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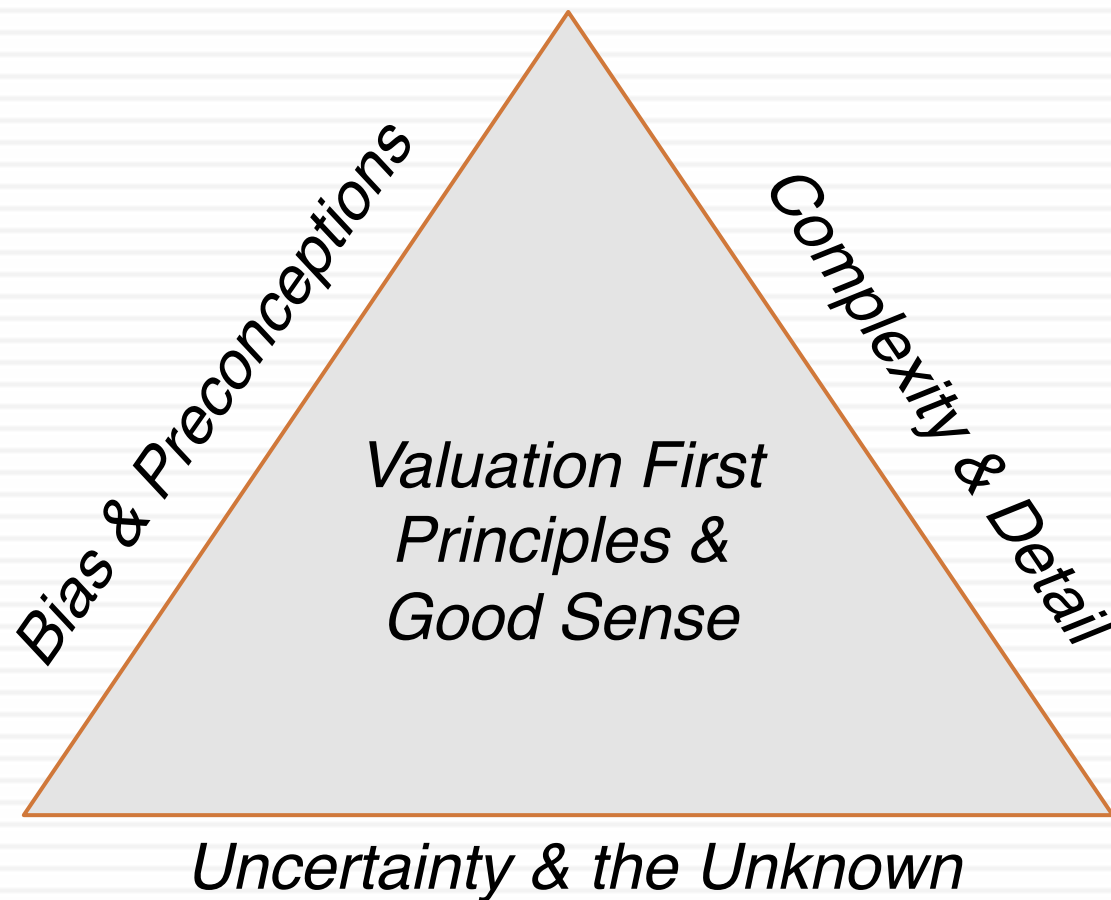*Blog: http://aswathdamodaran.blogspot.com/*
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THE DARK SIDE OF VALUATION: BIAS, UNCERTAINTY AND COMPLEXITY

Aswath Damodaran

The Bermuda Triangle of Valuation

Valuation First
Principles &
Good Sense

Bias & Preconceptions

Complexity & Detail

Uncertainty & the Unknown

I. Valuation Bias

- <u>Preconceptions and priors</u>: When you start on the valuation of a company, you almost never start with a blank slate. Instead, your valuation is shaped by your prior views of the company in question.
  - Corollary 1: <u>The more you know about a company</u>, the more likely it is that you will be biased, when valuing the company.
  - Corollary 2: <u>The "closer" you get to the management/owners of a company</u>, the more biased your valuation of the company will become.
- <u>Value first, valuation to follow</u>: In principle, you should do your valuation first before you decide how much to pay for an asset. In practice, people often decide what to pay and do the valuation afterwards.

Sources of bias

- <u>The power of the subconscious</u>: We are human, after all, and as a consequence are susceptible to
  - Herd behavior: For instance, there is the <u>"market price" magnet</u> in valuation, where estimates of intrinsic value move towards the market price with each iteration.
  - Hindsight bias: If you know the outcome of a sequence of events, it will affect your valuation. (That is why teaching valuation with cases is an exercise in futility)

- <u>The power of suggestion</u>: Hearing <u>what others think a company is worth</u> will color your thinking, and if you view those others as more informed/smarter than you are, you will be influenced even more.

- <u>The power of money</u>: If you have an <u>economic stake in the outcome</u> of a valuation, bias will almost always follow.
  - Corollary 1: Your bias in a valuation will be directly proportional to who pays you to do the valuation and how much you get paid.
  - Corollary 2: You will be more biased when valuing a company where you already have a position (long or short) in the company.

Biasing a DCF valuation: A template of "tricks"

If you want higher (lower) value, you can
1. Augment (haircut) earnings
2. Reduce(increase) effective tax rate
3. Ignore (Count in) unconventional cap ex
4. Narrow (Broaden) definition of working capital

If you want to increase (decrease) value, you can
1. Use higher (lower) growth rates
2. Assume less (more) reinvestment with the
same growth rate, thus raising (lowering) the
quality and value of growth.

Free Cashflow to Firm
EBIT (1- tax rate)
- (Cap Ex - Depreciation)
- Change in non-cash WC
= Free Cashflow to firm

Expected Growth in FCFF during high growth

If you want to increase (decrease) value, you can
1. Assume a longer (shorter) growth period
2. Assume more (less) excess returns over the growth period

Length of high growth period: PV of FCFF during high

Value of Operating Assets today
+ Cash & non-operating assets
- Debt
Value of equity

If you want to increase (decrease) value, you can add (subtract) premiums (discounts) for things you like (dislike) about the company.
Premiums: Control, Synergy, liquidity
Discounts: Illiquidity, private company

Cost of Capital
Weighted average of cost of equity & cost of debt

If you want to increase (decrease) value, you can
1. Assume a higher (lower) debt ratio, with the same costs of debt & equity. You may be able to accomplish this by using book (market) value debt ratios.
2. Use a lower (higher) equity risk premium for equity and a lower (higher) default spread for debt.
3. Find a "lower" ("higher") beta for your stock.
4. Don't add (add) other premiums to the cost of equity (small cap?)

Stable Growth
When operating income and FCFF grow at constant rate forever.

If you want to increase value, you can
1. Use stable growth rates that are economically impossible (higher than the growth rate of the economy)
2. Allow this growth to be accompanied by high positive excess returns (low reinvestment)
If you want to decrease value, you can
1. Use lower growth rates in perpetuity
2. Accompany this growth with high negative excess returns

Bias Tools 1a: The Cash Flow Ploy

Item	The "unbiased" solution	Bias up	Bias down
EBIT/ Earnings	Remove all extraordinary items & normalize the rest (with earnings going up or down) only if necessary.	Remove only extraordinary losses & normalize to push earnings up	Remove only extraordinary income & normalize to push earnings down
Tax rate	You can start with the effective tax rate but change over time towards marginal rate.	Use effective tax (if less than marginal) forever.	Use marginal tax rate (if higher than effective) forever.
Net Cap Ex	Count in all investments (R&D, acquisitions) made for growth & allow for the resulting growth.	Ignore unusual cap ex (acquisitions) while counting growth in.	Count unusual cap ex while ignoring growth generated.
Working Capital	Use historic or industry averages of working capital to estimate changes	Ignore working capital or use negative working capital as source of cash.	Use change in working capital, if it is a large drain on cash flow.

