Valuations

Aswath Damodaran
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<td>2-Stage DDM</td>
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</tr>
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<td>n-stage FCFF</td>
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</tr>
</tbody>
</table>
The risk premium that I will be using in the 1999 and 2000 valuations for mature equity markets is 4%. This is the average implied equity risk premium from 1960 to 2000.

For the valuations from 1998 and earlier, I use a risk premium of 5.5%.
Con Ed: Rationale for Model

- The firm is in stable growth; based upon size and the area that it serves. Its rates are also regulated; It is unlikely that the regulators will allow profits to grow at extraordinary rates.

- Firm Characteristics are consistent with stable, DDM model firm
  - The beta is 0.80 and has been stable over time.
  - The firm is in stable leverage.
  - The firm pays out dividends that are roughly equal to FCFE.
    - Average Annual FCFE between 1994 and 1999 = $553 million
    - Average Annual Dividends between 1994 and 1999 = $532 million
    - Dividends as % of FCFE = 96.2%
Con Ed: A Stable Growth DDM: December 31, 2000

- Earnings per share for trailing 4 quarters = $3.15
- Dividend Payout Ratio over the 4 quarters = 69.21%
- Dividends per share for last 4 quarters = $2.18
- Expected Growth Rate in Earnings and Dividends = 3%
- Con Ed Beta = 0.80 (Bottom-up beta estimate)
- Cost of Equity = 5.1% + 0.80*4% = 8.30%

Value of Equity per Share = $2.18 * 1.03 / (0.083 - 0.03) = $42.37

The stock was trading at $38.60 on December 31, 2000
Con Ed: Break Even Growth Rates

**Con Ed Value versus Growth Rate**

Implied Growth Rate: Value per share = $38.60
To estimate the implied growth rate in Con Ed’s current stock price, we set the market price equal to the value, and solve for the growth rate:

- Price per share = $38.60 = $2.18 \times (1+g) / (0.083 - g)
- Implied growth rate = 2.51%

Given its retention ratio of 30.79% and its return on equity in 1999 of 10%, the fundamental growth rate for Con Ed is:

Fundamental growth rate = (0.3079 \times 0.10) = 3.08%
Implied Growth Rates and Valuation Judgments

- When you do any valuation, there are three possibilities. The first is that you are right and the market is wrong. The second is that the market is right and that you are wrong. The third is that you are both wrong. In an efficient market, which is the most likely scenario?

- Assume that you invest in a misvalued firm, and that you are right and the market is wrong. Will you definitely profit from your investment?
  - Yes
  - No
Con Ed: A Look Back

Con Ed: Valuations over Time

Date of Valuation

1: December 1997
2: December 1998
3: June 1999

Estimated Value
Price per Share
ABN Amro: Rationale for 2-Stage DDM

- As a financial service institution, estimating FCFE or FCFF is very difficult.
- The expected growth rate based upon the current return on equity of 15.56% and a retention ratio of 62.5% is 9.73%. This is higher than what would be a stable growth rate (roughly 5% in Euros)
ABN Amro: Summarizing the Inputs

- Market Inputs
  - Long Term Riskfree Rate (in Euros) = 5.02%
  - Risk Premium = 4% (U.S. premium: Netherlands is AAA rated)
- Current Earnings Per Share = 1.60 Eur; Current DPS = 0.60 Eur;

<table>
<thead>
<tr>
<th>Variable</th>
<th>High Growth Phase</th>
<th>Stable Growth Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>5 years</td>
<td>Forever after yr 5</td>
</tr>
<tr>
<td>Return on Equity</td>
<td>15.56%</td>
<td>15% (Industry average)</td>
</tr>
<tr>
<td>Payout Ratio</td>
<td>37.5%</td>
<td>66.67%</td>
</tr>
<tr>
<td>Retention Ratio</td>
<td>62.5%</td>
<td>33.33% (b=g/ROE)</td>
</tr>
<tr>
<td>Expected growth</td>
<td>0.1556*.625=.0973</td>
<td>5% (Assumed)</td>
</tr>
<tr>
<td>Beta</td>
<td>0.95</td>
<td>1.00</td>
</tr>
<tr>
<td>Cost of Equity</td>
<td>5.02%+0.95(4%)</td>
<td>5.02%+1.00(4%)</td>
</tr>
</tbody>
</table>
<pre><code>       | =8.82%            | =9.02%              |
</code></pre>
ABN Amro: Valuation

<table>
<thead>
<tr>
<th>Year</th>
<th>EPS</th>
<th>DPS</th>
<th>PV of DPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.76</td>
<td>0.66</td>
<td>0.60</td>
</tr>
<tr>
<td>2</td>
<td>1.93</td>
<td>0.72</td>
<td>0.61</td>
</tr>
<tr>
<td>3</td>
<td>2.11</td>
<td>0.79</td>
<td>0.62</td>
</tr>
<tr>
<td>4</td>
<td>2.32</td>
<td>0.87</td>
<td>0.62</td>
</tr>
<tr>
<td>5</td>
<td>2.54</td>
<td>0.95</td>
<td>0.63</td>
</tr>
</tbody>
</table>

Expected EPS in year 6 = 2.54(1.05) = 2.67 Eur
Expected DPS in year 6 = 2.67*0.667=1.78 Eur
Terminal Price (in year 5) = 1.78/(0.0902-.05) = 42.41 Eur
PV of Terminal Price = 42.42/(1.0882)^5 = 27.79 Eur

Value Per Share = 0.60 + 0.61+0.62+0.62+0.63+27.79 = 30.87 Eur
The stock was trading at 24.33 Euros on December 31, 2000
VALUING ABN AMRO

Dividends
EPS = 1.60 Eur
* Payout Ratio 37.5%
DPS = 0.60 Eur

Expected Growth
62.5% *
15.56% = 9.73%

g = 5%; ROE = 15% (Ind. avg)
Beta = 1.00
Payout = (1 - 5/15) = .667

Terminal Value = EPS * Payout/(r-g)
= 2.67667 / (.0902 - .05) = 42.41

Cost of Equity
5.02% + 0.95 (4%) = 8.82%

Riskfree Rate:
Long term bond rate in the Netherlands
5.02%

Beta
0.95

Risk Premium
4%

Country Risk
0%

Mature Market
4%

Discount at Cost of Equity

Value of Equity per share = 30.87 Eur

0.66 Eur 0.72 Eur 0.79 Eur 0.87 Eur 0.95 Eur .......

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

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

Value of High Growth

Value of Stable Growth

Assets in 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: Decomposing Value

- Value of Assets in Place = Current DPS/Cost of Equity
  \[ \frac{0.60 \text{ Eur}}{.0882} = 6.65 \text{ Eur} \]

- Value of Stable Growth = 0.60 \[ \frac{(1.05)}{(.0882-.05)} \] - 6.65 NG
  \[ = 9.02 \text{ Eur} \]

- Value of High Growth = Total Value - (6.65+ 9.02)
  \[ = 30.87 - (6.65+9.02) = 15.20 \text{ Eur} \]
While markets overall generally do not grow faster than the economies in which they operate, there is reason to believe that the earnings at U.S. companies (which have outpaced nominal GNP growth over the last 5 years) will continue to do so in the next 5 years. The consensus estimate of growth in earnings (from Zacks) is roughly 10%.

