LIVING WITH NOISE
INVESTING IN THE FACE OF UNCERTAINTY

Aswath Damodaran, http://www.damodaran.com
Uncertainty is a feature, not a bug.
And we deal with uncertainty as humans always have...

- **Divine Intervention**: Praying for intervention from a higher power is the oldest and most practiced risk management system of all.

- **Paralysis & Denial**: When faced with uncertainty, some of us get paralyzed. Accompanying the paralysis is the hope that if you close your eyes to it, the uncertainty will go away.

- **Mental short cuts (rules of thumb)**: Behavioral economists note that investors faced with uncertainty adopt mental short cuts that have no basis in reality. And here is the clincher. More intelligent people are more likely to be prone to this.

- **Herding**: When in doubt, it is safest to go with the crowd. The herding instinct is deeply engrained and very difficult to fight.

- **Outsourcing**: Assuming that there are experts out there who have the answers does take a weight off your shoulders, even if those experts have no idea of what they are talking about.
SETTING THE TABLE: THE BASICS OF INTRINSIC VALUE

The value drivers
### DCF Choices: Equity Valuation versus Firm Valuation

**Firm Valuation:** Value the entire business

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Existing Investments</strong></td>
<td><strong>Debt</strong></td>
</tr>
<tr>
<td>Generate cashflows today</td>
<td>Fixed Claim on cash flows</td>
</tr>
<tr>
<td>Includes long lived (fixed) and</td>
<td>Little or No role in management</td>
</tr>
<tr>
<td>short-lived (working capital)</td>
<td><em>Fixed Maturity</em></td>
</tr>
<tr>
<td>assets</td>
<td><em>Tax Deductible</em></td>
</tr>
<tr>
<td><strong>Assets in Place</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Growth Assets</strong></td>
<td><strong>Equity</strong></td>
</tr>
<tr>
<td>Expected Value that will be</td>
<td>Residual Claim on cash flows</td>
</tr>
<tr>
<td>created by future investments</td>
<td>Significant Role in management</td>
</tr>
<tr>
<td></td>
<td><em>Perpetual Lives</em></td>
</tr>
</tbody>
</table>

**Equity valuation:** Value just the equity claim in the business
In **intrinsic valuation**, you value an asset based upon its intrinsic characteristics.

For cash flow generating assets, the intrinsic value will be a function of the magnitude of the expected cash flows on the asset over its lifetime and the uncertainty about receiving those cash flows.

Discounted cash flow valuation is a tool for estimating intrinsic value, where the expected value of an asset is written as the present value of the expected cash flows on the asset, with either the cash flows or the discount rate adjusted to reflect the risk.
Risk Adjusted Value: Three Basic Propositions

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

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

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

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

- **Proposition 3**: Assets that generate cash flows early in their life will be worth more than assets that generate cash flows later; the latter may however have greater growth and higher cash flows to compensate.
The fundamental determinants of value...

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

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

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

When will the firm become a mature firm, and what are the potential roadblocks?
3M: A Pre-crisis valuation

Current Cashflow to Firm
EBIT(1-t) = 5344 (1-.35) = 3474
- Nt CpX= 350
- Chg WC 691
= FCFF 2433
Reinvestment Rate = 1041/3474 =29.97%
Return on capital = 25.19%

Reinvestment Rate
Expected Growth in EBIT (1-t)
.30*.25=.075
7.5%

Return on Capital
25%

Stable Growth
g = 3%; Beta = 1.10;
Debt Ratio= 20%; Tax rate=35%
Cost of capital = 6.76%
ROC= 6.76%;
Reinvestment Rate=3/6.76=44%

Terminal Value
5
2645/(.0676-.03) = 70,409

Op. Assets 60607
+ Cash: 3253
- Debt 4920
=Equity 58400

Value/Share $ 83.55

Cost of Equity
8.32%

Cost of Debt
(3.72%+.75%)(1-.35)
= 2.91%

Weights
E = 92% D = 8%

Riskfree Rate:
Riskfree rate = 3.72%

Beta
1.15

Risk Premium
4%

Unlevered Beta for Sectors: 1.09
D/E=8.8%

On September 12, 2008, 3M was trading at $70/share

First 5 years
Year EBIT (1-t) $3,734 $4,014 $4,279 $4,485 $4,619
- Reinvestment $1,120 $1,204 $1,312 $1,435 $1,540
= FCFF $2,614 $2,810 $2,967 $3,049 $3,079

Cost of capital = 8.32% (0.92) + 2.91% (0.08) = 7.88%

Term Yr $4,758 $2,113 $2,645
Tata Motors: April 2010

Current Cashflow to Firm

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

Reinv Rate = (31590 + 2732) / 20116 = 170.61%; Tax rate = 21.00%
Return on capital = 17.16%

Expected Growth from new inv.
0.70 * 1.1716 = 0.1201

Return on Capital = 17.16%

Expected Growth

from new inv.
0.70 * 0.1716 = 0.1201

Stable Growth

g = 5%; Beta = 1.00
Country Premium = 3%
Cost of capital = 10.39%
Tax rate = 33.99%
ROC = 10.39%;
Reinvestment Rate = g / ROC
= 5 / 10.39 = 48.11%

Terminal Value

5

= 23493 / (0.1039 - 0.05) = Rs 435,686

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

Value/Share Rs 614

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

On April 1, 2010
Tata Motors price = Rs 781
### 9a. Amazon in January 2000

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenue Growth</th>
<th>Competitive Advantages</th>
<th>Sales Turnover Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>150.00%</td>
<td></td>
<td>3.00</td>
</tr>
<tr>
<td>2</td>
<td>100.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>75.00%</td>
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<tr>
<td>4</td>
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<td>15.60%</td>
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<td>9</td>
<td>10.80%</td>
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<td></td>
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<tr>
<td>10</td>
<td>6.00%</td>
<td></td>
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</tr>
</tbody>
</table>