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Bias Tools 1b: Tax Mismatching

- <u>Unbiased</u>: If your cash flows are after (no, corporate, corporate + individual) taxes, your discount rate has to reflect (no, corporate, corporate + individual) taxes

Entity	Entity taxes	Investor taxes	Valuation approaches
MLPs, REITs, Partnerships, Sole proprietorships	No taxes	1. Income taxed as ordinary income 2. Value appreciation taxed as capital gains	1. Value pre-tax income at a pre-tax discount rate 2. Value post-personal tax income at post personal tax discount rate.
Corporations	Income taxed at corporate tax rate	1. Dividends taxed when paid 2. Price appreciation taxed when stock sold	1. Value cash flows, post-corporate but pre-personal taxes, at a discount rate that is post-corporate but pre-personal. 2. Value cash flows, post-corporate & post personal taxes, at a discount rate that is post-corporate and post-personal

- <u>Bias up</u>: Use pre-tax (personal, personal & corporate) cash flows while discounting at an after-tax (personal, personal & corporate) discount rate.

- <u>Bias down</u>: Use after-tax tax (personal, personal & corporate) cash flows while discounting at a pre-tax (personal, personal & corporate) discount rate.

Bias Tools 2: The Growth Trick

	Unbiased	Bias up	Bias down
Scaling up of growth	Reduce growth rates as company scales up, but allow for exceptions.	Continue with high revenue growth, as you scale up.	Scale down growth too quickly.
Target Operating Margin	Move towards margins of mature companies in industry	Move well above margins of mature companies in industry	Moves well below typical margins in industry
Reinvestment	Enough reinvestment to allow for growth	No or little reinvestment, as growth continues	Disproportionately large reinvestment, given growth.
Imputed ROC	Trends down towards industry average and cost of capital.	Trends up away from industry average & cost of capital.	Trends down below the industry average & cost of capital

Bias Tools 3a: The Macro Game – Risk free rate

	Unbiased	Bias Up	Bias Down
Normalization	Use the current risk free rate.	Use the risk free rate today, if it is low, but replace with an average rate over time, if the current rate is high.	Use the average rate over time, if the current rate is low or the current rate, if it is high.
Government default risk	Remove the default risk from the government bond rate to get to riskfree rate.	Use a risk free rate in a lower inflation currency, with a default free government (but leave cash flows in local currency)	Use the government bond rate as the risk free rate.

Bias Tools 3b: Equity Risk Premiums

	Arithmetic Average		Geometric Average	
	Stocks - T. Bills	Stocks - T. Bonds	Stocks - T. Bills	Stocks - T. Bonds
1928-2012	7.65%	5.88%	5.74%	4.20%
	2.20%	2.33%		
1962-2012	5.93%	3.91%	4.60%	2.93%
	2.38%	2.66%		
2002-2012	7.06%	3.08%	5.38%	1.71%
	5.82%	8.11%		

Historical premium

In 2012, the actual cash returned to stockholders was 72.25. Using the average total yield for the last decade yields 69.46

Analysts expect earnings to grow 7.67% in 2013, 7.28% in 2014, scaling down to 1.76% in 2017, resulting in a compounded annual growth rate of 5.27% over the next 5 years. We will assume that dividends & buybacks will tgrow 5.27% a year for the next 5 years.

After year 5, we will assume that earnings on the index will grow at 1.76%, the same rate as the entire economy (= riskfree rate).

| 73.12 | 76.97 | 81.03 | 85.30 | 89.80 |

January 1, 2013
S&P 500 is at 1426.19
Adjusted Dividends & Buybacks
for base year = 69.46

$$1426.19 = \frac{73.12}{(1+r)} + \frac{76.97}{(1+r)^2} + \frac{81.03}{(1+r)^3} + \frac{85.30}{(1+r)^4} + \frac{89.80}{(1+r)^5} + \frac{89.80(1.0176)}{(r-.0176)(1+r)^5}$$

Expected Return on Stocks (1/1/13)   = 7.54%
T.Bond rate on 1/1/13   = 1.76%
Equity Risk Premium = 7.54% - 1.76% = 5.78%

Data Sources:
Dividends and Buybacks last year: S&P
Expected growth rate: S&P, Media reports, Factset, Thomson-Reuters

Austria	0.00%	5.75%
Belgium	1.20%	6.95%
Cyprus	16.50%	22.25%
Denmark	0.00%	5.75%
Finland	0.00%	5.75%
France	0.45%	6.20%
Germany	0.00%	5.75%
Greece	10.13%	15.88%
Iceland	3.38%	9.13%
Ireland	4.13%	9.88%
Isle of Man	0.00%	5.75%
Italy	3.00%	8.75%
Liechtenstein	0.00%	5.75%
Luxembourg	0.00%	5.75%
Malta	1.95%	7.70%
Netherlands	0.00%	5.75%
Norway	0.00%	5.75%
Portugal	5.40%	11.15%
Spain	3.38%	9.13%
Sweden	0.00%	5.75%
Switzerland	0.00%	5.75%
Turkey	3.38%	9.13%
UK	0.45%	6.20%
W. Europe	**1,.22%**	**6.97%**

Albania	6.75%	12.50%
Armenia	4.73%	10.48%
Azerbaijan	3.38%	9.13%
Belarus	10.13%	15.88%
Bosnia	10.13%	15.88%
Bulgaria	3.00%	8.75%
Croatia	4.13%	9.88%
Czech Republic	1.43%	7.18%
Estonia	1.43%	7.18%
Georgia	5.40%	11.15%
Hungary	4.13%	9.88%
Kazakhstan	3.00%	8.75%
Latvia	3.00%	8.75%
Lithuania	2.55%	8.30%
Macedonia	5.40%	11.15%
Moldova	10.13%	15.88%
Montenegro	5.40%	11.15%
Poland	1.65%	7.40%
Romania	3.38%	9.13%
Russia	2.55%	8.30%
Serbia	5.40%	11.15%
Slovakia	1.65%	7.40%
Slovenia	4.13%	9.88%
Ukraine	10.13%	15.88%
E. Europe/Russia	**3.13%**	**8.88%**

Bangladesh	5.40%	11.15%
Cambodia	8.25%	14.00%
China	1.20%	6.95%
Fiji	6.75%	12.50%
Hong Kong	0.45%	6.20%
India	3.38%	9.13%
Indonesia	3.38%	9.13%
Japan	1.20%	6.95%
Korea	1.20%	6.95%
Macao	1.20%	6.95%
Malaysia	1.95%	7.70%
Mauritius	2.55%	8.30%
Mongolia	6.75%	12.50%
Pakistan	12.00%	17.75%
Papua NG	6.75%	12.50%
Philippines	4.13%	9.88%
Singapore	0.00%	5.75%
Sri Lanka	6.75%	12.50%
Taiwan	1.20%	6.95%
Thailand	2.55%	8.30%
Vietnam	8.25%	14.00%
Asia	**1.77%**	**7.52%**

