Corporate Finance: Spring 2002

Aswath Damodaran
First Principles

- Invest in projects that **yield a return greater** than the **minimum acceptable hurdle rate**.
  - The hurdle rate should be **higher for riskier projects** and reflect the **financing mix** used - owners’ funds (equity) or borrowed money (debt)
  - Returns on projects should be measured based on **cash flows** generated and the **timing** of these cash flows; they should also consider both **positive and negative side effects** of these projects.

- Choose a **financing mix** that **minimizes the hurdle rate and matches the assets being financed**.

- If there are not enough investments that earn the hurdle rate, **return the cash to stockholders**.
  - The **form of returns** - dividends and stock buybacks - will depend upon the stockholders’ characteristics.

**Objective: Maximize the Value of the Firm**
Ponderous Thoughts… (or maybe not)

- Corporate financial analysis is 95% perspiration, 5% inspiration.
- There are few facts and lots of opinions…
- The model is your tool… You are not the model’s tool…
- Static analysis in a dynamic world is frustrating…
The Breakdown in the Classical Objective Function

**STOCKHOLDERS**
- Managers put their interests above stockholders
- Have little control over managers

**BONDHOLDERS**
- Lend Money
- Bondholders can get ripped off

**MANAGERS**
- Delay bad news or provide misleading information

**SOCIETY**
- Some costs cannot be traced to firm
- Markets make mistakes and can over react

**FINANCIAL MARKETS**
- Significant Social Costs

---

Aswath Damodaran
I. Where does the power lie?

[Diagram showing percentage distribution of power among managers, stockholders, and 'not sure' over different years]
US versus Non-US firms: Spring 1999
II. Who is your marginal investor?
III. Risk Profiles and Costs of Equity

Cost of Equity

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

Beta:
- Measures market risk

Risk Premium:
- Premium for average risk investment

Type of Business
Operating Leverage
Financial Leverage
Base Equity Premium
Country Risk Premium
Beta: The Standard Approach

**Beta of Equity**

**Top-Down**
- \( R_j \)
- \( R_m \)
- Intercept - \( R_f (1-Beta) = Jensen's \) Alpha
- Slope = Beta

**Bottom-up**
1. Identify businesses that firm is in.
2. Take weighted average of the unlevered betas of other firms in the business.
3. Compute the levered beta using the firm’s current debt to equity ratio:
   \[ \beta_l = \beta_u [1 + (1-tax \ rate) (Debt/Equity)] \]
Regression Estimation Approaches

![Bar Chart]

- Regression
- Bottom-up
- Other
Beta Distribution

![Beta Distribution Graph](chart.png)
Jensen’s Alpha Distribution

Jensen's Alpha

< -20%  -20% to -10%  0% to -10%  0% to -2%  2% to 5%  5% to 10%  10% to 20%  >20%
R Squared

![Bar chart showing R Squared values ranging from <10% to >50%.]
Cost of Capital

\[ \text{Cost of Capital} = \text{Cost of Equity} \left( \frac{E}{D+E} \right) + \text{After-tax cost of debt} \left( \frac{D}{D+E} \right) \]

**Cost of Equity**

**Cost of Debt**

- **Rating**
  - Actual Rating
  - Synthetic Rating

**Market-value Weights of Debt & Equity**

- Equity includes Options
- Debt includes all fixed commitments
Distribution of Current Market Value Debt Ratios

Actual Debt Ratio

0% 0.01% - 10% 10% - 20% 20% - 30% 30% - 40% 40% - 50% 50% - 60% 60% - 70% 70% - 80% 80% - 90% >90%

0 20 40 60 80 100 120 140

Aswath Damodaran
The Quality of Investments: The Firm View

Cost of Capital = Cost of Equity ($E/(D+E)$) + After-tax cost of debt ($D/(D+E)$)

After-tax Operating Income

Capital Invested in Assets in Place

Return on Capital = After-tax Operating Income / Capital Invested in Assets in Place

Return Spread = ROC - WACC

EVA = (ROC - WACC) (Capital Invested)

Cost of Capital = Cost of Equity ($E/(D+E)$) + After-tax cost of debt ($D/(D+E)$)
ROC versus Cost of Capital