- **Revenue Growth:**
  - 150.00%
  - 100.00%
  - 75.00%
  - 50.00%
  - 30.00%
  - 25.20%
  - 20.40%
  - 15.60%
  - 10.80%
  - 6.00%

- **Cost of Equity:**
  - 12.90%

- **Cost of Debt:**
  - 8.00%

- **After-tax cost of debt:**
  - 8.00%

- **Cost of Capital:**
  - 12.84%

- **Expected Margin:**
  - -> 10.00%

### From previous years

- **NOL:** 500 m
- **EBIT:** -410m

### Value of Op Assets $15,170

- **Value of Firm:** $14,936
- **Value of Debt:** $349
- **Value of Equity:** $14,847
- **Value Options:** $2,892
- **Value per share:** $35.08

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

### Forever

Amazon was trading at $84 in January 2000.

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

### Riskfree Rate:

- **T. Bond rate = 6.5%**

### Beta

- 1.60 -> 1.00

### Risk Premium

- 4%

### Internet/Retail

### Operating Leverage

### Current D/E: 1.21%

### Base Equity Premium

### Country Risk Premium

### Dot.com retailers for first 5 years

Convetoinal retailers after year 5

### Stable Growth

- **Stable Revenue Growth:** 6%
- **Stable Operating Margin:** 10.00%
- **Stable ROC=20% Reinvest 30% of EBIT(1-t)**

### Terminal Value = $1881/(0.0961-.06) = 52,148

### Risk of Equity

- 12.90%

### Cost of Debt

- 8.00%

### After-tax cost of debt

- 8.00%

### Cost of Capital

- 12.84%

### Reinvestment

- $600

### FCFF

- $931

### EBIT

- $373

### EBIT(1-t)

- $373

### Reinvestment

- $600

### Value per share

- $35.08

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

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## Twitter Pre-IPO Valuation: October 5, 2013

### Terminal Value

\[
10 = \frac{FCFF}{Cost\ of\ capital - Stable\ growth}\nonumber
\]

10 = \frac{$1,433}{(0.08 - 0.027)} = $27.036

### Cost of Capital

\[
Cost\ of\ capital = 8\% + \beta \times \text{Risk\ Premium}\nonumber
\]

Cost of Capital = 11.32% (.983) + 5.16% (.017) = 11.22%

### Stable Growth

\[
g = 2.7\%; \ \Beta = 1.00;\ \text{Cost\ of\ capital} = 8\%\nonumber
\]

ROC = 12%

Reinvestment Rate = 2.7%/12% = 22.5%

### Value of Equity

\[
\text{Value of equity} = \text{Operating\ assets} + \text{IPO Proceeds} - \text{Debt} - \text{Options}\nonumber
\]

Value of Equity = 10,779

### Value in stock

\[
\text{Value in stock} = \text{Value of equity} / \#\ of\ shares\nonumber
\]

Value in stock = 9,974

### Value/share

\[
\text{Value/share} = \text{Value in stock} / \#\ of\ shares\nonumber
\]

Value/share = $17.36

### Revenue

\[
\text{Revenues}\ \text{growth of 55% a year for 5 years, tapering down to 2.7% in year 10}\nonumber
\]

### Pre-tax operating margin

\[
\text{Pre-tax operating margin increases to 25% over the next 10 years}\nonumber
\]

### Sales to capital ratio of 1.50 for incremental sales

### Terminal year (11)

\[
\text{EBIT\ (1-t)} = \$1,849\nonumber
\]

- Reinvestment = $416

FCFF = $1,433

### On October 5, 2013, Twitter had not been priced yet, but the company’s most recent acquisition suggested a price of about $20/share.
CATEGORIZING AND RESPONDING TO UNCERTAINTY
I. Estimation versus Economic Uncertainty

- Estimation versus Economic uncertainty
  - Estimation uncertainty reflects the possibility that you could have the “wrong model” or estimated inputs incorrectly within this model.
  - Economic uncertainty comes from real sources: that markets and economies can change over time and that even the best medals will fail to capture these unexpected changes.

- Estimation uncertainty can be mitigated by doing your homework, collecting more data or building better models, but economic uncertainty is here to stay.
II. Micro versus Macro Uncertainty

- Micro uncertainty versus Macro uncertainty
  - Micro uncertainty refers to uncertainty about the firm you are valuing and its business model - the potential market or markets for its products, the competition it will face and the quality of its management team.
  - Macro uncertainty reflects the reality that your firm’s fortunes can be affected by changes in the macro economic environment – the strength of the economy, the level of interest rates and the price of risk (equity and debt).
- Micro uncertainty can be mitigated or even eliminated by diversifying across companies but macro uncertainty will remain even in the most diversified portfolios.
III. Discrete versus Continuous Uncertainty

- Discrete versus continuous uncertainty
  - Some events that you are uncertain about are discrete. Thus, a biotechnology firm with a new drug working its way through the FDA pipeline may see the drug fail at some stage of the approval process. In the same vein, a company in Venezuela or Argentina may worry about nationalization risk.
  
  - Most uncertainties, though, are continuous. Thus, changes in interest rates or economic growth occur continuously and affect value as they happen.

- In valuation, we are better at dealing with continuous risks than with discrete risks. In fact, discount rate risk adjustment models are designed for continuous risk.
Assessing uncertainty…

- Rank the four firms in terms of uncertainty (least to most) in your estimate:
  - 3M in 2007
  - Tata Motors in 2010
  - Amazon in 2000
  - Twitter in 2013

- With each company, specify the type of uncertainty that you face:

<table>
<thead>
<tr>
<th>Company</th>
<th>Estimation or Economic</th>
<th>Micro or Macro</th>
<th>Discrete or Continuous</th>
</tr>
</thead>
<tbody>
<tr>
<td>3M (2007)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tata Motors (2010)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amazon (2000)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Twitter (2013)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DEALING WITH UNCERTAINTY: BAD WAYS AND GOOD WAYS...
Ten suggestions for dealing with uncertainty...