Though it is possible to estimate FCFE for many of the firms in the S&P 500, it is not feasible for several (financial service firms). The dividends during the year should provide a reasonable (albeit conservative) estimate of the cash flows to equity investors from buying the index.
S &P 500: Inputs to the Model (12/31/00)

General Inputs
- Long Term Government Bond Rate = 5.1%
- Risk Premium for U.S. Equities = 4%
- Current level of the Index = 1320

Inputs for the Valuation

<table>
<thead>
<tr>
<th></th>
<th>High Growth Phase</th>
<th>Stable Growth Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>5 years</td>
<td>Forever after year 5</td>
</tr>
<tr>
<td>Dividend Yield</td>
<td>1.25%</td>
<td>1.25%</td>
</tr>
<tr>
<td>Expected Growth</td>
<td>7.5%</td>
<td>5.5% (Nominal US g)</td>
</tr>
<tr>
<td>Beta</td>
<td>1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>
S & P 500: 2-Stage DDM Valuation

Cost of Equity = 5.1% + 1(4%) = 9.1%

Terminal Value = \[23.69 \times 1.055 / (0.091 - 0.055) = 691.55\]

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected Dividends</td>
<td>$17.74</td>
<td>$19.07</td>
<td>$20.50</td>
<td>$22.04</td>
<td>$23.69</td>
</tr>
<tr>
<td>Expected Terminal Value</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$691.55</td>
</tr>
<tr>
<td>Present Value</td>
<td>$16.26</td>
<td>$16.02</td>
<td>$15.78</td>
<td>$15.55</td>
<td>$462.73</td>
</tr>
<tr>
<td>Intrinsic Value of Index</td>
<td>$526.35</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$526.35

$462.73

$15.55

$16.02

$16.26

$17.74

$19.07

$20.50

$22.04

$23.69
The index is at 1320, while the model valuation comes in at 526. This indicates that one or more of the following has to be true.

- The dividend discount model understates the value because dividends are less than FCFE.
- The expected growth in earnings over the next 5 years will be much higher than 7.5%.
- The risk premium used in the valuation (4%) is too high.
- The market is overvalued.
A More Realistic Valuation of the Index

- The median dividend/FCFE ratio for U.S. firms is about 50%. Thus the FCFE yield for the S&P 500 should be around 2.5% (1.25%/0.5).
- The implied risk premium between 1960 and 1970, which was when long term rates were as well behaved as they are today, is 3%.
- With these inputs in the model:

<table>
<thead>
<tr>
<th>Year</th>
<th>Expected Dividends</th>
<th>Expected Terminal Value</th>
<th>Present Value</th>
<th>Intrinsic Value of Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$35.48</td>
<td></td>
<td>$32.82</td>
<td>$1,459.62</td>
</tr>
<tr>
<td>2</td>
<td>$38.14</td>
<td></td>
<td>$32.63</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>$41.00</td>
<td></td>
<td>$32.45</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>$44.07</td>
<td></td>
<td>$32.27</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>$47.38</td>
<td>$1,915.07</td>
<td>$1,329.44</td>
<td></td>
</tr>
</tbody>
</table>

At a level of 1320, the market is undervalued by about 10%.
Sony: Background on Japanese firms

Japanese firms have proved to be among the most difficult of all firms to value for several reasons:

- The earnings in 1999 for most Japanese firms was depressed relative to earnings earlier in the decade and in the 1980s, reflecting the Japanese economy.
- Japanese accounting standards tend to understate earnings and overstate book value of equity, as firms are allowed to set aside provisions for unspecified expenses.
- The earnings of many export oriented Japanese firms tends to be heavily influenced by exchange rate movements.
- The cross holdings that Japanese firms have in other firms, and the lack of transparency in these holdings, makes it difficult to value these holdings.

Capital expenditures in 1999 amounted to 103 billion JPY, whereas depreciation is 76 billion JPY.

Non-cash working capital at Sony in 1999 was 220 billion JPY on revenues of 2593 billion yet, yielding a non-cash working capital to revenue ratio of 8.48%.

The long term government bond rate in Japan was 2% at the time of this valuation.
Sony: Rationale for Model

- We will normalize earnings to reflect the fact that current earnings are depressed. To normalize earnings, we will use the return on equity of 5.25%, which is the return on equity that Sony had last year and is close to return on equity it used to earn in the early 1990s.

- We will assume that the firm’s dominant market share will keep it from posting high growth. Over the last 5 years, the growth rate in revenues has been 3.5%. **We will assume a long term stable growth rate of 3%** (higher than the Japanese economy due to global exposure)

- We will assume that the net capital expenditures will grow at the same rate and that non-cash working capital will stay at 8.48% of revenues

- Sony’s current book debt to capital ratio is 25.8%; we will assume that they will finance reinvestment with this ratio (rather than the market value)

- We will use a beta of 1.10, to reflect the unlevered beta of electronic firms (globally) and Sony’s market value debt to equity ratio (16%)
Estimating the Inputs

- Normalized Earnings:
  - Book Value of Equity (3/1999) = 1795 billion JPY
  - Estimated Return on Equity = 5.25%
  - Normalized Net Income next year = 1795 billion * .0525 = 94.24 billion

- Reinvestment Needs
  - Current Net Capital Expenditures = (103 - 76) = 27 billion JPY
  - Expected Net Capital Expenditures = 27 billion (1.03) = 27.81 billion
  - Current Revenues = 2593 billion
  - Expected Revenues next year = 2593(1.03) = 2671 billion
  - Expected Change in non-cash Working Capital = (2671 - 2593)*.0848 = 6.60 billion JPY

- Book Value Debt Ratio = 25.8%
- Cost of Equity = 2% + 1.10 (4%) = 6.40%
The Valuation

- **Expected FCFE next year**

  Expected Net Income = 94.24 billion

  - (Net Cap Ex) (1- Debt Ratio) = 27.0 (1-.31) = 20.64
  - (Δ Non-cash WC) (1-Debt ratio) = 6.6 (1-.31) = 4.89

  FCFE = 68.71 billion JPY

- **Valuation**

  - Cost of Equity = 6.4%; Stable growth rate = 3%;

  Value of Equity = 68.71 billion / (.064 - .03) = 2021 billion JPY

  Sony was trading at a market value of equity of 7146 billion JPY
The Effect of Cross-holdings

- When firms have minority passive holdings in other companies, they report only the dividends they receive from these holdings as part of net income.
- Consequently, we tend to understate the value of these crossholdings in valuations.
- To value them right, we have to estimate the value of the companies in which these holdings are, and then take the percentage of the value of these firms owned by the firm you are valuing.
Earnings per share at the firm has grown about 5% a year for the last 5 years, but the fundamentals at the firm suggest growth in EPS of about 11%. (Analysts are also forecasting a growth rate of 12% a year for the next 5 years)

Nestle has a debt to capital ratio of about 37.6% and is unlikely to change that leverage materially. (How do I know? I do not. I am just making an assumption.)

