Let’s start with a general proposition. If you know the price paid for an asset and have estimates of the expected cash flows on the asset, you can estimate the IRR of these cash flows. If you paid the price, this is what you have priced the asset to earn (as an expected return).

If you assume that stocks are correctly priced in the aggregate and you can estimate the expected cashflows from buying stocks, you can estimate the expected rate of return on stocks by finding that discount rate that makes the present value equal to the price paid. Subtracting out the riskfree rate should yield an implied equity risk premium.

This implied equity premium is a forward looking number and can be updated as often as you want (every minute of every day, if you are so inclined).
We can use the information in stock prices to back out how risk averse the market is and how much of a risk premium it is demanding.

Between 2001 and 2007 dividends and stock buybacks averaged 4.02% of the index each year. Analysts expect earnings to grow 5% a year for the next 5 years. We will assume that dividends & buybacks will keep pace. Last year’s cashflow (59.03) growing at 5% a year

If you pay the current level of the index, you can expect to make a return of 8.39% on stocks (which is obtained by solving for r in the following equation)

\[
1468.36 = \frac{61.98}{1 + r} + \frac{65.08}{(1 + r)^2} + \frac{68.33}{(1 + r)^3} + \frac{71.75}{(1 + r)^4} + \frac{75.34}{(1 + r)^5} + \frac{75.35(1.0402)}{(r - .0402)(1 + r)^5}
\]

Implied Equity risk premium = Expected return on stocks - Treasury bond rate = 8.39% - 4.02% = 4.37%

January 1, 2008
S&P 500 is at 1468.36
4.02% of 1468.36 = 59.03

Aswath Damodaran
Assume that the index jumps 10% on January 2 and that nothing else changes. What will happen to the implied equity risk premium?

- a. Implied equity risk premium will increase
- b. Implied equity risk premium will decrease

Assume that the earnings jump 10% on January 2 and that nothing else changes. What will happen to the implied equity risk premium?

- a. Implied equity risk premium will increase
- b. Implied equity risk premium will decrease

Assume that the riskfree rate increases to 5% on January 2 and that nothing else changes. What will happen to the implied equity risk premium?

- a. Implied equity risk premium will increase
- b. Implied equity risk premium will decrease
A year that made a difference.. The implied premium in January 2009

<table>
<thead>
<tr>
<th>Year</th>
<th>Market value of index</th>
<th>Dividends</th>
<th>Buybacks</th>
<th>Cash to equity</th>
<th>Dividend yield</th>
<th>Buyback yield</th>
<th>Total yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>1148.09</td>
<td>15.74</td>
<td>14.34</td>
<td>30.08</td>
<td>1.37%</td>
<td>1.25%</td>
<td>2.62%</td>
</tr>
<tr>
<td>2002</td>
<td>879.82</td>
<td>15.96</td>
<td>13.87</td>
<td>29.83</td>
<td>1.81%</td>
<td>1.58%</td>
<td>3.39%</td>
</tr>
<tr>
<td>2003</td>
<td>1111.91</td>
<td>17.88</td>
<td>13.70</td>
<td>31.58</td>
<td>1.61%</td>
<td>1.23%</td>
<td>2.84%</td>
</tr>
<tr>
<td>2004</td>
<td>1211.92</td>
<td>19.01</td>
<td>21.59</td>
<td>40.60</td>
<td>1.57%</td>
<td>1.78%</td>
<td>3.35%</td>
</tr>
<tr>
<td>2005</td>
<td>1248.29</td>
<td>22.34</td>
<td>38.82</td>
<td>61.17</td>
<td>1.79%</td>
<td>3.11%</td>
<td>4.90%</td>
</tr>
<tr>
<td>2006</td>
<td>1418.30</td>
<td>25.04</td>
<td>48.12</td>
<td>73.16</td>
<td>1.77%</td>
<td>3.39%</td>
<td>5.16%</td>
</tr>
<tr>
<td>2007</td>
<td>1468.36</td>
<td>28.14</td>
<td>67.22</td>
<td>95.36</td>
<td>1.92%</td>
<td>4.58%</td>
<td>6.49%</td>
</tr>
<tr>
<td>2008</td>
<td>903.25</td>
<td>28.47</td>
<td>40.25</td>
<td>68.72</td>
<td>3.15%</td>
<td>4.61%</td>
<td>7.77%</td>
</tr>
<tr>
<td>Normalized</td>
<td>903.25</td>
<td>28.47</td>
<td>24.11</td>
<td>52.584</td>
<td>3.15%</td>
<td>2.67%</td>
<td>5.82%</td>
</tr>
</tbody>
</table>

In 2008, the actual cash returned to stockholders was 68.72. However, there was a 41% dropoff in buybacks in Q4. We reduced the total buybacks for the year by that amount.