1. Less is more (the rule on detail....) (Revenue & margin forecasts)
2. Build in internal checks on reasonableness... (reinvestment and ROC)
3. Use the offsetting principle (risk free rates & inflation at Tata Motors)
4. Draw on economic first principles (Terminal value at all the companies)
5. Use the “market” as a crutch (equity risk premiums, country risk premiums)
6. Use the law of large numbers (Beta for all companies)
7. Don’t let the discount rate become the receptacle for all uncertainties.
8. Confront uncertainty, if you can
9. Don’t look for precision
10. You can live with mistakes, but bias will defeat you.
1. Less is more

- **The principle of parsimony:** When faced with uncertainty, go for less detail, rather than more. That may sound counterintuitive, but here is why it makes sense:
  - You have a better shot at estimating an aggregate number, rather than individual numbers (Examples: Forecast the operating margin rather than individual operating expenses, total working capital instead of individual working capital items)
  - Estimation requires information and trying to estimate individual items, in the absence of information, is not only frustrating but an exercise in futility.

- **Auto pilot rules:** The uncertainty you face will increase as you go forward in time (it is much more difficult to estimate year 5 than year 1). Thus, it is best to create simple algorithms that estimate year-specific numbers as you go further out in time.
To illustrate: Revenues & Margins for Amazon

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

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

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th></th>
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<th>2013</th>
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<tbody>
<tr>
<td></td>
<td>%</td>
<td>$</td>
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<td>$</td>
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<tr>
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<td>5.04</td>
<td>$5.89</td>
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<td>$1.06</td>
<td>0.95</td>
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<tr>
<td>Amazon</td>
<td>0.48</td>
<td>$0.41</td>
<td>0.59</td>
<td>$0.61</td>
<td>0.71</td>
<td>$0.83</td>
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<tr>
<td>Pandora</td>
<td>0.28</td>
<td>$0.24</td>
<td>0.36</td>
<td>$0.37</td>
<td>0.50</td>
<td>$0.58</td>
</tr>
<tr>
<td>Twitter</td>
<td>0.16</td>
<td>$0.14</td>
<td>0.28</td>
<td>$0.29</td>
<td>0.50</td>
<td>$0.58</td>
</tr>
<tr>
<td>LinkedIn</td>
<td>0.18</td>
<td>$0.16</td>
<td>0.25</td>
<td>$0.26</td>
<td>0.32</td>
<td>$0.37</td>
</tr>
<tr>
<td>Millennial Media</td>
<td>0.05</td>
<td>$0.04</td>
<td>0.07</td>
<td>$0.07</td>
<td>0.10</td>
<td>$0.12</td>
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<tr>
<td>Other</td>
<td>55.59</td>
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<td>55.47</td>
<td>$57.71</td>
<td>52.29</td>
<td>$61.09</td>
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<tr>
<td>Total Market</td>
<td>100.00</td>
<td>$86.43</td>
<td>100.00</td>
<td>$104.04</td>
<td>100.00</td>
<td>$116.82</td>
</tr>
</tbody>
</table>
2. Build in “internal” checks for reasonableness...

- While you may be forecasting individual items in valuation, and you are uncertain about each item, you can create internal checks to make sure that your assumptions are not at war with each other.

- In particular, you should make sure that as you approach your terminal year, the company that you are creating on your spreadsheet is one that is feasible and viable in terms of:
  - Size, relative to the market that it serves... Your market share obviously cannot exceed 100% but there may be tighter constraints (your market share cannot exceed that of the largest company in the sector)
  - Profitability, as measured in terms of operating margins and returns on capital. In particular, the return on capital should be supportable, given the industry average return on capital and the cost of capital.
To illustrate: The reinvestment in Amazon

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

- To maintain high sustainable growth, a company has to reinvest a high percentage of its earnings, while maintaining a high return on that reinvestment.

  Expected Growth
  
  - Net Income
    - Retention Ratio = 1 - Dividends/Net Income
    - Return on Equity = Net Income/Book Value of Equity
    - Return on Equity = (Net Income/Book Value of Equity) x (1 - Dividends/Net Income)

  - Operating Income
    - Reinvestment Rate = (Net Cap Ex + Chg in WC/EBIT(1-t))
    - Return on Capital = EBIT/(1-t)/Book Value of Capital

- To estimate the growth rate in 3M in the pre-crisis valuation in 2008:
  - Reinvestment rate = 30% (close to most recent year’s 29.97%)
  - Return on capital = 25% (close to most recent year’s 25.19%)
  - Expected growth rate = 30% * 25% = 7.5%
Follow up propositions on growth...

- If growth has to come from either increased efficiency (improving return on capital on existing assets) and new investments (reinvestment rate & return on capital):
  - High growth is easy, high quality growth is more difficult.
  - Scaling up is hard to do, i.e., growth is more difficult to sustain as companies get larger.
3. Use consistency tests...

- While you can not grade a valuation on “correctness” (since different analysts can make different assumptions about growth and risk), you can grade it on consistency.

- For a valuation to be consistent, your estimates of cash flows have to be consistent with your discount rate definition.

  1. **Equity versus Firm**: If the cash flows being discounted are cash flows to equity, the appropriate discount rate is a cost of equity. If the cash flows are cash flows to the firm, the appropriate discount rate is the cost of capital.

  2. **Currency**: The currency in which the cash flows are estimated should also be the currency in which the discount rate is estimated.

