concluded that the value of Toyota’s equity was 4735 yen/share. Is there circular reasoning here?

- Yes
- No

- If there is, can you think of a way around this problem?
6a. Tube Investments: Status Quo (in Rs)

**Current Cashflow to Firm**
- EBIT(1-t) : 4,425
- Nt CpX : 843
- Chg WC : 4,150
= FCFF : -568
Reinvestment Rate = 112.82%

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

\[
\text{E}\times 0.092 = 0.0552 \quad 5.52\%
\]

**Return on Capital**
9.20%

**Stable Growth**
- g = 5%
- Beta = 1.00
- Debt ratio = 44.2%
- Country Premium = 3%
- ROC = 9.22%
Reinvestment Rate = 54.35%

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

**Firm Value**

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

**Value/Share**
Rs 61.57

**Cost of Equity**
22.80%

\[
\text{Cost of Debt} = 9.45\%
\]

\[
\text{Riskfree Rate} + \text{Beta} \times \text{Risk Premium} = 12\% + 1.17 \times 9.23 = 20.28\%
\]

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

In 2000, the stock was trading at 102 Rupees/share.
Stable Growth Rate and Value

- In estimating terminal value for Tube Investments, I used a stable growth rate of 5%. If I used a 7% stable growth rate instead, what would my terminal value be? (Assume that the cost of capital and return on capital remain unchanged.)

- What are the lessons that you can draw from this analysis for the key determinants of terminal value?
6b. Tube Investments: Higher Marginal Return (in Rs)

**Current Cashflow to Firm**

- EBIT(1-t) : 4,425
- Nt CpX : 843
- Chg WC : 4,150
- FCFF : 568
- Reinvestment Rate = 112.82%

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

\[ .60 \times 1.122 = 0.732 \]

**Return on Capital** 12.20%

**Stable Growth**

- Stable Growth: 5%; Beta = 1.00;
- Debt ratio = 44.2%;
- Country Premium = 3%
- ROC = 12.2%
- Reinvestment Rate = 40.98%

**Terminal Value**

\[ 3904 / (\text{Riskfree rate} - \text{Risk Premium}) = 39.921 \]

**Expected Growth**

\[ .60 \times .122 = .0732 \]

7.32%

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

\[ 22.8\% \times .558 + 9.45\% \times 0.442 = 16.90\% \]

**Cost of Equity**

22.80%

**Cost of Debt**

\[ (12\% + 1.50\%) \times (1 - .30) = 9.45\% \]

**Weights**

- E = 55.8%
- D = 44.2%

**Riskfree Rate**

Rs riskfree rate = 12%

**Beta**

1.17

**Risk Premium**

9.23%

**Unlevered Beta for Sectors**

0.75

**Firm's D/E Ratio**

79%

**Mature risk premium**

4%

**Country Risk Premium**

5.23%

Existing assets continue to generate negative excess returns.

**Firm Value**

25,185

- Cash: 13,653
- Debt: 18,073
- Equity: 20,765
- Options: 0

Value/Share: 84.34

**Company earns higher returns on new projects**

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

22.8% (.558) + 9.45% (0.442) = 16.90%
6c. Tube Investments: Higher Average Return

**Current Cashflow to Firm**

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

Reinvestment Rate = 60%

**Expected Growth**

60% \( \times 122 \) + 0.0581 = 0.1313

13.13%

**Expected Growth**

60% \( \times 122 \) + 0.0581 = 0.1313

13.13%

**Stable Growth**

\( g = 5\% \);

\( \text{Beta} = 1.00 \);

Debt ratio = 44.2\%;

Country Premium = 3\%

ROC = 12.2\%

Reinvestment Rate = 40.98\%

**Terminal Value**

\[ \frac{5}{0.1478 - 0.05} = 51,956 \]

**Cost of Equity**

22.80\%

**Cost of Debt**

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

**Weights**

\( E = 55.8\% \);

\( D = 44.2\% \)

**Riskfree Rate**

Rsl riskfree rate = 12\% + Risk Premium = 12\% + 9.23\% = 21.23\%
Stockholders in Asian, Latin American and many European companies have little or no power over the managers of the firm. In many cases, insiders own voting shares and control the firm and the potential for conflict of interests is huge. Would you discount the value that you estimated to allow for this absence of stockholder power?