Canada	0.00%	5.75%
United States	0.00%	5.75%
North America	**0.00%**	**5.75%**

Argentina	10.13%	15.88%
Belize	14.25%	20.00%
Bolivia	5.40%	11.15%
Brazil	3.00%	8.75%
Chile	1.20%	6.95%
Colombia	3.38%	9.13%
Costa Rica	3.38%	9.13%
Ecuador	12.00%	17.75%
El Salvador	5.40%	11.15%
Guatemala	4.13%	9.88%
Honduras	8.25%	14.00%
Mexico	2.55%	8.30%
Nicaragua	10.13%	15.88%
Panama	3.00%	8.75%
Paraguay	5.40%	11.15%
Peru	3.00%	8.75%
Suriname	5.40%	11.15%
Uruguay	3.38%	9.13%
Venezuela	6.75%	12.50%
Latin America	**3.94%**	**9.69%**

Angola	5.40%	11.15%
Benin	8.25%	14.00%
Botswana	1.65%	7.40%
Burkina Faso	8.25%	14.00%
Cameroon	8.25%	14.00%
Cape Verde	6.75%	12.50%
Egypt	12.00%	17.75%
Gabon	5.40%	11.15%
Ghana	6.75%	12.50%
Kenya	6.75%	12.50%
Morocco	4.13%	9.88%
Mozambique	6.75%	12.50%
Namibia	3.38%	9.13%
Nigeria	5.40%	11.15%
Rwanda	8.25%	14.00%
Senegal	6.75%	12.50%
South Africa	2.55%	8.30%
Tunisia	4.73%	10.48%
Uganda	6.75%	12.50%
Zambia	6.75%	12.50%
Africa	**5.90%**	**11.65%**

Bahrain	2.55%	8.30%
Israel	1.43%	7.18%
Jordan	6.75%	12.50%
Kuwait	0.90%	6.65%
Lebanon	6.75%	12.50%
Oman	1.43%	7.18%
Qatar	0.90%	6.65%
Saudi Arabia	1.20%	6.95%
UAE	0.90%	6.65%
Middle East	**1.38%**	**7.13%**

Australia	0.00%	5.75%
Cook Islands	6.75%	12.50%
New Zealand	0.00%	5.75%
Australia & NZ	**0.00%**	**5.75%**

Black #: Total ERP
Red #: Country risk premium
AVG: GDP weighted average

Bias Tools 3d: Adjust the discount rate

- **Unbiased:** If you feel that your risk adjustment metric (eg. Beta) is not capturing equity risk adequately, think about better ways of measuring that risk.

- **Bias up:** Reduce your discount rate to reflect imaginary savings or perceived safety.

  - Some value investors argue that the more they know about a firm, the lower the risk of the firm, and that a lower discount rate (even the risk free rate) can be used.

  - In acquisitions, you sometimes see analysts reducing discount rates to reflect the risk reduction from diversification.

  - A simple way to reduce your cost of capital is to increase the debt ratio you use, while keeping your cost of equity & debt fixed.

- **Bias down:** Add on premiums to your discount rate (for size, liquidity, private company risk, survival) to push up your discount rate and push down value.

Bias Tools 4: Terminal Value Magic

Unbiased: Move towards a marginal tax rate
Bias up: Leave at effective tax rate
Bias down: Use tax rate > marginal tax rate

Unbiased: Assume ROIC is equal to or just above cost of capital. RR= g/ROC
Bias up: Assume no or very low reinvestment & high ROIC
Bias down: Assume ROIC < Cost of capital in perpetuity.

$$\text{Terminal Value}_n = \frac{\text{EBIT}_{n+1}\ (1 - \text{tax rate})\ (1 - \text{Reinvestment Rate})}{\text{Cost of capital - Expected growth rate}}$$

Unbiased: Move towards mature company WACC
Bias up: Move below mature company WACC
Bias down: Leave at current WACC (especially if it is high risk company)

Unbiased: g≤ risk free rate
Bias up: g > risk free rate
Bias down: Depends on ROIC

Bias Tools 5: From firm to equity value

	Unbiased	Bias up	Bias Down
Cash	Treat as neutral, unless there is evidence that the market is discounting it.	Add a premium to the cash, arguing that it makes the company safer.	Discount the cash substantially, arguing that it earns a low rate of return.
Cross holdings	Try to estimate the intrinsic value of these holdings.	Use book value, especially if higher than intrinsic value, or let managers specify value.	Ignore cross holdings.
Other Assets	Add on the value of only those assets that are not counted in your cash flows.	Add on assets that you have already counted in your cash flows (real estate).	Ignore all other assets
Goodwill	Ignore value	Add on to value	Ignore goodwill but reduce earnings for impairment.
Debt	Include all debt counted in your cost of capital.	Use a lower debt number than you used in cost of capital.	Count in other liabilities as debt.

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Bias Tools 6: Post-valuation garnishing

- Unbiased: Follow the "it" proposition: "It" can have value only if it affects the cash flows of an asset or its risk, and "it" can be valued explicitly.

- Bias up: Look for premiums to add to value

  - Control premium: Is it really always 20%?

  - Synergy premium: Don't know what it is, but it is worth a lot.

  - Liquidity premium: If an asset is liquid, you add a premium.

- Bias down: Look for discounts

  - Minority discount: If you get less than 50%, you have to discount value.

  - Illiquidity discount: If it is illiquid, you need to discount its value.
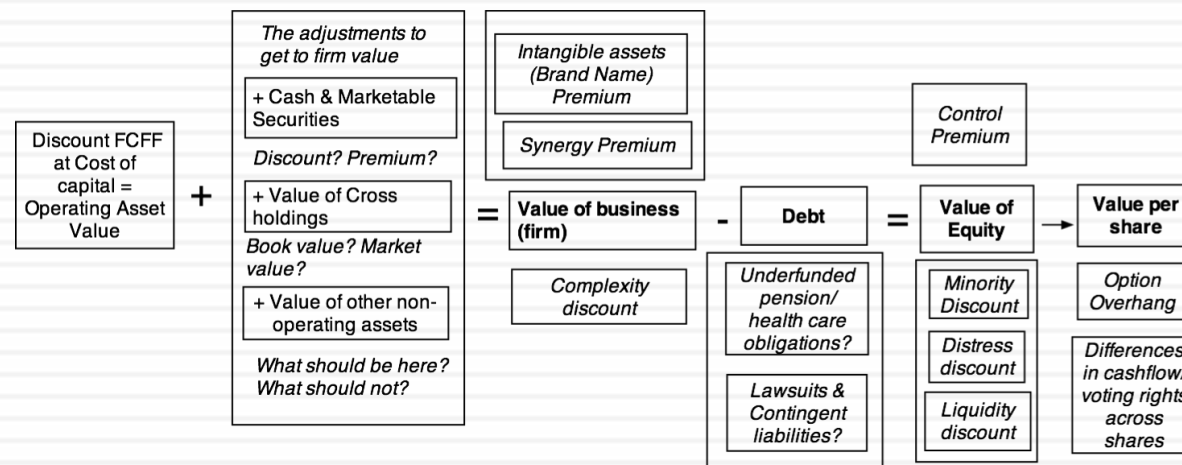
Facebook IPO: May 17, 2012

	This year	Last year
Revenues	$ 3,711.00	$ 1,974.00
Operating inco	$1,695.00	$ 1,032.00
Invested Capi	$ 4,216.11	$ 694.00
Tax rate	40.00%	
Operating ma	45.68%	
Return on cap	146.54%	
Sales/Capital	88.02%	