Like many large European firms, Nestle has paid less in dividends than it has available in FCFE.
Nestle: Summarizing the Inputs

General Inputs

- Long Term Government Bond Rate (Sfr) = 4%
- Current EPS = 108.88 Sfr; Current Revenue/share = 1,820 Sfr
- Capital Expenditures/Share = 114.2 Sfr; Depreciation/Share = 73.8 Sfr

<table>
<thead>
<tr>
<th></th>
<th>High Growth</th>
<th>Stable Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>5 years</td>
<td>Forever after yr 5</td>
</tr>
<tr>
<td>Beta</td>
<td>0.85</td>
<td>0.85</td>
</tr>
<tr>
<td>Return on Equity</td>
<td>23.63%</td>
<td>16%</td>
</tr>
<tr>
<td>Retention Ratio</td>
<td>65.10% (Current)</td>
<td>NA</td>
</tr>
<tr>
<td>Expected Growth</td>
<td>15.38%</td>
<td>5.00%</td>
</tr>
<tr>
<td>WC/Revenues</td>
<td>9.30% (Existing)</td>
<td>9.30% (Grow with earnings)</td>
</tr>
<tr>
<td>Debt Ratio</td>
<td>37.60%</td>
<td>37.60%</td>
</tr>
<tr>
<td>Cap Ex/Deprecn</td>
<td>Current Ratio</td>
<td>150%</td>
</tr>
</tbody>
</table>
Estimating the Risk Premium for Nestle

<table>
<thead>
<tr>
<th>Region</th>
<th>Revenues</th>
<th>Weight</th>
<th>Risk Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>17.5</td>
<td>24.82%</td>
<td>4.00%</td>
</tr>
<tr>
<td>South America</td>
<td>4.3</td>
<td>6.10%</td>
<td>12.00%</td>
</tr>
<tr>
<td>Switzerland</td>
<td>1.1</td>
<td>1.56%</td>
<td>4.00%</td>
</tr>
<tr>
<td>Germany/France/UK</td>
<td>18.4</td>
<td>26.10%</td>
<td>4.00%</td>
</tr>
<tr>
<td>Italy/Spain</td>
<td>6.4</td>
<td>9.08%</td>
<td>5.50%</td>
</tr>
<tr>
<td>Asia</td>
<td>5.8</td>
<td>8.23%</td>
<td>9.00%</td>
</tr>
<tr>
<td>Rest of W. Europe</td>
<td>13</td>
<td>18.44%</td>
<td>4.00%</td>
</tr>
<tr>
<td>Eastern Europe</td>
<td>4</td>
<td>5.67%</td>
<td>8.00%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>70.5</strong></td>
<td><strong>100.00%</strong></td>
<td><strong>5.26%</strong></td>
</tr>
</tbody>
</table>

- The risk premium that we will use in the valuation is 5.26%
- Cost of Equity = 4% + 0.85 (5.26%) = 8.47%
Nestle: Valuation

<table>
<thead>
<tr>
<th>Year</th>
<th>Earnings</th>
<th>(Net CpEX)*(1-DR)</th>
<th>Δ WC*(1-DR)</th>
<th>Free Cashflow to Equity</th>
<th>Present Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$125.63</td>
<td>$29.07</td>
<td>$16.25</td>
<td>$80.31</td>
<td>$74.04</td>
</tr>
<tr>
<td>2</td>
<td>$144.95</td>
<td>$33.54</td>
<td>$18.75</td>
<td>$92.67</td>
<td>$78.76</td>
</tr>
<tr>
<td>3</td>
<td>$167.25</td>
<td>$38.70</td>
<td>$21.63</td>
<td>$106.92</td>
<td>$83.78</td>
</tr>
<tr>
<td>4</td>
<td>$192.98</td>
<td>$44.65</td>
<td>$24.96</td>
<td>$123.37</td>
<td>$89.12</td>
</tr>
<tr>
<td>5</td>
<td>$222.66</td>
<td>$51.52</td>
<td>$28.79</td>
<td>$142.35</td>
<td>$94.7</td>
</tr>
</tbody>
</table>

Earnings per Share in year 6 = 222.66(1.05) = 231.57
Net Capital Ex 6 = Deprecn’n 6 * 0.50 = 73.8(1.1538)5(1.05)(.5)= 78.5 Sfr
Chg in WC6 = (Rev6 - Rev5)(.093) = 1538(1.1538)5(.05)(.093)=13.85 Sfr
FCFE6 = 231.57 - 78.5(1-.376) - 13.85(1-.376)= 173.93 Sfr
Terminal Value per Share = 173.93/(.0847-.05) = 3890.16 Sfr
Value=$74.04 +$78.76 +$83.78 +$89.12 +$94.7 +3890/(1.0847)5=3011Sf

The stock was trading 2906 Sfr on December 31, 1999
In our valuation of Nestle, we assumed that cap ex would be 150% of depreciation in steady state. If, instead, we had assumed that net cap ex was zero, as many analysts do, the terminal value would have been:

FCFE_6 = 231.57 - 13.85(1-.376) = 222.93 Sfr

Terminal Value per Share = 222.93/(.0847 -.05) = 4986 Sfr

Value= =$74.04 +$78.76 +$83.78 +$89.12 +$94.7 + 4986/(1.0847)^5=
3740.91 Sfr
Aswath Damodaran

A VALUATION OF NESTLE (PER SHARE)

**Cashflow to Equity**
- Net Income: 108.88
- (Cap Ex - Depr) (1 - DR): 25.19
- Change in WC (!-DR): 4.41
- FCFE: 79.28

**Expected Growth**
- Retention Ratio: 0.65
- Return on Equity: 0.2363
- Expected Growth: 0.65 * 0.2363 = 15.38%

**Value of Equity per Share = 3011 Sfr**

**Discount at Cost of Equity**
- Cost of Equity: 4% + 0.85 * (5.26%) = 8.47%

**Riskfree Rate**
- Swiss franc rate = 4%

**Beta**
- 0.85

**Risk Premium**
- 4% + 1.26%

**Bottom-up beta for food**
- 0.79

**Market D/E**
- 11%

**Base Equity Premium**
- 4%

**Country Risk Premium**
- 1.26%

**Firm is in stable growth**
- g = 5%; Beta = 0.85
- Cap Ex/Deprec = 150%
- Debt ratio stays 37.6%

**Terminal Value**
- 173.93 / (0.0847 - 0.05) = 3890
The Effects of New Information on Value

No valuation is timeless. Each of the inputs to the model are susceptible to change as new information comes out about the firm, its competitors and the overall economy.

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

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

- **Firm Specific Information**
  - New Earnings Reports
  - Changes in the Fundamentals (Risk and Return characteristics)
Nestle: Effects of an Earnings Announcement

Assume that Nestle makes an earnings announcement which includes two pieces of news:

- The earnings per share come in lower than expected. The base year earnings per share will be 105.5 Sfr instead of 108.8 Sfr.
- Increased competition in its markets is putting downward pressure on the net profit margin. The after-tax margin, which was 5.98% in the previous analysis, is expected to shrink to 5.79%.

There are two effects on value:

- The drop in earnings will make the projected earnings and cash flows lower, even if the growth rate remains the same.
- The drop in net margin will make the return on equity lower (assuming turnover ratios remain unchanged). This will reduce expected growth.
Terminal Value = \frac{164.84}{0.0847 - 0.05} = 3687

Cashflow to Equity
Net Income = 105.50
- (Cap Ex - Depr) (1 - DR) = 25.19
- Change in WC (1-DR) = 4.41
= FCFE = 75.90

Expected Growth
Retention Ratio * Return on Equity = 0.651 * 0.2323 = 15.12%

Firm is in stable growth:
g = 5%; Beta = 0.85;
Cap Ex/Deprec = 150%;
Debt ratio stays 37.6%

Terminal Value = \frac{164.84}{0.0847 - 0.05} = 3687

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

Riskfree Rate:
Swiss franc rate = 4%

Beta
0.85

Risk Premium
4% + 1.26%

Bottom-up beta for food = 0.79
Market D/E = 11%
Base Equity Premium: 4%
Country Risk Premium: 1.26%
Brahma has not only maintained high growth rates in the face of strong competition in the last few years in Brazil, it has done so while maintaining high returns on capital. The fundamentals suggest that growth will continue to be high.