Analysts expect earnings to grow 4% a year for the next 5 years. We will assume that dividends & buybacks will keep pace..

Last year’s cashflow (52.58) growing at 4% a year

\[
903.25 = \frac{54.69}{(1+r)} + \frac{56.87}{(1+r)^2} + \frac{59.15}{(1+r)^3} + \frac{61.52}{(1+r)^4} + \frac{63.98(1.0221)}{(1+r)^5} + \frac{63.98(1.0221)}{(1+r)^5}
\]

Expected Return on Stocks (1/1/09) = 8.64%
Riskfree rate = 2.21%
Equity Risk Premium = 6.43%

After year 5, we will assume that earnings on the index will grow at 2.21%, the same rate as the entire economy (= riskfree rate).

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

Average implied ERP: 1960-2007 = 4.00%
An Updated Equity Risk Premium: January 2015

Base year cash flow (last 12 mths)
- Dividends (TTM): 38.57
- + Buybacks (TTM): 61.92
= Cash to investors (TTM): **100.50**

Earnings in TTM: 114.74

100.5 growing @ 5.58% a year

Expected growth in next 5 years
Top down analyst estimate of earnings growth for S&P 500 with stable payout: **5.58%**

Beyond year 5
Expected growth rate = Riskfree rate = **2.17%**
Expected CF in year 6 = 131.81(1.0217)

r = Implied Expected Return on Stocks = **7.95%**

Minus

Risk free rate = T.Bond rate on 1/1/15 = **2.17%**

Equals

Implied Equity Risk Premium (1/1/15) = **7.95%** - **2.17%** = **5.78%**
Implied Premiums in the US: 1960-2014

Implied Premium for US Equity Market: 1960-2014

Aswath Damodaran
Expected Return on Stocks = T.Bond Rate + Equity Risk

Implied Premium (FCFE)

Since 2008, the expected return on stocks has stagnated at about 8%, but the risk free rate has dropped dramatically.
Equity Risk Premiums and Bond Default Spreads

Figure 16: Equity Risk Premiums and Bond Default Spreads

Aswath Damodaran
Equity Risk Premiums and Cap Rates (Real Estate)

Figure 17: Equity Risk Premiums, Cap Rates and Bond Spreads
Why implied premiums matter?

- In many investment banks, it is common practice (especially in corporate finance departments) to use historical risk premiums (and arithmetic averages at that) as risk premiums to compute cost of equity. If all analysts in the department used the arithmetic average premium (for stocks over T.Bills) for 1928-2014 of 8% to value stocks in January 2014, given the implied premium of 5.75%, what are they likely to find?

  a. The values they obtain will be too low (most stocks will look overvalued)

  b. The values they obtain will be too high (most stocks will look under valued)

  c. There should be no systematic bias as long as they use the same premium to value all stocks.
Which equity risk premium should you use?

**If you assume this**

Premiums revert back to historical norms and your time period yields these norms

Market is correct in the aggregate or that your valuation should be market neutral

Marker makes mistakes even in the aggregate but is correct over time

**Premium to use**

Historical risk premium

Current implied equity risk premium

Average implied equity risk premium over time.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Correlation with implied premium next year</th>
<th>Correlation with actual risk premium – next 10 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current implied premium</td>
<td>0.712</td>
<td>0.424</td>
</tr>
<tr>
<td>Average implied premium: Last 5 years</td>
<td>0.646</td>
<td>0.360</td>
</tr>
<tr>
<td>Historical Premium</td>
<td>-0.394</td>
<td>-0.486</td>
</tr>
<tr>
<td>Default Spread based premium</td>
<td>0.059</td>
<td>0.174</td>
</tr>
</tbody>
</table>
And the approach can be extended to emerging markets
Implied premium for the Sensex (September 2007)

- **Inputs for the computation**
  - Sensex on 9/5/07 = 15446
  - Dividend yield on index = 3.05%
  - Expected growth rate - next 5 years = 14%
  - Growth rate beyond year 5 = 6.76% (set equal to riskfree rate)