Revenue growth of 40% a year for 5 years, tapering down to 2% in year 10	Pre-tax operating margin declines to 35% in year 10	Sales to capital ratio of 1.50 for incremental sales	**Stable Growth** g = 2%; Beta = 1.00; Cost of capital = 8% ROC= 12%; Reinvestment Rate=2%/12% = 16.67%

Terminal Value$_{10}$= 7,713/(.08-.02) = 128,546

Year	1	2	3	4	5	6	7	8	9	10
Revenues	$5,195	$7,274	$10,183	$14,256	$19,959	$26,425	$32,979	$38,651	$42,362	$43,209
Operating margin	44.61%	43.54%	42.47%	41.41%	40.34%	39.27%	38.20%	37.14%	36.07%	35.00%
EBIT	$2,318	$3,167	$ 4,325	$ 5,903	$ 8,051	$10,377	$12,599	$14,353	$15,279	$15,123
EBIT (1-t)	$1,391	$1,900	$ 2,595	$ 3,542	$ 4,830	$ 6,226	$ 7,559	$ 8,612	$ 9,167	$ 9,074
- Reinvestment	$ 990	$1,385	$ 1,940	$ 2,715	$ 3,802	$ 4,311	$ 4,369	$ 3,782	$ 2,474	$ 565
FCFF	$ 401	$ 515	$ 655	$ 826	$ 1,029	$ 1,915	$ 3,190	$ 4,830	$ 6,694	$ 8,509

Term yr	
EBIT (1-t)	9255
- Reinv	1543
FCFF	7713

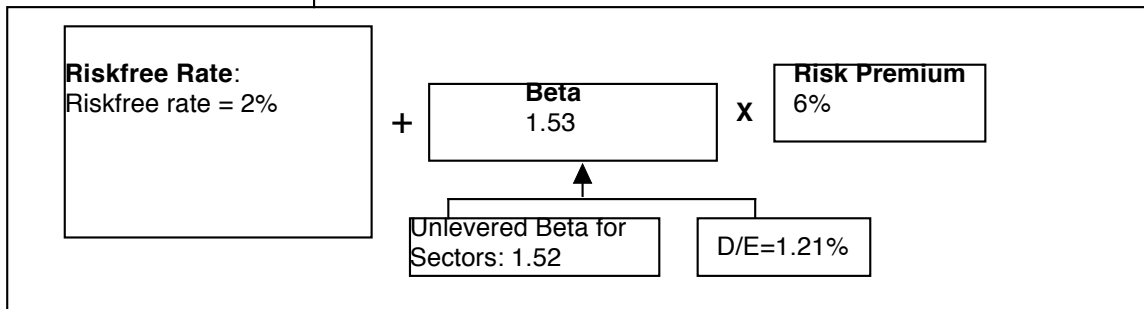| Operating assets	62,053
+ Cash	1,512
- Debt	1,219
Value of equity	62,350
- Options	3,088
Value in stock	59,262
Value/share	$25.39

Cost of capital = 11.19% (.988) + 1.59% (.012) = 11.07%

Cost of capital decreases to 8% from years 6-10

Cost of Equity 11.19%

Cost of Debt (2%+0.65%)(1-.40) = 1.59%

Weights E = 98.8% D = 1.2%

At 4.00 pm, May 17, the offering was priced at $38/share

Riskfree Rate: Riskfree rate = 2%

+

Beta 1.53

X

Risk Premium 6%

Unlevered Beta for Sectors: 1.52

D/E=1.21%

Bias Up: Facebook IPO: May 17, 2012

	This year	Last year
Revenues	$ 3,711.00	$ 1,974.00
Operating inco	$1,695.00	$ 1,032.00
Invested Capi	$ 4,216.11	$ 694.00
Tax rate	40.00%	
Operating ma	45.68%	
Return on cap	146.54%	
Sales/Capital	88.02%	

Revenue growth of 40% a year for 5 years, tapering down to 2% in year 10

Pre-tax operating margin stays at **45.68**%

Sales to capital ratio of **3.00** for incremental sales

Stable Growth
g = 2%; Beta = 1.00;
Cost of capital = 8%
ROC= **20**%;
Reinvestment Rate=2%/20% = 10%

Terminal Value$_{10}$= 10,870/(.08-.02) = 181,173

Year	1	2	3	4	5	6	7	8	9	10
Revenues	$5,195	$7,274	$10,183	$14,256	$19,959	$26,425	$32,979	$38,651	$42,362	$43,209
Operating margin	45.68%	45.68%	45.68%	45.68%	45.68%	45.68%	45.68%	45.68%	45.68%	45.68%
EBIT	$2,373	$3,322	$ 4,651	$ 6,512	$ 9,116	$12,070	$15,063	$17,654	$19,349	$19,736
EBIT (1-t)	$1,424	$1,993	$ 2,791	$ 3,907	$ 5,470	$ 7,242	$ 9,038	$10,592	$11,609	$11,841
- Reinvestment	$ 495	$ 693	$ 970	$ 1,358	$ 1,901	$ 2,156	$ 2,184	$ 1,891	$ 1,237	$ 282
FCFF	$ 929	$1,301	$ 1,821	$ 2,549	$ 3,569	$ 5,086	$ 6,853	$ 8,702	$10,372	$11,559

Term yr
EBIT (1-t)   12078
- Reinv   1208
FCFF   10870

Operating assets	94,564
+ Cash	1,512
- Debt	1,219
Value of equity	94,861
- Options	3,088
Value in stock	91,772
Value/share	$39.32

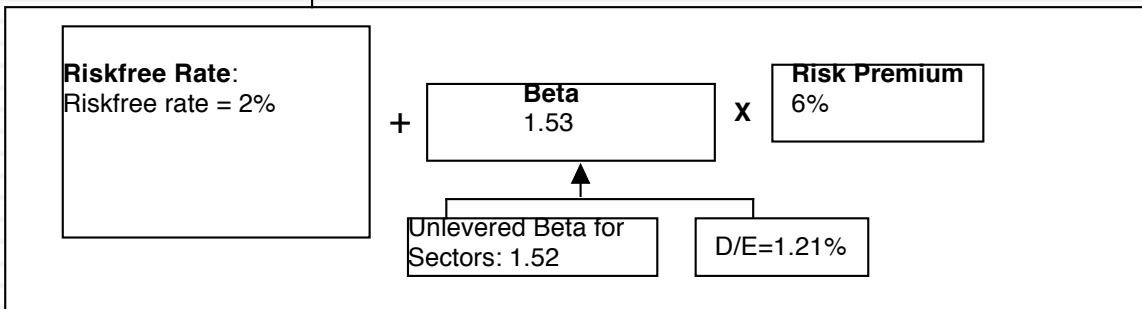Cost of capital = 11.19% (.988) + 1.59% (.012) = 11.07%

Cost of capital decreases to 8% from years 6-10

Cost of Equity
11.19%

Cost of Debt
(2%+0.65%)(1-.40)
= 1.59%

Weights
E = 98.8% D = 1.2%

At 4.00 pm, May 17, the offering was priced at $38/share

Riskfree Rate:
Riskfree rate = 2%

+

Beta
1.53

X

Risk Premium
6%

Unlevered Beta for Sectors: 1.52

D/E=1.21%

Bias Down: Facebook IPO: May 17, 2012

	This year	Last year
Revenues	$ 3,711.00	$ 1,974.00
Operating inc	$1,695.00	$ 1,032.00
Invested Capi	$ 4,216.11	$ 694.00
Tax rate	40.00%	
Operating ma	45.68%	
Return on cap	146.54%	
Sales/Capital	88.02%	