- Yes
- No.
### KRKA: April 2010

#### Current Cashflow to Firm
- **EBIT(1-t):** 179.33
- **Nt Cpx:** 15.00
- **Chg WC:** 68.00
- **FCFF:** 96.33

Reinvent Rate = (15+68)/179.33 = 46.28%
Tax rate = 23.69%
Return on capital = 18.71%

#### Reinvestment Rate
- Expected Growth in EBIT (1-t) = 0.5713 * 0.207 = 0.1183
- Return on Capital = 20.7%

#### Terminal Value
\[ \text{Terminal Value} = 202.4(0.076-0.03) = € 4400 \]

#### Value/Share
- **Op. Assets:** 3578
- **Cash:** 24
- **Debt:** 165
- **Minority Int:** 4
- **Equity:** 3,397

\[ \text{Value/Share} = € 96.87 \]

#### Discount at Cost of Capital (WACC)
\[ \text{Cost of Capital} = 7.26\% \times 0.933 + 3.24\% \times 0.067 = 6.99\% \]

#### Weight
- **E:** 93.3%
- **D:** 6.7%

On April 1, 2010
KRKA price = € 65 Euros

#### Riskfree Rate
- **Euro Riskfree Rate:** 3%

#### Beta
- **Unlevered Beta for Sectors:** 0.62
- **Firm’s D/E Ratio:** 7.14%

#### Mature market premium
- **4.5%**

#### CRPs
- **CRP for Slovenia:** 0.9%
- **CRP for Central Europe:** 3%

#### Country Default Spread
- **Mkt Vol**

#### CRPs
- **Lambda:**
  - **0.15**
  - **0.40**

- **Beta:** 0.65

- **Mkt Vol**
Comparing the Tata Companies: Cost of Capital

<table>
<thead>
<tr>
<th></th>
<th>Tata Chemicals</th>
<th>Tata Steel</th>
<th>Tata Motors</th>
<th>TCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of production in India</td>
<td>90%</td>
<td>90%</td>
<td>90%</td>
<td>92.00%</td>
</tr>
<tr>
<td>% of revenues in India</td>
<td>75%</td>
<td>88.83%</td>
<td>91.37%</td>
<td>7.62%</td>
</tr>
<tr>
<td>Lambda</td>
<td>0.75</td>
<td>1.10</td>
<td>0.80</td>
<td>0.20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Tata Chemicals</th>
<th>Tata Steel</th>
<th>Tata Motors</th>
<th>TCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta</td>
<td>1.21</td>
<td>1.57</td>
<td>1.2</td>
<td>1.05</td>
</tr>
<tr>
<td>Lambda</td>
<td>0.75</td>
<td>1.1</td>
<td>0.8</td>
<td>0.2</td>
</tr>
<tr>
<td>Cost of equity</td>
<td>13.82%</td>
<td>17.02%</td>
<td>14.00%</td>
<td>10.63%</td>
</tr>
<tr>
<td>Synthetic rating</td>
<td>BBB</td>
<td>A</td>
<td>B+</td>
<td>AAA</td>
</tr>
<tr>
<td>Cost of debt</td>
<td>6.60%</td>
<td>6.11%</td>
<td>8.09%</td>
<td>5.61%</td>
</tr>
<tr>
<td>Debt Ratio</td>
<td>30.48%</td>
<td>29.59%</td>
<td>25.30%</td>
<td>0.03%</td>
</tr>
<tr>
<td>Cost of Capital</td>
<td>11.62%</td>
<td>13.79%</td>
<td>12.50%</td>
<td>10.62%</td>
</tr>
</tbody>
</table>
### Growth and Value

#### Tata Chemicals | Tata Steel | Tata Motors | TCS
---|---|---|---
Return on capital | 10.35% | 13.42% | 11.81% | 40.63%
Reinvestment Rate | 56.50% | 38.09% | 70.00% | 56.73%
Expected Growth | 5.85% | 5.11% | 8.27% | 23.05%
Cost of capital | 11.62% | 13.79% | 12.50% | 10.62%

![Bar chart showing Acquisitions, Working Capital, and Net Cap Ex for Tata Chemicals, Tata Steel, Tata Motors, and TCS](image)
Tata Companies: Value Breakdown

Aswath Damodaran
The Dark Side of Valuation…

- Valuing stable, money making companies with understandable accounting, a long history and lots of comparable firms is generally 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)
Young Companies: Valuation Issues

Past revenues are either non-existent or small. Operating income is negative.

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

Little history and lots of volatility in past cap ex, working capital numbers.

Expected Growth:
- Reinvestment Rate
- Return on Capital

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

How long will high growth last?

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

Cost of Capital (WACC) = Cost of Equity \( \left( \frac{Equity}{(Debt + Equity)} \right) \) + Cost of Debt \( \left( \frac{Debt}{(Debt + Equity)} \right) \)

Company has no bond rating. Interest coverage ratio is negative.