![ROC - Cost of Capital](image)
The Quality of Investments: The Equity View

- **Net Income**
- **Equity Invested in Assets in Place**
- **Return on Equity** = Net Income / Equity Invested in Assets in Place
- **Return Spread** = ROE - COE
- **Equity EVA** = (ROE - COE) / (Equity Invested)
- **Cost of Equity**
ROE versus Cost of Equity
The Optimal Financing Mix

![Graph showing the relationship between debt ratio and cost of capital, cost of equity, and after-tax cost of debt.](image)
Optimal Debt Ratios

Debt Ratios

Optimal
Actual
Under versus Over Levered Firms

Degree of Under/OverLeverage

Underlevered > 40%
Underlevered 30-40%
Underlevered 20-30%
Underlevered 10-20%
Underlevered less than 10%
Overlevered less than 10%
Overlevered 10-20%
Overlevered 20-30%
Overlevered 30 to 40%
Overlevered more than 40%
Change in Cost of Capital
The Right Kind of Financing

- Sensitivity of Firm Value to Changes in Interest Rates
  - Duration of Assets
    - Duration of Debt
  - Cyclicality of Firm
    - Margin for Error
- Sensitivity of Firm Value to Changes in GDP
  - Duration of Debt
- Sensitivity of Firm Value to Changes in Inflation
  - Pricing Power
    - Fixed versus Floating Rate
- Sensitivity of Firm Value to Changes in Exchange Rates
  - Foreign Currency Exposure
    - Domestic versus Foreign Currency Debt
Duration of Assets

Duration Estimates

Aswath Damodaran
Measuring Potential Dividends

1. Begin with the net income (which is after interest expenses and taxes)
2. Add back the non-cash charges such as depreciation & amortization
3. Subtract out reinvestment needs
   - Capital expenditures
   - Investments in Non-cash Working Capital (Change)
4. Subtract out payments to non-equity investors
   - Principal Repayments
   - Preferred Stock Dividends
5. Add any cash inflows from new debt
   - New Debt Issues
6. To get to the Cash that is available for return to Owners
Dividends versus FCFE

Dividends as % of FCFE

- Bars represent the percentage of companies where dividends are a certain percentage of FCFE.
- The x-axis shows different percentage ranges: 0%, 0 - 10%, 10 - 20%, etc., up to >100%.
- The y-axis measures the number of companies in each range.

Aswath Damodaran
The Value of a Firm

**DISCOUNTED CASHFLOW VALUATION**

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

\[ = \text{FCFF} \]

**Expected Growth**
- Reinvestment Rate
- Return on Capital

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

\[ \text{Terminal Value} = \frac{\text{FCFF}_{n+1}}{r-g_n} \]

Discount at Cost of Capital (WACC) = Cost of Equity \((\text{Equity}/(\text{Debt} + \text{Equity}))\) + Cost of Debt \((\text{Debt}/(\text{Debt} + \text{Equity}))\)

Firm Value
- Value of Debt
= Value of Equity

\[ \text{FCFF}_1 \quad \text{FCFF}_2 \quad \text{FCFF}_3 \quad \text{FCFF}_4 \quad \text{FCFF}_5 \quad \text{FCFF}_n \]

\[ \text{Forever} \]
Cashflow to Equity
- Net Income
- (Cap Ex - Depr) (1 - DR)
- Change in WC (1-DR)
= FCFE

Expected Growth
- Retention Ratio *
- Return on Equity

Firm is in stable growth: Grows at constant rate forever

Terminal Value = FCFE \(_{n+1}/(r-e-g_n)\)

Value of Equity

Discount at Cost of Equity

Forever

Aswath Damodaran
Valuation versus Price

Valuation Results

- Undervalued > 50%
- Undervalued 10-50%
- Undervalued < 10%
- Overvalued less than 10%
- Overvalued between 10-50%
- Overvalued 50-100%
- Overvalued >100%
# Most Undervalued Stocks