Revenue growth of 40% a year for 5 years, tapering down to 2% in year 10

Pre-tax operating margin **drops to 31%** over the next 10 years

Sales to capital ratio **stays at 0.75**

Stable Growth
g = 2%; Beta = 1.00;
Cost of capital = 8%
ROC= **8%**;
Reinvestment Rate=2%/20% = 10%

Terminal Value$_{10}$= 6,148/(.08-.02) = 102,469

Year	1	2	3	4	5	6	7	8	9	10
Revenues	$5,195	$7,274	$10,183	$14,256	$19,959	$26,425	$32,979	$38,651	$42,362	$43,209
Operating margin	44.21%	42.74%	41.27%	39.81%	38.34%	36.87%	35.40%	33.94%	32.47%	31.00%
EBIT	$2,297	$3,109	$ 4,203	$ 5,675	$ 7,652	$ 9,743	$11,675	$13,116	$13,754	$13,395
EBIT (1-t)	$1,378	$1,865	$ 2,522	$ 3,405	$ 4,591	$ 5,846	$ 7,005	$ 7,870	$ 8,252	$ 8,037
- Reinvestment	$1,979	$2,771	$ 3,879	$ 5,431	$ 7,603	$ 8,622	$ 8,738	$ 7,563	$ 4,947	$ 1,130
FCFF	$ (601)	$ (906)	$ (1,358)	$ (2,026)	$ (3,012)	$ (2,776)	$ (1,733)	$ 307	$ 3,305	$ 6,907

Term yr
EBIT (1-t)	8198
- Reinv	2049
FCFF	6148

Operating assets	35,408
+ Cash	1,512
- Debt	1,219
Value of equity	35,705
- Options	3,088
Value in stock	32,616
Value/share	$13.97

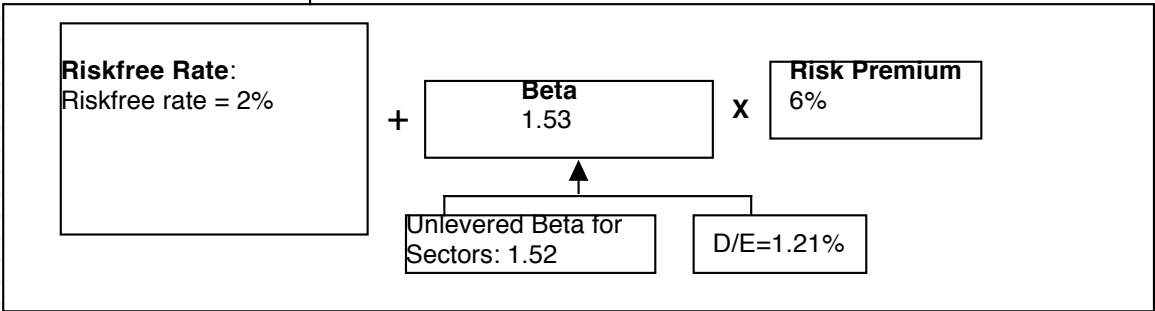Cost of capital = 11.19% (.988) + 1.59% (.012) = 11.07%

Cost of capital decreases to 8% from years 6-10

Cost of Equity 11.19%

Cost of Debt
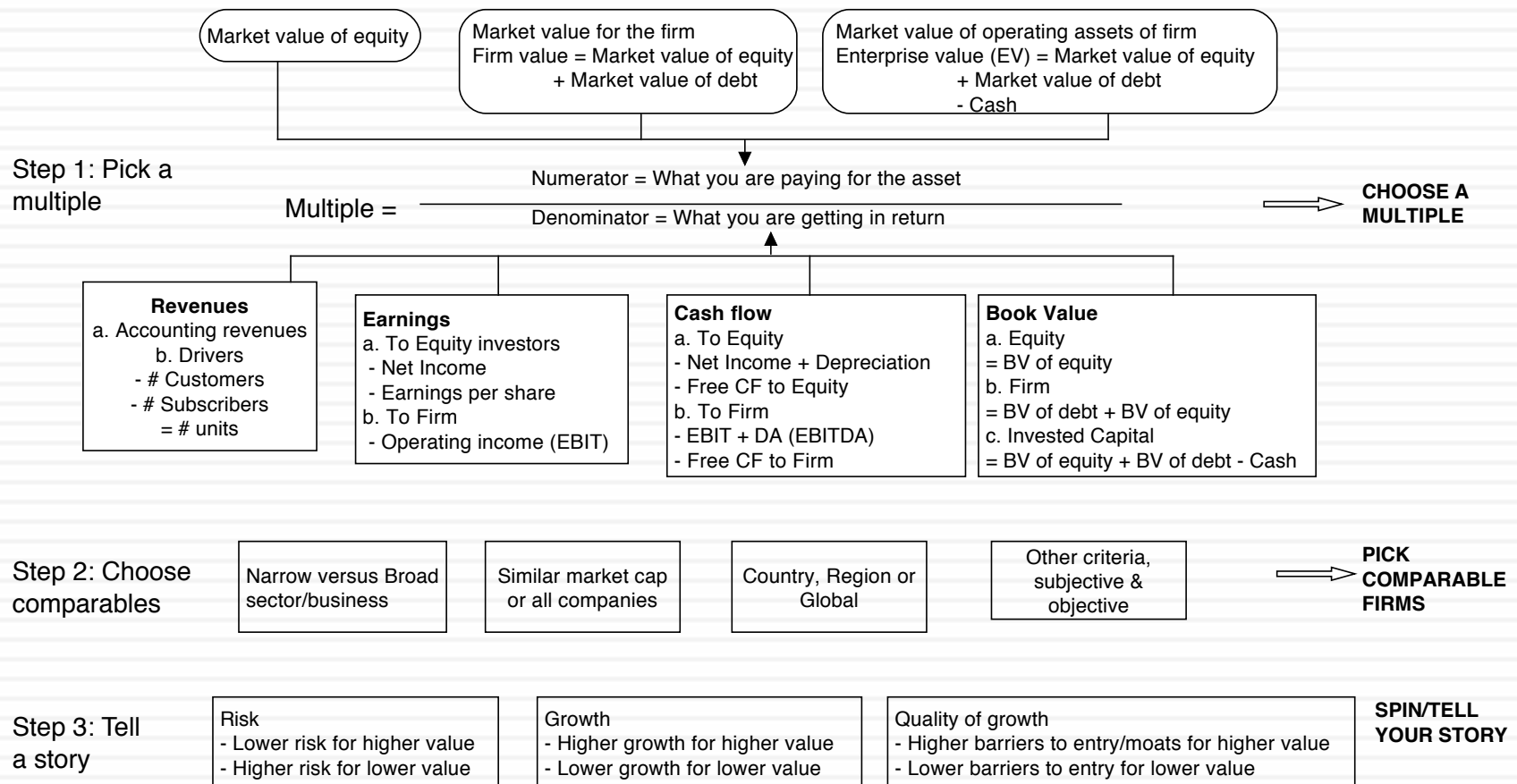(2%+0.65%)(1-.40)
= 1.59%

Weights
E = 98.8% D = 1.2%

At 4.00 pm, May 17, the offering was priced at $38/share

Riskfree Rate:
Riskfree rate = 2%

+

Beta 1.53

X

Risk Premium
6%

Unlevered Beta for Sectors: 1.52

D/E=1.21%

Relative Valuation Bias

Market value of equity

Market value for the firm
Firm value = Market value of equity
+ Market value of debt