Given the size of the market and potential growth (as well as the strong brand name identification), growth seems sustainable for a longer period.

The leverage is stable. The current debt to capital ratio of 43.50% will remain unchanged.

The analysis will be done in real BR to avoid inflation estimation problems.

Real 3-Stage FCFE Model
Brahma: Summarizing the Inputs

General Inputs

- Riskfree Rate = 5% (Set equal to real growth rate in Brazil)
- Risk Premium = 11.8% (U.S. Premium + 6.3% based on country risk)
- Capital Expenditures per Share = 54.70 BR/share
- Depreciation per Share = 25.28 BR/share
- Revenues per Share = 328.33 BR/share
### Brahma: Inputs for the 3 Stages

<table>
<thead>
<tr>
<th></th>
<th>High Growth</th>
<th>Transition Phase</th>
<th>Stable Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Length</strong></td>
<td>5 years</td>
<td>5 years</td>
<td>Forever after yr 10</td>
</tr>
<tr>
<td><strong>Beta</strong></td>
<td>0.80</td>
<td>Moves to 1.00</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Risk Premium</strong></td>
<td>5.5%+6.3%</td>
<td>5.50%+3%</td>
<td>5.5%+2%</td>
</tr>
<tr>
<td><strong>ROE (Real)</strong></td>
<td>22.23%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Retention Ratio</strong></td>
<td>66.64%</td>
<td>Not used</td>
<td></td>
</tr>
<tr>
<td><strong>Expected Growth</strong></td>
<td>14.82%</td>
<td>Moves to 5%</td>
<td>5%</td>
</tr>
<tr>
<td><strong>Cap Ex/Deprecn</strong></td>
<td>Current</td>
<td>Current</td>
<td>150%</td>
</tr>
<tr>
<td><strong>Working Capital</strong></td>
<td>5% of Revenues, which grow at same rate as earnings</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Brahma: Projected Cash Flows

<table>
<thead>
<tr>
<th>High Growth Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year</strong></td>
</tr>
<tr>
<td><strong>Earnings</strong></td>
</tr>
<tr>
<td><strong>(CEx-Depr)*(1-DR)</strong></td>
</tr>
<tr>
<td><em><em>Chg. WC</em>(1-DR)</em>*</td>
</tr>
<tr>
<td><strong>FCFE</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transition Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year</strong></td>
</tr>
<tr>
<td><strong>Real Growth Rate</strong></td>
</tr>
<tr>
<td><strong>Cumulated Growth</strong></td>
</tr>
<tr>
<td><strong>Earnings</strong></td>
</tr>
<tr>
<td><strong>(CapEx-Deprn)*(1-DR)</strong></td>
</tr>
<tr>
<td>*<em>Chg. WC <em>(1-DR)</em></em></td>
</tr>
<tr>
<td><strong>FCFE</strong></td>
</tr>
</tbody>
</table>
Brahma: Valuation

- Costs of Equity
  
<table>
<thead>
<tr>
<th>Year</th>
<th>1-5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta</td>
<td>0.80</td>
<td>0.84</td>
<td>0.88</td>
<td>0.92</td>
<td>0.96</td>
<td>1.00</td>
</tr>
<tr>
<td>Cost of Equity</td>
<td>14.44%</td>
<td>12.14%</td>
<td>12.48%</td>
<td>12.82%</td>
<td>13.16%</td>
<td>13.50%</td>
</tr>
</tbody>
</table>

- Terminal Price

  Earnings in Year 11 = 137.09 (1.05) = 143.94 BR
  Net Cap Ex in year 11 = 40.54 BR
  WC change in year 11 = 2.51 BR
  FCFE in year 11 = 143.84 - 40.94(1-.435) - 2.51(1-.435) = 119.62 BR
  Terminal Price = 119.62 BR/(.125-.05) = 1594.98 BR

- Value = PV of FCFE_{High\ Growth} + PV of FCFE_{Transition} + PV of Term price
  = 136.63 + 131.31 + 444.59 = 712.53 BR

  The stock was trading at about 650 BR on June 5, 1998
Brahma: Real versus Nominal Valuation

- This valuation was done in real terms. Assume now that you are told that you are over valuing the stock, since the real discount rate is so much lower than the nominal discount rate. Is this true?
  - Yes
  - No

- You are also looking at a valuation of Brahma done in U.S. dollars. What inflation rate should you use to estimate the cash flows?
DaimlerChrysler: Rationale for Model

- DaimlerChrysler is a mature firm in a mature industry. We will therefore assume that the firm is in stable growth.
- Since this is a relatively new organization, with two different cultures on the use of debt (Daimler has traditionally been more conservative and bank-oriented in its use of debt than Chrysler), the debt ratio will probably change over time. Hence, we will use the FCFF model.
Daimler Chrysler: Inputs to the Model

- In 1999, Daimler Chrysler had earnings before interest and taxes of 9,324 million DM and had an effective tax rate of 46.94%.
- Based upon this operating income and the book values of debt and equity as of 1998, DaimlerChrysler had an after-tax return on capital of 7.15%.
- The market value of equity is 62.3 billion DM, while the estimated market value of debt is 64.5 billion.
- The bottom-up unlevered beta for automobile firms is 0.61, and Daimler is AAA rated.
- The long term German bond rate is 4.87% (in DM) and the mature market premium of 4% is used.
- We will assume that the firm will maintain a long term growth rate of 3%.
Daimler/Chrysler: Analyzing the Inputs

- Expected Reinvestment Rate = \( g/\text{ROC} = 3\%/7.15\% = 41.98\% \)
- Cost of Capital
  - Bottom-up Levered Beta = 0.61 \( (1+(1-.4694)(64.5/62.3)) \) = 0.95
  - Cost of Equity = 4.87\% + 0.94 (4\%) = 8.65\%
  - After-tax Cost of Debt = (4.87\% + 0.20\%) \( (1-.4694) \) = 2.69\%
  - Cost of Capital = 8.1\%(62.3/(62.3+64.5))+ 2.69\% (64.5/(62.3+64.5)) = 5.62\%
Daimler Chrysler Valuation

Estimating FCFF

Expected EBIT (1-t) = 9324 (1.03) (1-.4694) = 5,096 mil DM
Expected Reinvestment needs = 5,096(.412) = 2,139 mil DM
Expected FCFF next year = 2,957 mil DM

Valuation of Firm

Value of operating assets = 5096 / (.056-.03) = 112,847 mil DM
+ Cash + Marketable Securities = 18,068 mil DM
Value of Firm = 130,915 mil DM
- Debt Outstanding = 64,488 mil DM
Value of Equity = 66,427 mil DM

Value per Share = 72.7 DM per share
Stock was trading at 62.2 DM per share on August 14, 2000
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. Is there circular reasoning here?
- Yes
- No
- If there is, can you think of a way around this problem?
Tube Investments: Rationale for Using 2-Stage FCFF Model