<table>
<thead>
<tr>
<th>Company</th>
<th>Value/share</th>
<th>Price/Share</th>
<th>Price/Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Princeton Video I</td>
<td>$18.74</td>
<td>$1.10</td>
<td>-94.13%</td>
</tr>
<tr>
<td>Acclaim</td>
<td>$33.27</td>
<td>$5.04</td>
<td>-84.85%</td>
</tr>
<tr>
<td>TiVo</td>
<td>$18.74</td>
<td>$3.97</td>
<td>-78.82%</td>
</tr>
<tr>
<td>Ford</td>
<td>$74.61</td>
<td>$16.80</td>
<td>-77.48%</td>
</tr>
<tr>
<td>Sports Authority</td>
<td>$29.25</td>
<td>$8.20</td>
<td>-71.97%</td>
</tr>
<tr>
<td>Morton's of Chica</td>
<td>$43.95</td>
<td>$12.98</td>
<td>-70.47%</td>
</tr>
<tr>
<td>Delta</td>
<td>$84.32</td>
<td>$26.83</td>
<td>-68.18%</td>
</tr>
<tr>
<td>Delphi</td>
<td>$37.55</td>
<td>$13.81</td>
<td>-63.22%</td>
</tr>
<tr>
<td>GemStar</td>
<td>$21.18</td>
<td>$8.72</td>
<td>-58.83%</td>
</tr>
<tr>
<td>Redhook Ale</td>
<td>$6.03</td>
<td>$2.51</td>
<td>-58.37%</td>
</tr>
<tr>
<td>Frontier</td>
<td>$37.30</td>
<td>$16.21</td>
<td>-56.54%</td>
</tr>
<tr>
<td>General Mills</td>
<td>$103.74</td>
<td>$45.17</td>
<td>-56.46%</td>
</tr>
<tr>
<td>International House</td>
<td>$67.21</td>
<td>$29.30</td>
<td>-56.41%</td>
</tr>
<tr>
<td>Toys R Us</td>
<td>$35.82</td>
<td>$16.56</td>
<td>-53.77%</td>
</tr>
</tbody>
</table>
The Triple Whammy: Underlevered, Cash Build-up and Under valued?