  3. **Nominal versus Real**: If the cash flows being discounted are nominal cash flows (i.e., reflect expected inflation), the discount rate should be nominal
To illustrate: The “currency effect”

- **Currency Invariance**: You can value any company in any currency and if you do it correctly, your value should be invariant to the currency used.

- **Puzzle**: How can currency invariance apply, if the risk free rates are higher in some currencies and lower in others?
<table>
<thead>
<tr>
<th></th>
<th>In Indian Rupees</th>
<th>In US $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk free Rate</td>
<td>5.00%</td>
<td>2.00%</td>
</tr>
<tr>
<td>Expected inflation rate</td>
<td>4.00%</td>
<td>1.00%</td>
</tr>
<tr>
<td>Cost of capital</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- High Growth</td>
<td>12.50%</td>
<td>9.25%</td>
</tr>
<tr>
<td>- Stable Growth</td>
<td>10.39%</td>
<td>7.21%</td>
</tr>
<tr>
<td>Expected growth rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- High Growth</td>
<td>12.01%</td>
<td>8.78%</td>
</tr>
<tr>
<td>- Stable Growth</td>
<td>5.00%</td>
<td>2.00%</td>
</tr>
<tr>
<td>Return on Capital</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- High Growth</td>
<td>17.16%</td>
<td>13.78%</td>
</tr>
<tr>
<td>- Stable Growth</td>
<td>10.39%</td>
<td>7.21%</td>
</tr>
<tr>
<td>Value per share</td>
<td>Rs 614</td>
<td>$12.79/share (roughly Rs 614 at current exchange rate)</td>
</tr>
</tbody>
</table>
4. Draw on economic first principles and mathematical limits...

- When doing valuation, you are free to make assumptions about how your company will evolve over time in the market that it operates, but you are not free to violate first principles in economics and mathematics.

- Put differently, there are assumptions in valuation that are either mathematically impossible or violate first laws of economics and cannot be ever justified.
To illustrate: The growth rate in terminal value

- When a firm’s cash flows grow at a “constant” rate forever, the present value of those cash flows can be written as:
  - Value = Expected Cash Flow Next Period / (r - g)

- The stable growth rate cannot exceed the growth rate of the economy but it can be set lower.
  - If you assume that the economy is composed of high growth and stable growth firms, the growth rate of the latter will probably be lower than the growth rate of the economy.
  - The stable growth rate can be negative. The terminal value will be lower and you are assuming that your firm will disappear over time.
  - If you use nominal cashflows and discount rates, the growth rate should be nominal in the currency in which the valuation is denominated.

- One simple proxy for the nominal growth rate of the economy is the riskfree rate:
  - Riskfree rate = Expected inflation + Expected real interest rate
  - Nominal growth rate in GDP = Expected inflation + Expected real growth rate
And the “excess return” effect...

<table>
<thead>
<tr>
<th>Stable growth rate</th>
<th>3M</th>
<th>Tata Motors</th>
<th>Amazon</th>
<th>Twitter</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>$70,409</td>
<td>435,686₹</td>
<td>$26,390</td>
<td>$23,111</td>
</tr>
<tr>
<td>1%</td>
<td>$70,409</td>
<td>435,686₹</td>
<td>$28,263</td>
<td>$24,212</td>
</tr>
<tr>
<td>2%</td>
<td>$70,409</td>
<td>435,686₹</td>
<td>$30,595</td>
<td>$25,679</td>
</tr>
<tr>
<td>3%</td>
<td>$70,409</td>
<td>435,686₹</td>
<td>$33,594</td>
<td></td>
</tr>
<tr>
<td>4%</td>
<td></td>
<td>435,686₹</td>
<td>$37,618</td>
<td></td>
</tr>
<tr>
<td>5%</td>
<td></td>
<td>435,686₹</td>
<td>$43,334</td>
<td>$52,148</td>
</tr>
<tr>
<td>Riskfree rate</td>
<td>3.72%</td>
<td>5%</td>
<td>6.60%</td>
<td>2.70%</td>
</tr>
<tr>
<td>ROIC</td>
<td>6.76%</td>
<td>10.39%</td>
<td>20%</td>
<td>12.00%</td>
</tr>
<tr>
<td>Cost of capital</td>
<td>6.76%</td>
<td>10.39%</td>
<td>9.61%</td>
<td>8.00%</td>
</tr>
</tbody>
</table>
5. Use the market as a crutch...

- In intrinsic valuation, you start with the presumption that the market is not always right and that your value may yield a better estimate of the “true” value of a business than the market’s estimate of that value.

- While that is a reasonable (albeit debatable) belief, you can still use market values either as inputs for some variables or as checks on your inputs. That will allow you to value your company in a more bounded environment, where you are not making assumptions about variables that you either should not be bringing in your point of view on and/or are unequipped to do so.
Here is an example: Equity Risk Premiums

### Arithmetic Average
<table>
<thead>
<tr>
<th></th>
<th>Stocks - T. Bills</th>
<th>Stocks - T. Bonds</th>
</tr>
</thead>
<tbody>
<tr>
<td>1928-2015</td>
<td>7.92%</td>
<td>6.18%</td>
</tr>
<tr>
<td>Std Error</td>
<td>2.15%</td>
<td>2.29%</td>
</tr>
<tr>
<td>1966-2015</td>
<td>6.05%</td>
<td>3.89%</td>
</tr>
<tr>
<td>Std Error</td>
<td>2.42%</td>
<td>2.74%</td>
</tr>
<tr>
<td>2006-2015</td>
<td>7.87%</td>
<td>3.88%</td>
</tr>
<tr>
<td>Std Error</td>
<td>6.06%</td>
<td>8.66%</td>
</tr>
</tbody>
</table>