Cost of Equity

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

Weights Based on Market Value

Cost of capital will change over time.

Young companies have little or no debt but will generally borrow more as they mature.

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

Not enough data or company is changing too much for regression beta to yield reliable estimate.
The dark side of valuation... With young companies..

- When valuing companies, we draw on three sources of information:
  - The firm’s current financial statement
  - 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)

- Valuation is most difficult when a company
  - Has negative earnings and low revenues in its current financial statements
  - No history
  - No comparables (or even if they exist, they are all at the same stage of the life cycle as the firm being valued)
### 9a. Amazon in January 2000

- **Current Revenue**: $1,117
- **Current Margin**: -36.71%

**Taxes**:
- **NOL**: $500 m
- **Cost of Equity**: 12.90%
- **Cost of Debt**: 6.5% + 1.5% = 8.0%
- **Weighted Average Cost of Capital**: 12.84%

**Value of Operation Assets**: $14,910 + **Cash**: $26

**Value of Firm** = **Value of Operation Assets** + **Cash** = $14,936

**Value of Debt**: $349

**Value of Equity**: $14,587

**Equity Options**: $2,892

**Value per Share**: $34.32

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

**Competitive Advantages**:
- **Revenue Growth**: 42%
- **Sales Turnover Ratio**: 3.00
- **Operating Margin**: 42%

**EBIT**:
- **EBIT**: $2,793
- **EBIT (1-t)**: $2,793 - 410m

**FCFF**:
- **FCFF**: $2,733

**Cost of Capital**:
- **Cost of Equity**: 12.90%
- **Cost of Debt**: 8.00%
- **Cost of Capital**: 12.84%

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

- **Revenues**: $2,793, $5,585, $9,774, $14,661, $19,059, $23,862, $28,729, $33,211, $36,798, $39,006
- **EBIT**: -$373, -$94, $407, $1,038, $1,628, $2,212, $2,768, $3,261, $3,646, $3,883
- **EBIT (1-t)**: -$373, -$94, $407, $1,038, $1,628, $2,212, $2,768, $3,261, $3,646, $3,883
- **Taxes**:
  - **Reinvestment**: $559, $931, $1,396, $1,629, $1,466, $1,601, $1,623, $1,494, $1,196, $736
  - **AT cost of debt**: $931, $1,024, $989, $758, $408, $163, $177, $625, $1,174, $1,788

**Sales Growth**:
- **Growth Rate**: 6%
- **Operating Margin**: 10.00%

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

---

### Internet/Retail Operating Leverage

- **Revenue Growth**: 42%
- **Sales Turnover Ratio**: 3.00
- **Operating Margin**: 42%

**Competitive Advantages**:
- **Revenue Growth**: 42%
- **Sales Turnover Ratio**: 3.00
- **Operating Margin**: 42%

**EBIT**:
- **EBIT**: $2,793
- **EBIT (1-t)**: $2,793 - 410m

**FCFF**:
- **FCFF**: $2,733

**Cost of Capital**:
- **Cost of Equity**: 12.90%
- **Cost of Debt**: 8.00%
- **Cost of Capital**: 12.84%

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

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**Sales Growth**:
- **Growth Rate**: 6%
- **Operating Margin**: 10.00%

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

---

### Riskfree Rate

T. Bond rate = 6.5%

**Beta**

- **Beta**: 1.60 -> 1.00
- **Risk Premium**: 4%

**Country Risk**

Amazon was trading at $84 in January 2000.

Pushed debt ratio to retail industry average of 15%.
What do you need to break-even at $84?

<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>
9b. Amazon in January 2001

Aswath Damodaran

**Cost of Equity**
13.81%

**Cost of Debt**
6.5% + 3.5% = 10.0%

**Weights**
Debt = 27.3% -> 15%

**Value of Op Assets**
$8,789

+ **Cash & Non-op**
$1,263

= **Value of Firm**
$10,052

- **Value of Debt**
$1,879

= **Value of Equity**
$8,173

- **Equity Options**
$845

= **Value per share**
$20.83

**Revenue Growth**
25.41%

**Expected Margin**
-> 9.32%

**Sales Turnover Ratio**
3.02

**EBIT**
-853m

**Discount Rate**
10.00%

**Beta**
2.18

**Risk Premium**
4%

Amazon.com
January 2001
Stock price = $14
Amazon over time…

Value per share
Price per share
10. Amgen: Status Quo

Current Cashflow to Firm

\[
\text{EBIT}(1-t) = 0.7336(1 - 0.28) = 0.6058
\]

- 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)

\[
0.60 \times 0.16 = 0.096
\]

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

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

Cost of Capital (WACC) = 11.7% (0.90) + 3.66% (0.10) = 10.90%

Cost of Equity

11.70%

Cost of Debt

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

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

Riskfree Rate

Riskfree rate = 4.78%

Beta

1.73

Risk Premium

4%

Unlevered Beta for Sectors: 1.59

D/E = 11.06%
## Amgen: The R&D Effect?