- Tube Investments is a diversified manufacturing firm in India. While its growth rate has been anemic, there is potential for high growth over the next 5 years.
- The firm’s financing policy is also in a state of flux as the family running the firm reassesses its policy of funding the firm.
Aswath Damodaran
The Effects of Return Improvements on Value

- The firm is considering changes in the way in which it invests, which management believes will increase the return on capital to 12.20% on just new investments (and not on existing investments) over the next 5 years.
- The value of the firm will be higher, because of higher expected growth.
Current Cashflow to Firm

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBIT(1-t)</td>
<td>4,425</td>
</tr>
<tr>
<td>Nt CpX</td>
<td>843</td>
</tr>
<tr>
<td>Chg WC</td>
<td>4,150</td>
</tr>
<tr>
<td>FCFF</td>
<td>-568</td>
</tr>
<tr>
<td>Reinvestment Rate</td>
<td>60%</td>
</tr>
</tbody>
</table>

= FCFF = EBIT(1-t) - Nt CpX - Chg WC

Reinvestment Rate = 112.82%

Expected Growth in EBIT (1-t)

\[ \text{Expected Growth} = 0.60 \times 0.122 = 0.0732 \]

7.32%

Firm Value: 25,185

+ Cash: 13,653

- Debt: 18,073

= Equity 20,765

- Options 0

Value/Share 84.34

Cost of Equity 22.80%

Cost of Debt

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

Weights

E = 55.8% D = 44.2%

Riskfree Rate: Real riskfree rate = 12%

\[ \text{Riskfree Rate} + \text{Beta} \times \text{Risk Premium} \]

\[ 12\% + 1.17 \times 9.23\% = 22.80\% \]

Discount at Cost of Capital (WACC)

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

Terminal Value

\[ \frac{3904}{0.1478 - 0.05} = 39.921 \]

Firm Value: 25,185

+ Cash: 13,653

- Debt: 18,073

Equity 20,765

Options 0

Value/Share 84.34

Return on Capital 12.20%

Stable Growth

\[ g = 5\%; \text{ Beta} = 1.00; \]

\[ \text{Debt ratio} = 44.2\%; \text{ Country Premium} = 3\% \]

\[ \text{ROG} = 12.22\%; \text{ Reinvestment Rate} = 40.98\% \]

Terminal Value

\[ 5 = 3904/(0.1478 - 0.05) = 39.921 \]

Expected Growth in EBIT (1-t)

\[ 0.60 \times 0.122 = 0.0732 \]

7.32%

Stable Growth

\[ g = 5\%; \text{ Beta} = 1.00; \]

\[ \text{Debt ratio} = 44.2\%; \text{ Country Premium} = 3\% \]

\[ \text{ROG} = 12.22\%; \text{ Reinvestment Rate} = 40.98\% \]

Expected Growth

\[ 0.60 \times 0.122 = 0.0732 \]

7.32%

Actual Growth

\[ 0.15 \times 0.50 = 0.075 \]

7.5%

Terminal Value

\[ 5 = 3904/(0.1478 - 0.05) = 39.921 \]

Discount at Cost of Capital (WACC)

\[ 22.8\% \times 0.558 + 9.45\% \times 0.442 = 16.90\% \]
Return Improvements on Existing Assets

- If Tube Investments is also able to increase the return on capital on existing assets to 12.20% from 9.20%, its value will increase even more.
- The expected growth rate over the next 5 years will then have a second component arising from improving returns on existing assets:
  - Expected Growth Rate = \(0.122 \times 0.60 + \left\{ \left(1 + \frac{0.122 - 0.092}{0.092}\right)^{1/5} - 1 \right\}\)
  - \(= 0.1313\) or 13.13%
Aswath Damodaran

Tube Investments: Higher Average Return (in Rs)

Current Cashflow to Firm

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
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<tr>
<td>EBIT(1-t)</td>
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<tr>
<td>- Nt Cpx</td>
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<td>4,150</td>
</tr>
<tr>
<td>= FCFF</td>
<td>-568</td>
</tr>
<tr>
<td>Reinvestment Rate</td>
<td>60%</td>
</tr>
<tr>
<td>Expected Growth</td>
<td></td>
</tr>
<tr>
<td>60% * 12.22 + 0.0581 = .1313</td>
<td></td>
</tr>
<tr>
<td>13.13%</td>
<td></td>
</tr>
</tbody>
</table>

Reinvestment Rate = 60%

Firm Value: 31,829
+ Cash: 13,653
- Debt: 18,073
= Equity 27,409
- Options 0
Value/Share 111.3

Discount at Cost of Capital (WACC) = 22.8% (.558) + 9.45% (0.442) = 16.90%

Cost of Equity 22.80%
Cost of Debt (12% + 1.50%)(1-.30) = 9.45%
Weights E = 55.8% D = 44.2%

Riskfree Rate: Real riskfree rate = 12%

Beta 1.17

Risk Premium 9.23%

Unlevered Beta for Sectors: 0.75
Firm’s D/E Ratio: 79%
Mature risk premium 4%
Country Risk Premium 5.23%

Return on Capital 12.20%

Improvement on existing assets {1 + (.122-.092)/.092}^{1/5} - 1

Stable Growth

g = 5%; Beta = 1.00;
Debt ratio = 44.2%
Country Premium = 3%
ROC = 12.22%
Reinvestment Rate = 40.98%

Terminal Value 5 = 5081 / (0.1478 - .05) = 51,956

Term Yr
8,610
3,529
5,081

EBIT(1-t) $5,006 $5,664 $6,407 $7,248 $8,200
- Reinvestment $3,004 $3,398 $3,844 $4,349 $4,920
FCFF $2,002 $2,266 $2,563 $2,899 $3,280

Terminal Value 5 = 5081 / (0.1478 - .05) = 51,956
Dealing with Operating Leases: A Valuation of the Home Depot

- The Home Depot does not carry much in terms of traditional debt on its balance sheet. However, it does have significant operating leases.
- When doing firm valuation, these operating leases have to be treated as debt. This, in turn, will mean that operating income has to get restated.
Operating Leases at The Home Depot in 1998

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Commitment</th>
<th>Present Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$294.00</td>
<td>$277.88</td>
</tr>
<tr>
<td>2</td>
<td>$291.00</td>
<td>$259.97</td>
</tr>
<tr>
<td>3</td>
<td>$264.00</td>
<td>$222.92</td>
</tr>
<tr>
<td>4</td>
<td>$245.00</td>
<td>$195.53</td>
</tr>
<tr>
<td>5</td>
<td>$236.00</td>
<td>$178.03</td>
</tr>
<tr>
<td>6 and beyond</td>
<td>$270.00</td>
<td>$1,513.37</td>
</tr>
</tbody>
</table>

- Debt Value of leases = $2,647.70
### Other Adjustments from Operating Leases

<table>
<thead>
<tr>
<th></th>
<th>Operating Lease</th>
<th>Operating Lease</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Expensed</td>
<td>converted to Debt</td>
</tr>
<tr>
<td>EBIT</td>
<td>$2,661 mil</td>
<td>$2,815 mil</td>
</tr>
<tr>
<td>EBIT (1-t)</td>
<td>$1,730 mil</td>
<td>$1,829 mil</td>
</tr>
<tr>
<td>Debt</td>
<td>$1,433 mil</td>
<td>$4,081 mil</td>
</tr>
</tbody>
</table>
The Home Depot: A Valuation