### Geometric Average
<table>
<thead>
<tr>
<th></th>
<th>Stocks - T. Bills</th>
<th>Stocks - T. Bonds</th>
</tr>
</thead>
<tbody>
<tr>
<td>1928-2015</td>
<td>6.05%</td>
<td>4.54%</td>
</tr>
<tr>
<td>1966-2015</td>
<td>4.69%</td>
<td>2.90%</td>
</tr>
<tr>
<td>2006-2015</td>
<td>6.11%</td>
<td>2.53%</td>
</tr>
</tbody>
</table>

**Base year cash flow (last 12 mths)**
- Dividends (TTM): 42.66
- Buybacks (TTM): 63.43
- Cash to investors (TTM): 106.09

**Payout ratio assumed to stay stable.** 106.09 growing @ 5.55% a year

**Expected growth in next 5 years**
Top down analyst estimate of earnings growth for S&P 500: 5.55%

**S&P 500 on 1/1/16 = 2043.94**

\[
2043.94 = \frac{111.99}{(1 + r)} + \frac{118.21}{(1 + r)^2} + \frac{124.77}{(1 + r)^3} + \frac{131.70}{(1 + r)^4} + \frac{139.02}{(1 + r)^5} + \frac{142.17}{r - 0.0227} \frac{1}{(1 + r)^5}
\]

You have to solve for the discount rate \(r\). I used the solver or Goal seek function in Excel

**Risk free rate = T.Bond rate on 1/1/16 = 2.27%**

**Implied Equity Risk Premium (1/1/16) = 8.39% - 2.27% = 6.12%**
Assume that the equity risk premium for the US and other mature equity markets is 5.8%.

To estimate the additional risk premium for an emerging market, you can start with a country default spread, using one of two approaches:

- Default spread, given the country’s bond rating (estimated either by looking at a US $ or Euro government bond issued by that country)
- CDS spread for the country, from the market

Adjusted for equity risk: The country equity risk premium is based upon the volatility of the market in question relative to U.S market.

- Total equity risk premium = Default SpreadCountry* (σ_{Country Equity} / σ_{Country Bond})
- Standard Deviation in Bovespa = 30%
- Standard Deviation in Brazilian government bond= 20%
- Default spread for Brazil= 1.75%
- Additional risk premium for Brazil = 1.75% (30/20) = 2.63%
<table>
<thead>
<tr>
<th>Country</th>
<th>ERP</th>
<th>CRP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angola</td>
<td>10.48%</td>
<td>4.48%</td>
</tr>
<tr>
<td>Botswana</td>
<td>7.26%</td>
<td>1.26%</td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>15.70%</td>
<td>9.70%</td>
</tr>
<tr>
<td>Cameroon</td>
<td>14.20%</td>
<td>8.20%</td>
</tr>
<tr>
<td>Cape Verde</td>
<td>14.20%</td>
<td>8.20%</td>
</tr>
<tr>
<td>Congo (DR)</td>
<td>15.70%</td>
<td>9.70%</td>
</tr>
<tr>
<td>Congo (Republic)</td>
<td>11.37%</td>
<td>5.37%</td>
</tr>
<tr>
<td>Côte d’Ivoire</td>
<td>11.37%</td>
<td>5.37%</td>
</tr>
<tr>
<td>Egypt</td>
<td>15.70%</td>
<td>9.70%</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>12.71%</td>
<td>6.71%</td>
</tr>
<tr>
<td>Gabon</td>
<td>11.37%</td>
<td>5.37%</td>
</tr>
<tr>
<td>Ghana</td>
<td>15.70%</td>
<td>9.70%</td>
</tr>
<tr>
<td>Kenya</td>
<td>12.71%</td>
<td>6.71%</td>
</tr>
<tr>
<td>Morocco</td>
<td>9.72%</td>
<td>3.72%</td>
</tr>
<tr>
<td>Mozambique</td>
<td>14.20%</td>
<td>8.20%</td>
</tr>
<tr>
<td>Namibia</td>
<td>9.28%</td>
<td>3.28%</td>
</tr>
<tr>
<td>Nigeria</td>
<td>11.37%</td>
<td>5.37%</td>
</tr>
<tr>
<td>Rwanda</td>
<td>12.71%</td>
<td>6.71%</td>
</tr>
<tr>
<td>Senegal</td>
<td>12.71%</td>
<td>6.71%</td>
</tr>
<tr>
<td>South Africa</td>
<td>8.84%</td>
<td>2.84%</td>
</tr>
<tr>
<td>Tunisia</td>
<td>11.37%</td>
<td>5.37%</td>
</tr>
<tr>
<td>Uganda</td>
<td>12.71%</td>
<td>6.71%</td>
</tr>
<tr>
<td>Zambia</td>
<td>14.20%</td>
<td>8.20%</td>
</tr>
<tr>
<td>Africa</td>
<td>11.76%</td>
<td>5.76%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Country</th>
<th>ERP</th>
<th>CRP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abu Dhabi</td>
<td>6.74%</td>
<td>0.74%</td>
</tr>
<tr>
<td>Bahrain</td>
<td>9.28%</td>
<td>3.28%</td>
</tr>
<tr>
<td>Israel</td>
<td>7.05%</td>
<td>1.05%</td>
</tr>
<tr>
<td>Jordan</td>
<td>12.71%</td>
<td>6.71%</td>
</tr>
<tr>
<td>Kuwait</td>
<td>6.74%</td>
<td>0.74%</td>
</tr>
<tr>
<td>Lebanon</td>
<td>14.20%</td>
<td>8.20%</td>
</tr>
<tr>
<td>Oman</td>
<td>7.05%</td>
<td>1.05%</td>
</tr>
<tr>
<td>Qatar</td>
<td>6.74%</td>
<td>0.74%</td>
</tr>
<tr>
<td>Ras Al Khaimah</td>
<td>7.26%</td>
<td>1.26%</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>6.90%</td>
<td>0.90%</td>
</tr>
<tr>
<td>Sharjah</td>
<td>7.79%</td>
<td>1.79%</td>
</tr>
<tr>
<td>United Arab Emirates</td>
<td>6.74%</td>
<td>0.74%</td>
</tr>
<tr>
<td>Middle East</td>
<td>7.11%</td>
<td>1.11%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Country</th>
<th>ERP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>63.0</td>
</tr>
<tr>
<td>Brunei</td>
<td>72.8</td>
</tr>
<tr>
<td>Cambodia</td>
<td>62.0</td>
</tr>
<tr>
<td>Cameroon</td>
<td>53.8</td>
</tr>
<tr>
<td>Congo-Brazzaville</td>
<td>62.3</td>
</tr>
<tr>
<td>Croatia</td>
<td>63.5</td>
</tr>
<tr>
<td>Haiti</td>
<td>57.0</td>
</tr>
<tr>
<td>Iran</td>
<td>67.8</td>
</tr>
<tr>
<td>Iraq</td>
<td>56.0</td>
</tr>
<tr>
<td>Korea, D.P.R.</td>
<td>50.0</td>
</tr>
<tr>
<td>Liberia</td>
<td>50.5</td>
</tr>
<tr>
<td>Libya</td>
<td>52.8</td>
</tr>
<tr>
<td>Madagascar</td>
<td>61.3</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>11.37%</td>
</tr>
<tr>
<td>Cambodia</td>
<td>14.20%</td>
</tr>
<tr>
<td>China</td>
<td>6.90%</td>
</tr>
<tr>
<td>Fiji</td>
<td>12.71%</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>6.59%</td>
</tr>
<tr>
<td>India</td>
<td>9.28%</td>
</tr>
<tr>
<td>Indonesia</td>
<td>9.28%</td>
</tr>
<tr>
<td>Japan</td>
<td>7.05%</td>
</tr>
<tr>
<td>Korea</td>
<td>6.74%</td>
</tr>
<tr>
<td>Macao</td>
<td>6.74%</td>
</tr>
<tr>
<td>Malaysia</td>
<td>7.79%</td>
</tr>
<tr>
<td>Mauritius</td>
<td>8.38%</td>
</tr>
<tr>
<td>Mongolia</td>
<td>14.20%</td>
</tr>
<tr>
<td>Pakistan</td>
<td>15.70%</td>
</tr>
<tr>
<td>Papua New Guinea</td>
<td>12.71%</td>
</tr>
<tr>
<td>Philippines</td>
<td>8.84%</td>
</tr>
<tr>
<td>Singapore</td>
<td>6.00%</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>12.71%</td>
</tr>
<tr>
<td>Taiwan</td>
<td>6.90%</td>
</tr>
<tr>
<td>Thailand</td>
<td>8.38%</td>
</tr>
<tr>
<td>Vietnam</td>
<td>12.71%</td>
</tr>
<tr>
<td>Asia</td>
<td>7.49%</td>
</tr>
<tr>
<td>Australia</td>
<td>6.00%</td>
</tr>
<tr>
<td>Cook Islands</td>
<td>12.71%</td>
</tr>
<tr>
<td>New Zealand</td>
<td>6.00%</td>
</tr>
<tr>
<td>Australia &amp; NZ</td>
<td>6.00%</td>
</tr>
</tbody>
</table>