<table>
<thead>
<tr>
<th>Company</th>
<th>Current Debt ratio</th>
<th>Optimal Debt Ratio</th>
<th>Change in WACC</th>
<th>Duration</th>
<th>Dividends</th>
<th>FCFE</th>
<th>Value/share</th>
<th>Price/Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abercrombie (AN)</td>
<td>16.74%</td>
<td>40.00%</td>
<td>0.59%</td>
<td>13.22</td>
<td>23.6</td>
<td>77.3</td>
<td>$47.11</td>
<td>$30.62</td>
</tr>
<tr>
<td>Abercrombie and Fitch</td>
<td>16.77%</td>
<td>40.00%</td>
<td>0.30%</td>
<td>25.8</td>
<td>0</td>
<td>35.17</td>
<td>$47.05</td>
<td>$31.85</td>
</tr>
<tr>
<td>Amerada Hess</td>
<td>43.15%</td>
<td>60.00%</td>
<td>0.21%</td>
<td>0</td>
<td>94</td>
<td>2660</td>
<td>$90.44</td>
<td>$77.55</td>
</tr>
<tr>
<td>Apple</td>
<td>3.22%</td>
<td>20.00%</td>
<td>0.17%</td>
<td>2.19</td>
<td>64</td>
<td>119</td>
<td>$28.00</td>
<td>$23.51</td>
</tr>
<tr>
<td>Automatic Data P</td>
<td>2.92%</td>
<td>20.00%</td>
<td>0.59%</td>
<td>11</td>
<td>334.28</td>
<td>53099.25</td>
<td>$84.41</td>
<td>$50.58</td>
</tr>
<tr>
<td>Compaq</td>
<td>10.92%</td>
<td>30.00%</td>
<td>0.87%</td>
<td>2.14</td>
<td>158</td>
<td>2472</td>
<td>$13.00</td>
<td>$11.00</td>
</tr>
<tr>
<td>ExxonMobil</td>
<td>4.35%</td>
<td>30.00%</td>
<td>0.32%</td>
<td>10.06</td>
<td>6254.000</td>
<td>15254.000</td>
<td>$50.52</td>
<td>$40.80</td>
</tr>
<tr>
<td>Ford</td>
<td>33.28%</td>
<td>60.00%</td>
<td>0.85%</td>
<td>4.86</td>
<td>2751</td>
<td>4089</td>
<td>$74.61</td>
<td>$16.80</td>
</tr>
<tr>
<td>GlaxoSmithkline</td>
<td>4.82%</td>
<td>20.00%</td>
<td>0.40%</td>
<td>7.92</td>
<td>3940.5</td>
<td>8661.5</td>
<td>$23.12</td>
<td>$18.00</td>
</tr>
<tr>
<td>Guidant</td>
<td>6.11%</td>
<td>20.00%</td>
<td>-0.25%</td>
<td>18</td>
<td>102.5</td>
<td>144.57</td>
<td>$62.22</td>
<td>$41.25</td>
</tr>
<tr>
<td>Guidant</td>
<td>7.48%</td>
<td>20.00%</td>
<td>0.29%</td>
<td>6.75</td>
<td>0</td>
<td>321</td>
<td>$44.28</td>
<td>$38.40</td>
</tr>
<tr>
<td>K-Swiss</td>
<td>1.00%</td>
<td>40.00%</td>
<td>1.00%</td>
<td>0</td>
<td>13.24</td>
<td>17.7</td>
<td>$54.49</td>
<td>$47.76</td>
</tr>
<tr>
<td>MDC Holdings</td>
<td>17.28%</td>
<td>60.00%</td>
<td>-0.86%</td>
<td>0</td>
<td>4.21</td>
<td>27.37</td>
<td>$76.14</td>
<td>$52.80</td>
</tr>
<tr>
<td>Merck</td>
<td>6.41%</td>
<td>20.00%</td>
<td>33%</td>
<td>10.55</td>
<td>445.2</td>
<td>7593</td>
<td>$81.50</td>
<td>$54.47</td>
</tr>
<tr>
<td>Nautica</td>
<td>22.78%</td>
<td>40.00%</td>
<td>-0.32%</td>
<td>0</td>
<td>21.34</td>
<td>57.78</td>
<td>$22.35</td>
<td>$14.25</td>
</tr>
<tr>
<td>Neiman Marcus</td>
<td>25.77%</td>
<td>40.00%</td>
<td>0.66%</td>
<td>0</td>
<td>15.16</td>
<td>59.69</td>
<td>$54.11</td>
<td>$38.80</td>
</tr>
<tr>
<td>Pfizer</td>
<td>4.22%</td>
<td>20.00%</td>
<td>0.30%</td>
<td>5.5</td>
<td>1717.8</td>
<td>4166</td>
<td>$52.21</td>
<td>$36.27</td>
</tr>
<tr>
<td>Pfizer</td>
<td>4.00%</td>
<td>20.00%</td>
<td>0.34%</td>
<td>9.55</td>
<td>2621</td>
<td>2961</td>
<td>$50.85</td>
<td>$36.18</td>
</tr>
<tr>
<td>Pfizer</td>
<td>3.73%</td>
<td>20.00%</td>
<td>-0.31%</td>
<td>2367.9</td>
<td>2842.2</td>
<td></td>
<td>$45.67</td>
<td>$37.50</td>
</tr>
<tr>
<td>Schering Plough</td>
<td>2.54%</td>
<td>20.00%</td>
<td>0.44%</td>
<td>17.05</td>
<td>916.11</td>
<td>1113.16</td>
<td>$40.83</td>
<td>$32.50</td>
</tr>
<tr>
<td>Schering Plough</td>
<td>3.28%</td>
<td>20.00%</td>
<td>0.45%</td>
<td>11.7</td>
<td>1052.8</td>
<td>1553.6</td>
<td>$31.26</td>
<td>$27.50</td>
</tr>
<tr>
<td>Schering-Plough</td>
<td>2.42%</td>
<td>30.00%</td>
<td>0.63%</td>
<td>17.13</td>
<td>1266</td>
<td>1657</td>
<td>$33.28</td>
<td>$27.50</td>
</tr>
<tr>
<td>Schering-Plough</td>
<td>1.58%</td>
<td>30.00%</td>
<td>0.64%</td>
<td>17.13</td>
<td>719.6</td>
<td>1707.48</td>
<td>$31.78</td>
<td>$27.50</td>
</tr>
<tr>
<td>Takeda</td>
<td>0.37%</td>
<td>20.00%</td>
<td>0.29%</td>
<td>2.5</td>
<td>23,251</td>
<td>43,240</td>
<td>$8,957.00</td>
<td>$5,540.00</td>
</tr>
<tr>
<td>The Sharper Image</td>
<td>27.37%</td>
<td>50.00%</td>
<td>0.48%</td>
<td>4.45</td>
<td>0</td>
<td>1.147</td>
<td>$43.69</td>
<td>$22.85</td>
</tr>
</tbody>
</table>
Objectives of this class

- Big picture of corporate finance
- Tools and techniques that you need to answer corporate finance questions in the real world
- Corporate finance is fun!!!