### Current Cashflow to Firm

<table>
<thead>
<tr>
<th>Component</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBIT(1-t)</td>
<td>1,829</td>
</tr>
<tr>
<td>Net CPX</td>
<td>1,799</td>
</tr>
<tr>
<td>Chg WC</td>
<td>190</td>
</tr>
<tr>
<td>= FCFF</td>
<td>&lt;160&gt;</td>
</tr>
<tr>
<td>Reinvestment Rate</td>
<td>88.62%</td>
</tr>
</tbody>
</table>

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

\[
\text{Expected Growth} = 0.8862 \times 0.1637 = 0.1451 = 14.51\%
\]

### Return on Capital

16.37%

### Reinvestment Rate

108.75%

### Stable Growth

- \( g = 5\%; \) Beta = 0.87;
- \( \frac{D}{D+E} = 30\%; \) ROC = 14.1%
- Reinvestment Rate = 35.46%

### Terminal Value

\[
10 = \frac{4806}{0.0792 - 0.05} = 164,486
\]

### Cost of Equity

9.79%

### Cost of Debt

\[
(5\% + 0.80\%)(1 - 0.35) = 3.77\%
\]

### Weights

\[
E = 95.55\%;\ D = 4.45\%
\]

### Discount at Cost of Capital (WACC)

\[
9.79\% (0.9555) + 3.77\% (0.0445) = 9.52\%
\]

### Firm Value

\[
\text{Firm Value} = 68,949 + \text{Cash} - \text{Debt} \\
\text{Equity} = 64,930 - \text{Options} \\
\text{Value/Share} = \frac{64,930}{2,021} = 42.55
\]

### Riskfree Rate

Government Bond Rate = 5%

### Beta

0.87

### Risk Premium

5.5%

### Historical US Premium

5.5%

### Country Risk Premium

0%

---

Aswath Damodaran
Bristol Myers, like most pharmaceutical firms, has a significant amount of research and development expenses. These expenses, though treated as operating expenditures, by accountants, are really capital expenditures.

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

- Operating income
- Capital Expenditures
- Depreciation and Amortization
- Reinvestment Rates
- Return on Capital
Converting R&D Expenses to Capital Expenses

<table>
<thead>
<tr>
<th>Year</th>
<th>R&amp;D Expense</th>
<th>Unamortized portion</th>
<th>Unamortized Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>1577.00</td>
<td>1.00</td>
<td>1577.00</td>
</tr>
<tr>
<td>-2</td>
<td>1385.00</td>
<td>0.90</td>
<td>1246.50</td>
</tr>
<tr>
<td>-3</td>
<td>1276.00</td>
<td>0.80</td>
<td>1020.80</td>
</tr>
<tr>
<td>-4</td>
<td>1199.00</td>
<td>0.70</td>
<td>839.30</td>
</tr>
<tr>
<td>-5</td>
<td>1108.00</td>
<td>0.60</td>
<td>664.80</td>
</tr>
<tr>
<td>-6</td>
<td>1128.00</td>
<td>0.50</td>
<td>564.00</td>
</tr>
<tr>
<td>-7</td>
<td>1083.00</td>
<td>0.40</td>
<td>433.20</td>
</tr>
<tr>
<td>-8</td>
<td>983.00</td>
<td>0.30</td>
<td>294.90</td>
</tr>
<tr>
<td>-9</td>
<td>881.00</td>
<td>0.20</td>
<td>176.20</td>
</tr>
<tr>
<td>-10</td>
<td>789.00</td>
<td>0.10</td>
<td>78.90</td>
</tr>
</tbody>
</table>

Value of Research Asset = $6,895.60
Amortization of asset for current year = $689.56

Adjustment to Operating Income:
- Add back the R&D Expenses $1,577 million
- Subtract out the amortization $690 million
- Net Effect on Operating Expenses $887 million (Increase)

Tax Effect of R&D Expensing
- The entire R&D expense of $1,577 million is tax-deductible, rather than just the net effect of $887 million
- This creates a tax benefit that can be computed as follows:
  Additional tax benefit of expensing = (1577 - 887) (.2641) = $234
(26.41% is the tax rate)
## Capitalizing R&D: The Effects

<table>
<thead>
<tr>
<th></th>
<th>R&amp;D expensed</th>
<th>R&amp;D capitalized</th>
<th>In general</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBIT</td>
<td>$5,121 mil</td>
<td>$6,008 mil</td>
<td>Increase</td>
</tr>
<tr>
<td>EBIT(1-t)</td>
<td>$3,769 mil</td>
<td>$4,656 mil</td>
<td>Increase</td>
</tr>
<tr>
<td>Capital Exp</td>
<td>$ 788 mil</td>
<td>$2,365 mil</td>
<td>Increase</td>
</tr>
<tr>
<td>Depr &amp; Amortn</td>
<td>$ 625 mil</td>
<td>$1,315 mil</td>
<td>Increase</td>
</tr>
<tr>
<td>Net Cap Ex</td>
<td>$ 163 mil</td>
<td>$1,050 mil</td>
<td>Increase</td>
</tr>
<tr>
<td>Reinvestment Rate</td>
<td>6.4%</td>
<td>24.24%</td>
<td>Increase</td>
</tr>
<tr>
<td>BV of Equity</td>
<td>$7,219 mil</td>
<td>$14,114 mil</td>
<td>Increase</td>
</tr>
<tr>
<td>ROC</td>
<td>41.68%</td>
<td>29.22%</td>
<td>Decrease</td>
</tr>
</tbody>
</table>
Bristol Myers: A Valuation

**Cashflow to Firm**
- EBIT(1-t): 4656
- Nt CpX: 1050
- Chg WC: 78
- = FCFF: 3527

**Expected Growth in EBIT (1-t)**
- 35% * 29.22% = 10.23%

**Return on Capital**
- 29.22%

**Stable Growth**
- g = 5%; Beta = 0.80; ROC = 20%
- Reinvestment rate = 25%
- Terminal Value: $5,966/(0.0914-.05) = $144,171

**Cost of Equity**
- 9.20%

**Cost of Debt**
- (6% + 0.20%) (1-.2641)
- = 4.56%

**Weights**
- E = 98.66% D = 1.34%

**Riskfree Rate**
- T.Bond Rate = 6%

**Beta**
- 0.80

**Risk Premium**
- 4% + 0%

**Average Unlevered Beta for Sector**
- 0.79

**BM’s D/E Ratio**
- 1.46%

**Historical US Premium**
- 5.5%

**Country Risk Premium**
- 0%

**Value**
- $108,700 + Cash = $2,529
- Firm = $111,230 - Debt = $1,846
- Equity = $109,384 /Share: $55.08

**Discount at Cost of Capital (WACC) = 9.20% (0.9866) + 4.56% (0.0134) = 9.14%**

**Firm**
- $108,700 + Cash = $2,529
- $111,230 - Debt = $1,846
- $109,384 /Share: $55.08
The Dark Side of Valuation

Aswath Damodaran
http://www.stern.nyu.edu/~adnomodar
To make our estimates, we draw our information from:

- 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)
- We often substitute one type of information for another; for instance, in valuing Ford, we have 70 years+ of historical data, but not too many comparable firms; in valuing a software firm, we might not have too much historical data but we have lots of comparable firms.
The Dark Side...