Black #: Total ERP
Red #: Country risk premium
AVG: GDP weighted average
6. Draw on the law of large numbers...

- **The law of large numbers**: The "law of large numbers" is one of several theorems expressing the idea that as the number of trials of a random process increases, the percentage difference between the expected and actual values goes to zero.

- **The average is your friend**: In pragmatic terms, when faced with uncertainty on an input, you are better off using an average (over time or across companies) than using the actual number.
To illustrate: A single regression beta is noisy...

<HELP> for explanation, <MENU> for similar functions.

Equity BETA

Y = TATA MOTORS LTD
X = BSE SENSEX 30 INDEX

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw BETA</td>
<td>1.405</td>
</tr>
<tr>
<td>Adj BETA</td>
<td>1.270</td>
</tr>
<tr>
<td>ALPHA(Intercept)</td>
<td>0.357</td>
</tr>
<tr>
<td>R^2(Correlation^2)</td>
<td>0.541</td>
</tr>
<tr>
<td>Std Dev Of Error</td>
<td>6.291</td>
</tr>
<tr>
<td>Std Error Of ALPHA</td>
<td>0.621</td>
</tr>
<tr>
<td>Std Error Of BETA</td>
<td>0.129</td>
</tr>
<tr>
<td>Number Of Points</td>
<td>103</td>
</tr>
</tbody>
</table>
But an average beta across companies is not...

- There are 111 publicly traded companies, globally in the automobile business.
  - Average beta across companies = 1.22
  - Average D/E ratio across companies = 35%
  - Average tax rate across companies = 30%
  - Unlevered beta for automobile company = \( \frac{1.22}{1 + (1-.30)(.35)} \) = 0.98
  - Standard error on “average” beta = 0.26/Sq root of 111 = 0.025

- To estimate the beta for Tata Motors
  - Unlevered beta for automobile company = 0.98
  - D/E ratio for Tata Motors = 33.87%
  - Marginal tax rate in India = 33.99%
  - Levered beta = 0.98 \( (1 + (1-.3399)(.3387)) \) = 1.20
Another illustration: Normalizing earnings for Tata Motors

- Tata Motors, like most cyclical companies, has had volatile earnings over time. It reported after-tax operating income of Rs 13,846 million in the most recent fiscal year on revenues of Rs 265,868 million.

- To normalize the earnings, you can start with the history of prior year’s earnings. Between 2004 and 2008, Tata Motors earned an average after tax operating margin of 9.58% on revenues and paid 21% of its income in taxes.