Market value of operating assets of firm
Enterprise value (EV) = Market value of equity
+ Market value of debt
- Cash

Step 1: Pick a multiple

Numerator = What you are paying for the asset

Multiple = ——————————————————————————————

Denominator = What you are getting in return

→ **CHOOSE A MULTIPLE**

Revenues
a. Accounting revenues
b. Drivers
- # Customers
- # Subscribers
= # units

Earnings
a. To Equity investors
- Net Income
- Earnings per share
b. To Firm
- Operating income (EBIT)

Cash flow
a. To Equity
- Net Income + Depreciation
- Free CF to Equity
b. To Firm
- EBIT + DA (EBITDA)
- Free CF to Firm

Book Value
a. Equity
= BV of equity
b. Firm
= BV of debt + BV of equity
c. Invested Capital
= BV of equity + BV of debt - Cash

Step 2: Choose comparables

| Narrow versus Broad sector/business | Similar market cap or all companies | Country, Region or Global | Other criteria, subjective & objective |

→ **PICK COMPARABLE FIRMS**

Step 3: Tell a story

| Risk
- Lower risk for higher value
- Higher risk for lower value | Growth
- Higher growth for higher value
- Lower growth for lower value | Quality of growth
- Higher barriers to entry/moats for higher value
- Lower barriers to entry for lower value |

SPIN/TELL YOUR STORY

Bias tool 1a: Pick the value measure – Market Cap, Enterprise Value or Firm Value

| Company Name	Market Capitalization	Ranking	(Plus) Total Debt	(Plus) PV of leases	(Plus) Preferred Stock	Firm Value	Ranking	(Minus) Cash & Investments	(Minus) Equity cross holdings	(Plus) Minority Interests	Enterprise Value	Ranking
Exxon Mobil Corporation (NYSE:XOM)	$401,730	1	$13,412	$7,351	$0	$422,493	2	$41,855	$0	$6,076	$386,714	2
Apple Inc. (NasdaqGS:AAPL)	$372,203	2	$0	$3,854	$0	$376,056	3	$144,687	$0	$0	$231,369	10
Google Inc. (NasdaqGS:GOOG)	$292,077	3	$7,376	$3,224	$0	$302,677	8	$51,568	$0	$0	$251,109	6
Microsoft Corporation (NasdaqGS:MSFT)	$288,489	4	$14,765	$1,781	$0	$305,035	7	$84,981	$0	$0	$220,054	13
Wal-Mart Stores Inc. (NYSE:WMT)	$244,080	5	$57,201	$14,389	$0	$315,670	6	$9,355	$0	$6,141	$312,456	3
Johnson & Johnson (NYSE:JNJ)	$241,171	6	$15,892	$835	$0	$257,898	11	$23,193	$0	$0	$234,705	8
General Electric Company (NYSE:GE)	$239,787	7	$397,412	$3,623	$0	$640,822	1	$155,210	$0	$5,336	$490,948	1
Chevron Corporation (NYSE:CVX)	$229,403	8	$14,143	$3,190	$0	$246,736	13	$43,552	$0	$1,352	$204,536	15
PetroChina Co. Ltd. (SEHK:857)	$223,060	9	$91,709	$13,701	$0	$328,469	5	$33,089	$13,373	$19,413	$301,420	4
International Business Machines Corporation (NYSE:IBM)	$211,902	10	$33,397	$5,250	$0	$250,548	12	$17,045	$0	$122	$233,625	9
Procter & Gamble Co. (NYSE:PG)	$211,012	11	$32,223	$1,598	$1,195	$246,028	14	$7,385	$0	$685	$239,328	7
Roche Holding AG (SWX:ROG)	$210,644	12	$26,859	$793	$0	$238,296	17	$15,609	$26	$2,440	$225,101	11
China Mobile Limited (SEHK:941)	$209,922	13	$4,602	$5,387	$0	$219,911	18	$72,414	$7,757	$299	$140,039	20
Nestlé S.A. (SWX:NESN)	$208,796	14	$30,402	$2,839	$0	$242,037	15	$27,051	$10,754	$1,810	$206,042	14
Royal Dutch Shell plc (LSE:RDSA)	$203,451	15	$35,790	$27,023	$0	$266,263	10	$56,970	$34,478	$1,433	$176,248	17
Pfizer Inc. (NYSE:PFE)	$198,681	16	$40,403	$1,084	$39	$240,207	16	$51,529	$0	$577	$189,255	16
Toyota Motor Corporation (TSE:7203)	$191,230	17	$151,749	$578	$0	$343,557	4	$105,270	$22,329	$6,633	$222,591	12
AT&T, Inc. (NYSE:T)	$190,452	18	$74,915	$19,909	$0	$285,276	9	$9,625	$4,998	$340	$270,993	5
The Coca-Cola Company (NYSE:KO)	$178,640	19	$35,125	$966	$0	$214,731	19	$30,403	$9,850	$414	$174,892	18
Novartis AG (SWX:NOVN)	$174,213	20	$20,944	$2,664	$0	$197,822	20	$23,181	$0	$119	$174,760	19

Bias Tool 1b: Pick your scaling variable

Twitter: Revenues =$550 m, Users = 230 m, Employees = 1250, EBITDA and Net Income were negative.

Company	EV	Market Cap	EV/Sales	EV/EBITDA	PE	Market Cap/User	Market Cap/Employee
Facebook, Inc. (NasdaqGS:FB)	$100,017	$107,909	16.35	36.20	193.73	$97.22	$20.36
Google Inc. (NasdaqGS:GOOG)	$248,856	$296,078	4.46	14.64	25.45	$270.89	$6.61
LinkedIn Corporation (NYSE:LNKD)	$28,449	$29,322	22.87	179.26	729.40	$130.32	$6.91
Netlfix	$13,959	$14,539	3.54	81.20	304.80	$403.86	$7.11
OpenTable, Inc. (NasdaqGS:OPEN)	$1,642	$1,734	9.45	30.35	59.99	$15.34	$3.02
Pandora Media, Inc. (NYSE:P)	$4,163	$4,232	7.89	NA	NA	$21.16	$5.72
RetailMeNot	$1,724	$1,715	10.20	34.20	64.96	$147.84	$4.60
Trulia, Inc. (NYSE:TRLA)	$1,647	$1,853	17.75	NA	NA	$59.02	$3.57
Yelp, Inc. (NYSE:YELP)	$4,006	$4,103	22.42	NA	NA	$41.03	$2.67
Zillow, Inc. (NasdaqGS:Z)	$3,420	$3,590	22.48	NA	NA	$78.20	$5.22
Yahoo! Inc. (NasdaqGS:YHOO)	$27,263	$29,855	5.65	21.24	7.19	$106.24	$2.55
Groupon	$5,857	$7,039	2.42	44.04	NA	$168.80	$0.62
Travelzoo Inc. (NasdaqGS:TZOO)	$347	$421	2.23	12.81	23.39	$16.20	$0.95
Aggregate	$441,350	$502,389	5.82	20.43	30.76	$151.57	$5.96
Median			8.67	32.27	59.99	101.73	4.91
Average			10.97	47.44	159.96	121.98	5.42

If you wanted to show me that Twitter is cheap at $10 billion, which scaling variable would you use?

Bias Tools 1c: Choose the timing of your variable

☐ <u>Unbiased</u>: No particular preference but you stay consistent with that choice across companies and across time.