- 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)
Discounted Cash Flow Valuation: High Growth with Negative Earnings

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

FCFF = Revenue* Op Margin (1-t) - Reinvestment

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

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

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

Aswath Damodaran
Amazon’s Bottom-up Beta

Unlevered beta for firms in internet retailing = 1.60
Unlevered beta for firms in specialty retailing = 1.00

Amazon is a specialty retailer, but its risk currently seems to be determined by the fact that it is an online retailer. Hence we will use the beta of internet companies to begin the valuation but move the beta, after the first five years, towards the beta of the retailing business.
The rating for a firm can be estimated using the financial characteristics of the firm. In its simplest form, the rating can be estimated from the interest coverage ratio

Interest Coverage Ratio = EBIT / Interest Expenses

Amazon.com has negative operating income; this yields a negative interest coverage ratio, which should suggest a low rating. We computed an average interest coverage ratio of 2.82 over the next 5 years. This yields an average rating of BBB for Amazon.com for the first 5 years. (In effect, the rating will be lower in the earlier years and higher in the later years than BBB)
Estimating the cost of debt

- The synthetic rating for Amazon.com is BBB. The default spread for BBB rated bonds is 1.50%
- Pre-tax cost of debt = Riskfree Rate + Default spread
  \[ = 6.50\% + 1.50\% = 8.00\% \]
- After-tax cost of debt right now = \(8.00\% \times (1 - 0) = 8.00\%\): The firm is paying no taxes currently. As the firm’s tax rate changes and its cost of debt changes, the after tax cost of debt will change as well.

<table>
<thead>
<tr>
<th>Year</th>
<th>Pre-tax</th>
<th>Tax rate</th>
<th>After-tax</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8.00%</td>
<td>0%</td>
<td>8.00%</td>
</tr>
<tr>
<td>2</td>
<td>8.00%</td>
<td>0%</td>
<td>8.00%</td>
</tr>
<tr>
<td>3</td>
<td>8.00%</td>
<td>0%</td>
<td>8.00%</td>
</tr>
<tr>
<td>4</td>
<td>8.00%</td>
<td>16.1%</td>
<td>6.71%</td>
</tr>
<tr>
<td>5</td>
<td>8.00%</td>
<td>35%</td>
<td>5.20%</td>
</tr>
<tr>
<td>6</td>
<td>8.00%</td>
<td>35%</td>
<td>5.07%</td>
</tr>
<tr>
<td>7</td>
<td>7.80%</td>
<td>35%</td>
<td>5.04%</td>
</tr>
<tr>
<td>8</td>
<td>7.75%</td>
<td>35%</td>
<td>4.98%</td>
</tr>
<tr>
<td>9</td>
<td>7.75%</td>
<td>35%</td>
<td>4.88%</td>
</tr>
<tr>
<td>10</td>
<td>7.75%</td>
<td>35%</td>
<td>4.55%</td>
</tr>
</tbody>
</table>
Estimating Cost of Capital: Amazon.com

- **Equity**
  - Cost of Equity = 6.50% + 1.60 (4.00%) = 12.90%
  - Market Value of Equity = $84/share* 340.79 mil shs = $28,626 mil (98.8%)

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

- **Cost of Capital**
  Cost of Capital = 12.9% (.988) + 8.00% (1- 0) (.012)) = 12.84%

Amazon.com has a book value of equity of $138 million and a book value of debt of $349 million. Shows you how irrelevant book value is in this process.
Calendar Years, Financial Years and Updated Information

- The operating income and revenue that we use in valuation should be updated numbers. One of the problems with using financial statements is that they are dated.
- As a general rule, it is better to use 12-month trailing estimates for earnings and revenues than numbers for the most recent financial year. This rule becomes even more critical when valuing companies that are evolving and growing rapidly.

<table>
<thead>
<tr>
<th></th>
<th>Last 10-K</th>
<th>Trailing 12-month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenues</td>
<td>$ 610 million</td>
<td>$1,117 million</td>
</tr>
<tr>
<td>EBIT</td>
<td>- $125 million</td>
<td>- $ 410 million</td>
</tr>
</tbody>
</table>

Aswath Damodaran
Many internet companies are arguing that selling and G&A expenses are the equivalent of R&D expenses for a high-technology firms and should be treated as capital expenditures.

If we adopt this rationale, we should be computing earnings before these expenses, which will make many of these firms profitable. It will also mean that they are reinvesting far more than we think they are. It will, however, make not their cash flows less negative.

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

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBIT</td>
<td>-$373</td>
<td>-$94</td>
<td>$407</td>
<td>$1,038</td>
<td>$1,628</td>
</tr>
<tr>
<td>Taxes</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$167</td>
<td>$570</td>
</tr>
<tr>
<td>EBIT(1-t)</td>
<td>-$373</td>
<td>-$94</td>
<td>$407</td>
<td>$871</td>
<td>$1,058</td>
</tr>
<tr>
<td>Tax rate</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>16.13%</td>
<td>35%</td>
</tr>
<tr>
<td>NOL</td>
<td>$500</td>
<td>$873</td>
<td>$967</td>
<td>$560</td>
<td>$0</td>
</tr>
</tbody>
</table>

After year 5, the tax rate becomes 35%.
Estimating FCFF: Amazon.com

- EBIT (Trailing 1999) = -$410 million
- Tax rate used = 0% (Assumed Effective = Marginal)
- Capital spending (Trailing 1999) = $243 million (includes acquisitions)
- Depreciation (Trailing 1999) = $31 million
- Non-cash Working capital Change (1999) = -$80 million

**Estimating FCFF (1999)**

\[
\text{Current EBIT} \times (1 - \text{tax rate}) = -410 \times (1-0) = -$410 \text{ million} \\
- (\text{Capital Spending} - \text{Depreciation}) = -$212 \text{ million} \\
- \text{Change in Working Capital} = -$80 \text{ million} \\
\text{Current FCFF} = -$542 \text{ million}
\]
## Growth in Revenues, Earnings and Reinvestment: Amazon

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenue Growth</th>
<th>Revenue Chg</th>
<th>New Investment</th>
<th>Sales/Capital</th>
<th>ROC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>150.00%</td>
<td>$1,676</td>
<td>$559</td>
<td>3.00</td>
<td>-76.62%</td>
</tr>
<tr>
<td>2</td>
<td>100.00%</td>
<td>$2,793</td>
<td>$931</td>
<td>3.00</td>
<td>-8.96%</td>
</tr>
<tr>
<td>3</td>
<td>75.00%</td>
<td>$4,189</td>
<td>$1,396</td>
<td>3.00</td>
<td>20.59%</td>
</tr>
<tr>
<td>4</td>
<td>50.00%</td>
<td>$4,887</td>
<td>$1,629</td>
<td>3.00</td>
<td>25.82%</td>
</tr>
<tr>
<td>5</td>
<td>30.00%</td>
<td>$4,398</td>
<td>$1,466</td>
<td>3.00</td>
<td>21.16%</td>
</tr>
<tr>
<td>6</td>
<td>25.20%</td>
<td>$4,803</td>
<td>$1,601</td>
<td>3.00</td>
<td>22.23%</td>
</tr>
<tr>
<td>7</td>
<td>20.40%</td>
<td>$4,868</td>
<td>$1,623</td>
<td>3.00</td>
<td>22.30%</td>
</tr>
<tr>
<td>8</td>
<td>15.60%</td>
<td>$4,482</td>
<td>$1,494</td>
<td>3.00</td>
<td>21.87%</td>
</tr>
<tr>
<td>9</td>
<td>10.80%</td>
<td>$3,587</td>
<td>$1,196</td>
<td>3.00</td>
<td>21.19%</td>
</tr>
<tr>
<td>10</td>
<td>6.00%</td>
<td>$2,208</td>
<td>$736</td>
<td>3.00</td>
<td>20.39%</td>
</tr>
</tbody>
</table>