- Applying the average pre-tax margin to the revenues in the most recent fiscal year yields a “normalized” operating income, which can then be used to estimate an after

  
  Normalized operating income = 265,868*.0958 = Rs 25,465 m

  Normalized after-tax EBIT = 25465 (1-.21) = Rs 20,116 m

- Note that neither working capital nor net cap ex were normalized, since they did not have the same degree of volatility.
7. Don’t let the discount rate become the receptacle for all your uncertainty...

- In discounted cash flow valuation, it is true that risk is incorporated into the discount rate. Taking that principle to its logical limits, analysts often “hike” the discount rate to reflect any uncertainty they feel about value.

- There are several dangers with doing so:
  - You may be building in risks that will disappear in a portfolio and thus unnecessarily lowering the value of some risky investments. If you are valuing a company for a diversified investor, it is macro risks that you should be capturing in the discount rate, not micro risks.
  - Adding to the proposition, adjusting discount rates is easier to do with continuous risk (that earnings will be volatile or exchange rates will change) than for discontinuous risk.
To illustrate: Survival risk at young firms...
Contrasting ways of dealing with survival risk...

- **The Venture Capital approach:** In the venture capital approach, you hike the “discount rate” well above what would be appropriate for a going concern and then use this “target” rate to discount your “exit value” (which is estimated using a multiple and forward earnings).
  
  \[
  \text{Value} = \frac{(\text{Forward Earnings in year } n \times \text{Exit multiple})}{(1 + \text{target rate})^n}
  \]

- **The decision tree approach:**
  
  Value the business as a “going concern”, with a rate of return appropriate for a “going concern”.
  
  Estimate the probability of survival (and failure) and the value of the business in the event of failure.
  
  \[
  \text{Value} = \text{Going concern value (Probability of survival)} + \text{Liquidation value (Probability of failure)}
  \]
Generalizing to other “truncation” risks

- Default risk for a “distressed” company: For firms that have substantial debt, there is the possibility of default. In default, you will receive a liquidation value for your assets in place, that may not reflect their going concern value, and will lose any “growth asset” value.
  - Value = Going concern value \( (1 - \text{Probability of default}) \) + Liquidation value \( \text{Probability of default} \)

- Nationalization risk: The primary cost of being nationalized is that what you receive for your business from the nationalizing authority is less than the fair value of the business.
  - Value = Going concern value \( (1 - \text{Probability of nationalization}) \) + Liquidation value \( \text{Probability of nationalization} \)
Exhibit 8.2: Valuing a Distressed firm: Las Vegas Sands in early 2009

Las Vegas Sands owns and operates the Venetian Casino and Sands Convention Center in Las Vegas and the Sands Macau Casino in Macau, China. While the revenues increased from $1.75 billion in 2005 to $4.39 billion in 2008 and it had two other casinos in development - it ran into significant financial trouble in the last quarter of 2008. Fears about whether the firm would be able to meet its debt obligations pushed down both stock prices (almost 90%) and bond prices (about 40%) in 2008.

1. **Limited revenue growth**
   Distress makes it difficult to build new casinos. So growth has to come from existing casinos.

2. **Return to operating health**
   Current margins are low. Operating margins improve as distress wanes and firm returns to health. The margin in year 11 is based on industry averages and the company's historical margins.

3. **Tax rate**
   As tax benefits from investments fade and profits come back, tax rate rises to marginal tax rate.

4. **Curtail reinvestment**
   Difficulty in raising new capital and debt repayment needs reduce cash available for reinvestment, at least for near term.

5. **Return to financial health**
   High debt ratio pushed up cost of equity and capital. As debt is repaid, debt ratio decreases and cost of capital drops.

6. **Terminal value**
   With return to health, back to growth
   
   \[
   \frac{1051 \times (1.03)(1-0.30)}{(0.0743 - 0.03)} = \$17,129
   \]

7. **Risk of default**
   The high debt ratio makes default a very real probability. Given the company's rating (BB), history suggests a 28.25% probability of default within 10 years.

8. **Distress sale value**
   If the firm is unable to make debt payments, there will be no value to equity.

9. **Default adjusted value**
   Weighted average of going concern value and distress sale value:
   
   \[8.25 \times (0.7175) + 50 \times (0.2125)\]
8. Confront uncertainty, if you can...

- In standard valuation, you are forced to make point estimates for inputs where you are uncertain about values. In statistical terms, you are being asked to compress a probability distribution about a variable into an expected value. You then obtain a single estimate of value, based upon your base case or expected values.

- In a simulation, you can enter distributions for variables, rather than point estimates. Rather than obtain a single estimate of value, you get a distribution of values, which can provide you with substantially more information than a single valuation.
To illustrate: Revisiting the Twitter valuation...

- **Revenue Growth Rate**
  - Distribution: Uniform
  - Expected Value: 55%
  - Minimum Value: 40%
  - Maximum Value: 70%

- **Target Operating Margin**
  - Distribution: Normal
  - Expected Value: 25%
  - Standard Deviation: 5%

- **Sales to Capital Ratio**
  - Distribution: Lognormal
  - Expected Value: 1.50
  - Standard Deviation: 0.15

- **Cost of Capital**
  - Distribution: Triangular
  - Expected Value: 11.22%
  - Minimum Value: 10.02%
  - Maximum Value: 12.22%
With the consequences for equity value...
9. Don’t look for precision..