☐ <u>Bias up</u>: Use forward estimates for your company while sticking with trailing or current values for the comparable firms.

☐ <u>Bias down</u>: Use trailing or current values for your company while projecting forward values for your comparable firms.
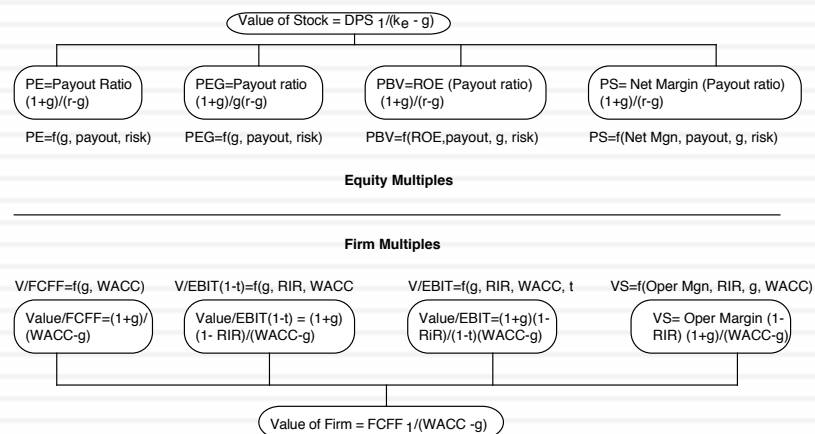

Current, Trailing & Forward Values: US companies on 1/1/2013
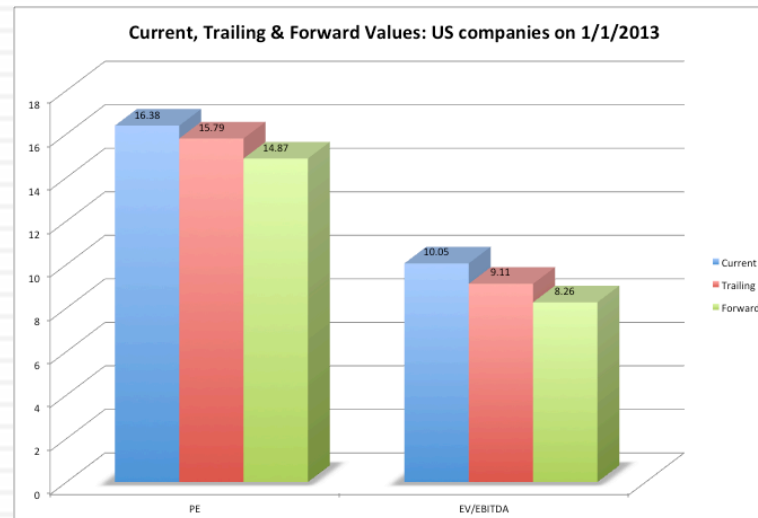
Bias tool 2: Prune your comparable firms

- Unbiased: Have pre-set criteria for choosing comparable firms, but once selected, you generally do not prune that list. (Even if you have outliers, you remove firms symmetrically)

- Bias up: Remove the cheapest firms in your comparable firm list, based on whatever metric or multiple you are using in your valuation..

- Bias down: Remove the most expensive firms in your comparable firm list, based on whatever metric or multiple you are using in your valuation.

Just Facebook and Linkedin							
Company	EV	Market Cap	EV/Sales	EV/EBITDA	PE	Market Cap/User	Market Cap/Employee
Facebook, Inc. (NasdaqGS:FB)	$100,017.00	$107,909.00	16.35	36.20	193.73	$97.22	$20.36
LinkedIn Corporation (NYSE:LNKD)	$28,448.50	$29,321.90	22.87	179.26	729.40	$130.32	$6.91
Facebook + Linkedin	$128,465.50	$137,230.90	17.45	43.97	229.79	$102.79	$14.38

Bias Tools 3: Spin your story

☐ <u>Unbiased:</u> Once you have the multiples computed for your ample, you control for differences in all of the fundamental variables, measuring risk, cash flows and growth between your firm and the comparable firms.

☐ <u>Bias up:</u> You pick the fundamental variable that your firm looks better than the comparable firms on and ignore the rest.

☐ <u>Bias down:</u> You pick the fundamental variable that your firm looks worse than the comparable firms on and ignore the rest.
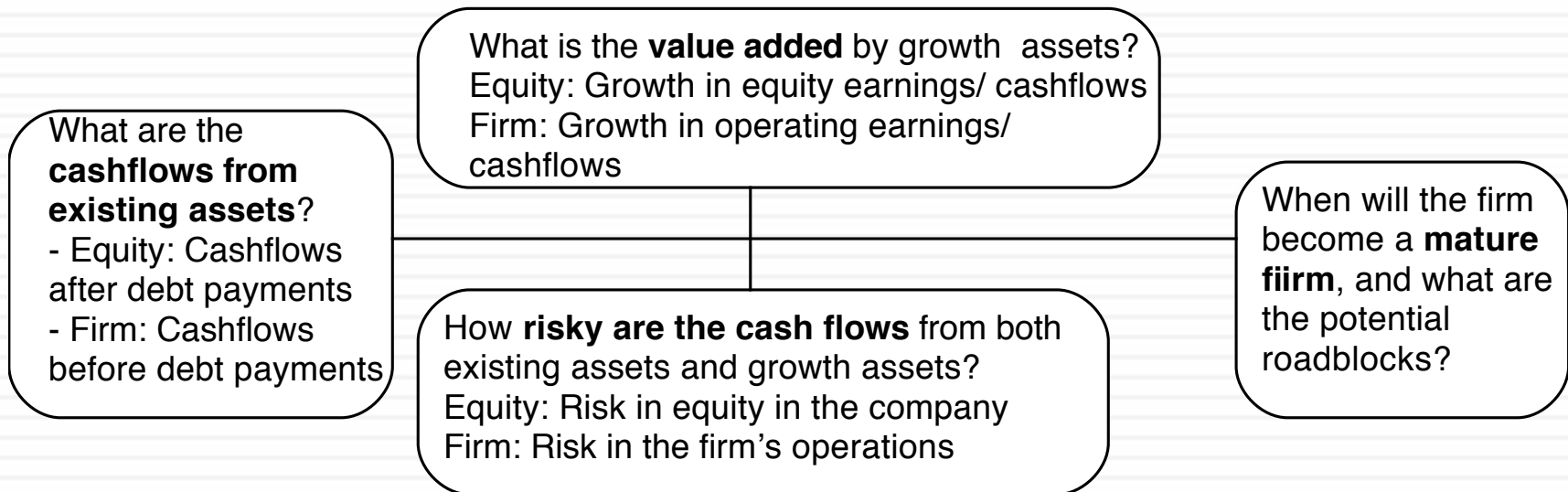
Value of Stock = $DPS_1/(k_e - g)$

| PE=Payout Ratio $(1+g)/(r-g)$ | PEG=Payout ratio $(1+g)/g(r-g)$ | PBV=ROE (Payout ratio) $(1+g)/(r-g)$ | PS= Net Margin (Payout ratio) $(1+g)/(r-g)$ |

PE=f(g, payout, risk)   PEG=f(g, payout, risk)   PBV=f(ROE,payout, g, risk)   PS=f(Net Mgn, payout, g, risk)

Equity Multiples

Firm Multiples

V/FCFF=f(g, WACC)   V/EBIT(1-t)=f(g, RIR, WACC   V/EBIT=f(g, RIR, WACC, t   VS=f(Oper Mgn, RIR, g, WACC)

| Value/FCFF=$(1+g)/$ (WACC-g) | Value/EBIT(1-t) = $(1+g)$ (1- RIR)/(WACC-g) | Value/EBIT=$(1+g)(1-$ RiR)/(1-t)(WACC-g) | VS= Oper Margin (1- RIR) $(1+g)/(WACC-g)$ |

Value of Firm = $FCFF_1/(WACC -g)$

Dealing with bias: The "bad" ways

- **I am not a crook:** You don't have to be crooked to be biased. It is easy to delude yourself into believing that you are just being objective.