The sales/capital ratio of 3.00 was based on what Amazon accomplished last year and the averages for the industry.
## Amazon.com: Stable Growth Inputs

<table>
<thead>
<tr>
<th></th>
<th>High Growth</th>
<th>Stable Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta</td>
<td>1.60</td>
<td>1.00</td>
</tr>
<tr>
<td>Debt Ratio</td>
<td>1.20%</td>
<td>15%</td>
</tr>
<tr>
<td>Return on Capital</td>
<td>Negative</td>
<td>20%</td>
</tr>
<tr>
<td>Expected Growth Rate</td>
<td>NMF</td>
<td>6%</td>
</tr>
<tr>
<td>Reinvestment Rate</td>
<td>&gt;100%</td>
<td>6%/20% = 30%</td>
</tr>
</tbody>
</table>
Details of options outstanding

- Average strike price of options outstanding = $13.375
- Average maturity of options outstanding = 8.4 years
- Standard deviation in ln(stock price) = 50.00%
- Annualized dividend yield on stock = 0.00%
- Treasury bond rate = 6.50%
- Number of options outstanding = 38 million
- Number of shares outstanding = 340.79 million

Value of options outstanding (using dilution-adjusted Black-Scholes model)

- Value of equity options = $2,892 million
### Reinvestment:
- Cap ex includes acquisitions
- Working capital is 3% of revenues

### Sales Turnover
- Ratio: 3.00

### Competitive Advantages

### Revenue Growth:
- 42%

### Expected Margin:
- -> 10.00%

### Terminal Value:
\[ \frac{1881}{0.0961 - 0.06} = 52,148 \]

### Cost of Equity
12.90%

### Cost of Debt
8.00% + 1.5% = 8.00%

### Tax rate
0% -> 35%

### Weights
- Debt: 1.2% -> 15%

### Internet/Retail Operating Leverage

### Current
- D/E: 1.21%
- Base Equity Premium
- Country Risk Premium

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

### Revenues
$2,793, 5,585, 9,774, 14,661, 19,059, 23,862

### EBIT
-$373, -$94, $407, $1,038, $1,628, $2,212, $2,768

### EBIT (1-t)
-$373, -$94, $407, $871, $1,058, $1,438, $1,799

### - Reinvestment
$559, $931, $1,396, $1,629, $1,466, $1,601, $1,623, $1,494, $1,196, $736

### FCFF
-$931, -$1,024, -$989, -$758, -$408, -$163, -$177, $625, $1,174, $1,788

### Revenues
1, 2, 3, 4, 5, 6, 7, 8, 9, 10

### EBIT
$-410m

### NOL:
500 m

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

### Riskfree Rate
T. Bond rate = 6.5%

### Risk Premium
4%

### Beta
1.60 -> 1.00

### Amazon.com
January 2000
Stock Price = $84
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>
### Terminal Value

Terminal Value = \( \frac{1064}{0.0876 - 0.05} \)
\[= \$28,310 \]

### Cost of Equity

Cost of Equity = 13.81%

### Cost of Debt

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

### Tax Rate

Tax rate = 0% -> 35%

### Weights

Debt = 27.3% -> 15%

### Value of Operations Assets

Value of Op Assets = \$8,789

+ Cash & Non-op = \$1,263

= Value of Firm = \$10,052

- Value of Debt = \$1,879

= Value of Equity = \$8,173

- Equity Options = \$845

Value per share = \$20.83

### Reinvestment

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

### Sales Turnover Ratio

Sales Turnover Ratio = 3.02

### Competitive Advantages

Expected Margin: -> 9.32%

### Revenues

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenue</th>
<th>EBIT</th>
<th>EBIT(1-t)</th>
<th>FCFF</th>
<th>Debt Ratio</th>
<th>Beta</th>
<th>Cost of Equity</th>
<th>AT cost of Debt</th>
<th>Cost of Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$4,314</td>
<td>$545</td>
<td>$545</td>
<td>-$1,157</td>
<td>27.27%</td>
<td>2.18</td>
<td>13.81%</td>
<td>10.00%</td>
<td>12.77%</td>
</tr>
<tr>
<td>2</td>
<td>$6,471</td>
<td>$107</td>
<td>$107</td>
<td>-$822</td>
<td>27.27%</td>
<td>2.18</td>
<td>13.81%</td>
<td>10.00%</td>
<td>12.77%</td>
</tr>
<tr>
<td>3</td>
<td>$9,059</td>
<td>$347</td>
<td>$347</td>
<td>-$510</td>
<td>27.27%</td>
<td>2.18</td>
<td>13.81%</td>
<td>10.00%</td>
<td>12.77%</td>
</tr>
<tr>
<td>4</td>
<td>$11,777</td>
<td>$1,123</td>
<td>$1,123</td>
<td>-$126</td>
<td>27.27%</td>
<td>2.18</td>
<td>13.81%</td>
<td>10.00%</td>
<td>12.77%</td>
</tr>
<tr>
<td>5</td>
<td>$14,132</td>
<td>$1,428</td>
<td>$1,428</td>
<td>$237</td>
<td>27.27%</td>
<td>2.18</td>
<td>13.81%</td>
<td>10.00%</td>
<td>12.77%</td>
</tr>
<tr>
<td>6</td>
<td>$16,534</td>
<td>$1,692</td>
<td>$1,692</td>
<td>$132</td>
<td>27.27%</td>
<td>2.18</td>
<td>13.81%</td>
<td>10.00%</td>
<td>12.77%</td>
</tr>
<tr>
<td>7</td>
<td>$18,849</td>
<td>$1,914</td>
<td>$1,914</td>
<td>$333</td>
<td>27.27%</td>
<td>2.18</td>
<td>13.81%</td>
<td>10.00%</td>
<td>12.77%</td>
</tr>
<tr>
<td>8</td>
<td>$20,922</td>
<td>$2,302</td>
<td>$2,302</td>
<td>$802</td>
<td>27.27%</td>
<td>2.18</td>
<td>13.81%</td>
<td>10.00%</td>
<td>12.77%</td>
</tr>
<tr>
<td>9</td>
<td>$22,596</td>
<td>$2,302</td>
<td>$2,302</td>
<td>$1,064</td>
<td>27.27%</td>
<td>2.18</td>
<td>13.81%</td>
<td>10.00%</td>
<td>12.77%</td>
</tr>
<tr>
<td>10</td>
<td>$23,726</td>
<td>$2,302</td>
<td>$2,302</td>
<td>$1,064</td>
<td>27.27%</td>
<td>2.18</td>
<td>13.81%</td>
<td>10.00%</td>
<td>12.77%</td>
</tr>
</tbody>
</table>

### Internet/ Retail

Beta = 2.18 -> 1.10

### Operating Leverage

Risk Premium = 4%

### Current D/E

Current D/E: 37.5%

### Base Equity Premium

Country Risk Premium

### Amazon.com

January 2001

Stock price = \$14