- **Solving for the expected return**:
  \[
  15446 = \frac{537.06}{1 + r} + \frac{612.25}{(1 + r)^2} + \frac{697.86}{(1 + r)^3} + \frac{795.67}{(1 + r)^4} + \frac{907.07}{(1 + r)^5} + \frac{907.07(1.0676)}{(r - 0.0676)(1 + r)^5}
  \]

- **Expected return on stocks = 11.18%**
- **Implied equity risk premium for India = 11.18% - 6.76% = 4.42%**

Aswath Damodaran
Can country risk premiums change? Brazil CRP & Total ERP from 2000 to 2013

Figure 15: Implied Equity Risk Premium - Brazil

Aswath Damodaran
# The evolution of Emerging Market Risk

<table>
<thead>
<tr>
<th>Year</th>
<th>PBV Developed</th>
<th>PBV Emerging</th>
<th>ROE Developed</th>
<th>ROE Emerging</th>
<th>US T.Bond rate</th>
<th>Growth rate Developed</th>
<th>Growth rate Emerging</th>
<th>Cost of equity (Developed)</th>
<th>Cost of equity (Emerging)</th>
<th>Differential ERP</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>2.00</td>
<td>1.19</td>
<td>10.81%</td>
<td>11.65%</td>
<td>4.22%</td>
<td>3.72%</td>
<td>5.22%</td>
<td>7.27%</td>
<td>10.62%</td>
<td>3.36%</td>
</tr>
<tr>
<td>2005</td>
<td>2.09</td>
<td>1.27</td>
<td>11.12%</td>
<td>11.93%</td>
<td>4.39%</td>
<td>3.89%</td>
<td>5.39%</td>
<td>7.35%</td>
<td>10.54%</td>
<td>3.19%</td>
</tr>
<tr>
<td>2006</td>
<td>2.03</td>
<td>1.44</td>
<td>11.32%</td>
<td>12.18%</td>
<td>4.70%</td>
<td>4.20%</td>
<td>5.70%</td>
<td>7.71%</td>
<td>10.20%</td>
<td>2.49%</td>
</tr>
<tr>
<td>2007</td>
<td>1.67</td>
<td>1.67</td>
<td>10.87%</td>
<td>12.88%</td>
<td>4.02%</td>
<td>3.52%</td>
<td>5.02%</td>
<td>7.92%</td>
<td>9.73%</td>
<td>1.81%</td>
</tr>
<tr>
<td>2008</td>
<td>0.87</td>
<td>0.83</td>
<td>9.42%</td>
<td>11.12%</td>
<td>2.21%</td>
<td>1.71%</td>
<td>3.21%</td>
<td>10.57%</td>
<td>12.74%</td>
<td>2.17%</td>
</tr>
<tr>
<td>2009</td>
<td>1.20</td>
<td>1.34</td>
<td>8.48%</td>
<td>11.02%</td>
<td>3.84%</td>
<td>3.34%</td>
<td>4.84%</td>
<td>7.62%</td>
<td>9.45%</td>
<td>1.83%</td>
</tr>
<tr>
<td>2010</td>
<td>1.39</td>
<td>1.43</td>
<td>9.14%</td>
<td>11.22%</td>
<td>3.29%</td>
<td>2.79%</td>
<td>4.29%</td>
<td>7.36%</td>
<td>9.14%</td>
<td>1.78%</td>
</tr>
<tr>
<td>2011</td>
<td>1.12</td>
<td>1.08</td>
<td>9.21%</td>
<td>10.04%</td>
<td>1.88%</td>
<td>1.38%</td>
<td>2.88%</td>
<td>8.37%</td>
<td>9.51%</td>
<td>1.14%</td>
</tr>
<tr>
<td>2012</td>
<td>1.17</td>
<td>1.18</td>
<td>9.10%</td>
<td>9.33%</td>
<td>1.76%</td>
<td>1.26%</td>
<td>2.76%</td>
<td>7.96%</td>
<td>8.33%</td>
<td>0.37%</td>
</tr>
<tr>
<td>Jun-13</td>
<td>1.17</td>
<td>1.17</td>
<td>8.79%</td>
<td>9.37%</td>
<td>2.55%</td>
<td>2.05%</td>
<td>3.55%</td>
<td>7.81%</td>
<td>8.52%</td>
<td>0.71%</td>
</tr>
</tbody>
</table>
Measuring Relative Risk

**Relative Risk Measure**
How risky is this asset, relative to the average risk investment?

- **The CAPM Beta**
  Regression beta of stock returns at firm versus stock returns on market index

- **Accounting Earnings Volatility**
  How volatile is your company’s earnings, relative to the average company’s earnings?