<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>
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).
11. Sears Holdings: Status Quo

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

**Reinvestment Rate**
-30.00%

**Expected Growth in EBIT (1-t)**
-0.30*0.05 = -0.015
-1.5%

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

**Terminal Value**
4 = 868 / (0.0713 - 0.02) = 16,921

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

**Op. Assets** 17,634
+ Cash: 1,622
- Debt 7,726
= Equity 11,528
- Options 5
Value/Share $87.29

**EBIT (1-t)**
1 1.165
2 1.147
3 1.130
4 1.113
- Reinvestment
1 0.349
2 0.344
3 0.339
4 0.334
FCFF
1 1.514
2 1.492
3 1.469
4 1.447

**Term Yr**
1 $1,206
2 $339
3 $868

**On July 23, 2008, Sears was trading at $76.25 a share.**
Dealing with 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 \( \times \text{Probability of distress} \)

- 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).
Cost of Equity
21.82%

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

Riskfree Rate:
T. Bond rate = 3%

Beta
3.14 -> 1.20

Risk Premium
6%

Casino
1.15

Current D/E: 277%

Base Equity

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:

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

■ 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 \((1 - .7666) + $0.00 (.7666) = $1.92\)
Another type of truncation risk?

- Assume that you are valuing Gazprom, the Russian oil company and have estimated a value of US $180 billion for the operating assets. The firm has $30 billion in debt outstanding. What is the value of equity in the firm?

- Now assume that the firm has 15 billion shares outstanding. Estimate the value of equity per share.

- The Russian government owns 42% of the outstanding shares. Would that change your estimate of value of equity per share?
Uncertainty is endemic to valuation....

Assume that you have valued your firm, using a discounted cash flow model and with the all the information that you have available to you at the time. Which of the following statements about the valuation would you agree with?

- If I know what I am doing, the DCF valuation will be precise
- No matter how careful I am, the DCF valuation gives me an estimate

If you subscribe to the latter statement, how would you deal with the uncertainty?

- Collect more information, since that will make my valuation more precise
- Make my model more detailed
- Do what-if analysis on the valuation
- Use a simulation to arrive at a distribution of value
- Will not buy the company
Option 1: Collect more information

- There are two types of errors in valuation. The first is estimation error and the second is uncertainty error. The former is amenable to information collection but the latter is not.

- Ways of increasing information in valuation
  - Collect more historical data (with the caveat that firms change over time)
  - Look at cross-sectional data (hoping the industry averages convey information that the individual firm’s financial do not)
  - Try to convert qualitative information into quantitative inputs

- Proposition 1: More information does not always lead to more precise inputs, since the new information can contradict old information.

- Proposition 2: The human mind is incapable of handling too much divergent information. Information overload can lead to valuation trauma.
Option 2: Build bigger models

- When valuations are imprecise, the temptation often is to build more detail into models, hoping that the detail translates into more precise valuations. The detail can vary and includes:
  - More line items for revenues, expenses and reinvestment
  - Breaking time series data into smaller or more precise intervals (Monthly cash flows, mid-year conventions etc.)
- More complex models can provide the illusion of more precision.
- **Proposition 1:** There is no point to breaking down items into detail, if you do not have the information to supply the detail.
- **Proposition 2:** Your capacity to supply the detail will decrease with forecast period (almost impossible after a couple of years) and increase with the maturity of the firm (it is very difficult to forecast detail when you are valuing a young firm)
- **Proposition 3:** Less is often more
Option 3: What if?

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

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

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

Correlation = 0.4
The Simulated Values of Amgen: What do I do with this output?
Valuing a commodity company - Exxon in Early 2009

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

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

\[R^2 = 90.2\%\]

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

Estimate normalized income based on current oil price

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

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

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.

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

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%.

\[
\text{Cost of capital} = 8.35\% (.9715) + 3.75\% (1-.38) (.0285) = 8.18\%.
\]

Expected growth in operating income

Since Exxon Mobile is the largest oil company in the world, we will assume an expected growth of only 2% in perpetuity.
Exxon Mobil Valuation: Simulation