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

- As information comes out, you will have to adjust and adapt your model to reflect the information. Rather than be defensive about the resulting changes in value, recognize that this is the essence of risk.
9b. Amazon in January 2001

**Current Revenue** $2,465

**Current Margin:** -34.60%

**EBIT** -853m

**NOL:** 1,289 m

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

**Sales Turnover Ratio:** 3.02

**Revenue Growth:** 25.41%

**Expected Margin:** -> 9.32%

**Terminal Value:** $28,310

**Cost of Equity** 13.81%

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

**Tax rate = 0% -> 35%**

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

**Internet/Retail Operating Leverage**

**Current D/E:** 37.5%

**Base Equity Premium**

**Country Risk Premium**

**Riskfree Rate:**
- T. Bond rate = 5.1%

**Beta** 2.18 -> 1.10

**Risk Premium** 4%

Amazon.com
January 2001
Stock price = $14
To illustrate: Your mistakes versus market mistakes.
10. You can make mistakes, but try to keep bias out..

- When you are wrong on individual company valuations, as you inevitably will be, recognize that while those mistakes may cause the value to be very different from the price for an individual company, the mistakes should average out across companies.
  - Put differently, if you are an investor, you have can make the “law of large numbers” work for you by diversifying across companies, with the degree of diversification increasing as uncertainty increases.

- If you are “biased” on individual company valuations, your mistakes will not average out, no matter how diversified you get.

- Bottom line: You are better off making large mistakes and being unbiased than making smaller mistakes, with bias.
AND IT'S NOT JUST VALUE THAT YOU ARE UNCERTAIN ABOUT...
Valuation and Pricing

Tools for intrinsic analysis
- Discounted Cashflow Valuation (DCF)
- Intrinsic multiples
- Book value based approaches
- Excess Return Models

Drivers of intrinsic value
- Cashflows from existing assets
- Growth in cash flows
- Quality of Growth

Tools for "the gap"
- Behavioral finance
- Price catalysts

Drivers of "the gap"
- Information
- Liquidity
- Corporate governance

Tools for pricing
- Multiples and comparables
- Charting and technical indicators
- Pseudo DCF

Drivers of price
- Market moods & momentum
- Surface stories about fundamentals

Value of cashflows, adjusted for time and risk

INTRINSIC VALUE

THE GAP
Is there one? Will it close?

PRICE

Drivers of price
Three views of “the gap”

<table>
<thead>
<tr>
<th>View of the gap</th>
<th>Investment Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Efficient Marketer</td>
<td>Index funds</td>
</tr>
<tr>
<td>The gaps between price and value, if they do occur, are random.</td>
<td></td>
</tr>
<tr>
<td>The “value” extremist</td>
<td>Buy and hold stocks where value &lt; price</td>
</tr>
<tr>
<td>You view pricers as dilettantes who will move on to fad and fad. Eventually, the price will converge on value.</td>
<td></td>
</tr>
<tr>
<td>The pricing extremist</td>
<td>(1) Look for mispriced securities.</td>
</tr>
<tr>
<td>Value is only in the heads of the “eggheads”. Even if it exists (and it is questionable), price may never converge on value.</td>
<td>(2) Get ahead of shifts in demand/momentum.</td>
</tr>
</tbody>
</table>
The “pricers” dilemma..

- No anchor: If you do not believe in intrinsic value and make no attempt to estimate it, you have no moorings when you invest. You will therefore be pushed back and forth as the price moves from high to low. In other words, everything becomes relative and you can lose perspective.

- Reactive: Without a core measure of value, your investment strategy will often be reactive rather than proactive.

- Crowds are fickle and tough to get a read on: The key to being successful as a pricer is to be able to read the crowd mood and to detect shifts in that mood early in the process. By their nature, crowds are tough to read and almost impossible to model systematically.
The valuer’s dilemma ...

- **Uncertainty about the magnitude of the gap:**
  - **Margin of safety:** Many value investors swear by the notion of the “margin of safety” as protection against risk/uncertainty.
  - **Collect more information:** Collecting more information about the company is viewed as one way to make your investment less risky.
  - **Ask what if questions:** Doing scenario analysis or what if analysis gives you a sense of whether you should invest.

- **Uncertainty about gap closing:** This is tougher and you can reduce your exposure to it by
  - **Lengthening your time horizon**
  - **Providing or looking for a catalyst that will cause the gap to close.**
And here is how it plays out...

The value process
My valuation of Apple in January 2013

My valuation of Apple with revenue growth of 6% (Normal, $\sigma=3\%$), target pre-tax margin of 30% (Uniform, 25%-35%) and cost of capital of 12.5% (Triangle, 11-14%). There is a 90% chance that Apple is undervalued at $440/share.

Asthath Damodaran

The Pricing Process: Apple
Why the “margin of safety” is not a buffer against uncertainty...

- The margin of safety (MOS) is a buffer that you build into your investment decisions to protect yourself from investment mistakes. Thus, if your margin of safety is 30%, you will buy a stock only if the price is more than 30% below its “intrinsic” value.

- While value investors use the “margin of safety” as a shield against risk, keep in mind that:
  - MOS comes into play at the end of the investment process, not at the beginning.
  - MOS does not substitute for risk assessment and intrinsic valuation, but augments them.
  - The MOS cannot and should not be a fixed number, but should be reflective of the uncertainty in the assessment of intrinsic value.
  - Being too conservative can be damaging to your long term investment prospects. Too high a MOS can hurt you as an investor.
Strategies for managing the risk in the “closing” of the gap

- The “karmic” approach: In this one, you buy (sell short) under (over) valued companies and sit back and wait for the gap to close. You are implicitly assuming that given time, the market will see the error of its ways and fix that error.

- The catalyst approach: For the gap to close, the price has to converge on value. For that convergence to occur, there usually has to be a catalyst.
  - If you are an activist investor, you may be the catalyst yourself. In fact, your act of buying the stock may be a sufficient signal for the market to reassess the price.
  - If you are not, you have to look for other catalysts. Here are some to watch for: a new CEO or management team, a “blockbuster” new product or an acquisition bid where the firm is targeted.