- **Accounting Earnings Beta**
  Regression beta of changes in earnings at firm versus changes in earnings for market index

- **Balance Sheet Ratios**
  Risk based upon balance sheet ratios (debt ratio, working capital, cash, fixed assets) that measure risk

- **Composite Risk Measures**
  Use a mix of quantitative (price, ratios) & qualitative analysis (management quality) to estimate relative risk

- **Proxy measures**
  Use a proxy for risk (market cap, sector).

- **Implied Beta/Cost of equity**
  Estimate a cost of equity for firm or sector based upon price today and expected cash flows in future

- **Debt cost based**
  Estimate cost of equity based upon cost of debt and relative volatility

- **Price Variance Model**
  Standard deviation, relative to the average across all stocks

- **Sector-average Beta**
  Average regression beta across all companies in the business(es) that the firm operates in.

- **APM/Multi-factor Models**
  Estimate 'betas' against multiple macro risk factors, using past price data

**MPT Quadrant**
Price based, Model Agnostic Quadrant

**Accounting Risk Quadrant**

**Intrinsic Risk Quadrant**

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The CAPM Beta

- The standard procedure for estimating betas is to regress stock returns \((R_j)\) against market returns \((R_m)\) -
  \(R_j = a + b R_m\)
  where \(a\) is the intercept and \(b\) is the slope of the regression.
- The slope of the regression corresponds to the beta of the stock, and measures the riskiness of the stock.
- This beta has three problems:
  - It has high standard error
  - It reflects the firm’s business mix over the period of the regression, not the current mix
  - It reflects the firm’s average financial leverage over the period rather than the current leverage.
Beta Estimation: The Noise Problem
Beta Estimation: The Index Effect

\[ \text{Adjusted Beta} = (0.67) \times \text{Raw Beta} + (0.33) \times 1.0 \]

Beta:

1.27

Alpha (Intercept):

0.42

R2 (Correlation):

0.94

Std Dev of Error:

1.87

Std Error of Beta:

0.03

Number of Points:

103
Stock-priced based solutions to the Regression Beta Problem

- Modify the regression beta by
  - changing the index used to estimate the beta
  - adjusting the regression beta estimate, by bringing in information about the fundamentals of the company

- Estimate the beta for the firm using
  - the standard deviation in stock prices instead of a regression against an index
  - Relative risk = Standard deviation in stock prices for investment/Average standard deviation across all stocks

- Estimate the beta for the firm from the bottom up without employing the regression technique. This will require
  - understanding the business mix of the firm
  - estimating the financial leverage of the firm

- Imputed or implied beta (cost of equity) for the sector.

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Alternative measures of relative risk for equity

- **Accounting risk measures**: To the extent that you don’t trust market-priced based measures of risk, you could compute relative risk measures based on
  - Accounting earnings volatility: Compute an accounting beta or relative volatility
  - Balance sheet ratios: You could compute a risk score based upon accounting ratios like debt ratios or cash holdings (akin to default risk scores like the Z score)

- **Proxies**: In a simpler version of proxy models, you can categorize firms into risk classes based upon size, sectors or other characteristics.

- **Qualitative Risk Models**: In these models, risk assessments are based at least partially on qualitative factors (quality of management).

- **Debt based measures**: You can estimate a cost of equity, based upon an observable costs of debt for the company.
  - Cost of equity = Cost of debt * Scaling factor
Determinants of Betas & Relative Risk

Beta of Equity (Levered Beta)

Beta of Firm (Unlevered Beta)

Nature of product or service offered by company:
Other things remaining equal, the more discretionary the product or service, the higher the beta.

Implications
1. Cyclical companies should have higher betas than non-cyclical companies.
2. Luxury goods firms should have higher betas than basic goods.
3. High priced goods/service firms should have higher betas than low priced goods/services firms.
4. Growth firms should have higher betas.

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

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

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

Implications
Highly levered firms should have higher betas than firms with less debt.
Equity Beta (Levered beta) = Unlev Beta (1 + (1-t) (Debt/Equity Ratio))