- **I use only numbers:** The easiest defense is to argue that you are only using numbers and that bias requires subjective judgments.

- **I am a "professional":** Valuation professionals point to the requirements of their professional groups (CPA, CFA, CVA etc.) that they be unbiased.

- **It is a "fair" value (with my lawyer/accountant's imprimatur)**: The most common response to bias is to add legal or accounting cover.
  - Legal fair value: In most countries, investment bankers have to sign a legal document that their value is a "fair" value.
  - Accounting fair value: Accountants have jumped into the mix and have set up standards for fair value.

Healthy responses to bias

1. <u>Build processes that minimize bias, not maximize it</u>: To the degree that a significant portion of bias comes from reward/punishment mechanisms, we need to build processes that disassociate the valuation outcome from compensation.

2. <u>Be honest (at least with yourself)</u>: Even if you may not want to reveal your biases to your clients, you should at least be honest with yourself.

3. <u>Bayesian valuation</u>: It may be a good idea to require anyone valuing a company to state what they believe that they will find in the valuation, before they actually do the valuation. Anyone using the valuation should then have access to both the analyst's priors and the valuation.

4. <u>Transparency about motives</u>: All valuations should be accompanied with full details of who is paying for the valuation and how much, as well as any other stakes in the outcome of the valuation.

II. Valuation Uncertainty

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

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

How **risky are the cash flows** 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 fiirm**, 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
30%

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

First 5 years

Year	1	2	3	4	5	Term Yr
EBIT (1-t)	$3,734	$4,014	$4,279	$4,485	$4,619	$4,758
- Reinvestment	$1,120	$1,204	$1,312	$1,435	$1,540 ,	$2,113
= FCFF	$2,614	$2,810	$2,967	$3,049	$3,079	$2,645

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

Value/Share $ 83.55

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

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

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

X

Risk Premium
4%

Unlevered Beta for Sectors: 1.09

D/E=8.8%
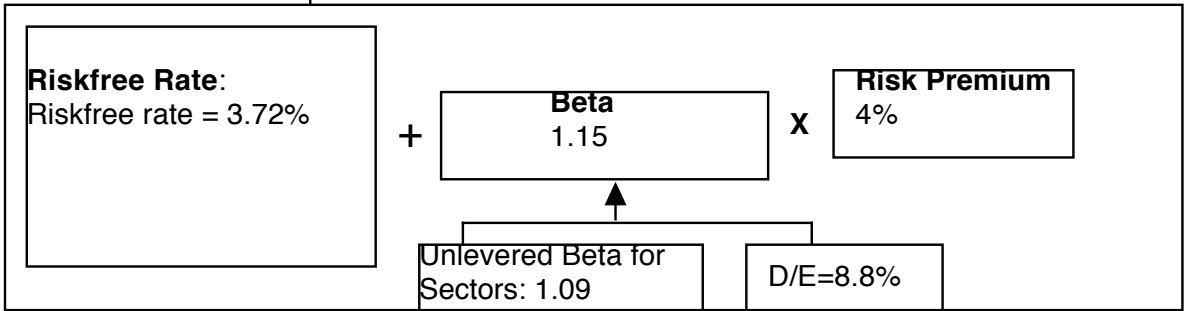
Tata Motors: April 2010

Current Cashflow to Firm
EBIT(1-t) :   Rs 20,116
- Nt CpX   Rs 31,590
- Chg WC   Rs   2,732
= FCFF   - Rs 14,205
Reinv Rate = (31590+2732)/20116 =
170.61%; Tax rate = 21.00%
Return on capital = 17.16%

Average reinvestment rate
from 2005-09: 179.59%;
without acquisitions: 70%

Reinvestment Rate
70%

**Expected Growth
from new inv.**
.70*.1716=0.1201

Return on Capital
17.16%

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 Value5= 23493/(.1039-.05) = Rs 435,686

Rs Cashflows

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

Value/Share Rs 614

Year	1	2	3	4	5	6	7	8	9	10
EBIT (1-t)	22533	25240	28272	31668	35472	39236	42848	46192	49150	51607
- Reinvestment	15773	17668	19790	22168	24830	25242	25138	24482	23264	21503
FCFF	6760	7572	8482	9500	10642	13994	17711	21710	25886	30104

45278
21785
23493

Discount at Cost of Capital (WACC) = 14.00% (.747) + 8.09% (0.253) = 12.50%

*Growth declines to 5%
and cost of capital
moves to stable period
level.*

**Cost of Equity
14.00%**

Cost of Debt
(5%+ 4.25%+3)(1-.3399)
= 8.09%

Weights
E = 74.7% D = 25.3%

On April 1, 2010
Tata Motors price = Rs 781

Riskfree Rate:
Rs Riskfree Rate= 5%

+

Beta
1.20

X

**Mature market
premium**
4.5%

+

Lambda
0.80

X

Country Equity Risk
Premium
4.50%
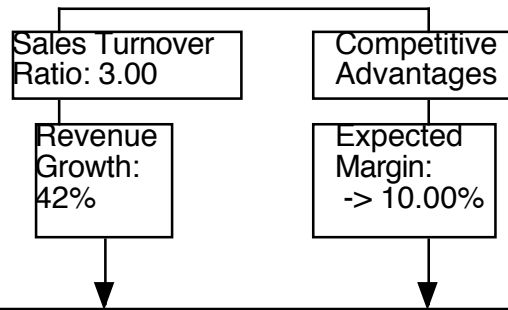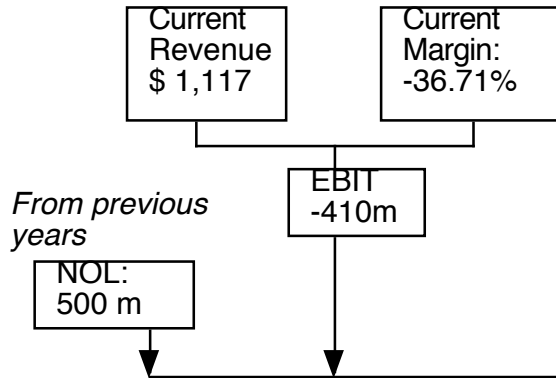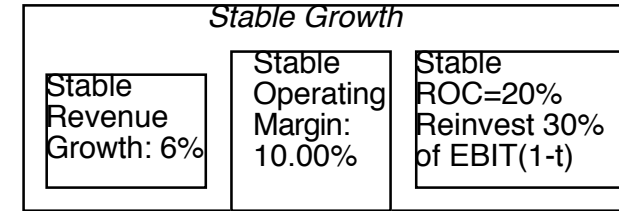
Unlevered Beta for
Sectors: 1.04

Firm's D/E
Ratio: 33%

Country Default
Spread
3%

X

Rel Equity
Mkt Vol
1.50

9a. Amazon in January 2000

Current Revenue $ 1,117

Current Margin: -36.71%

EBIT -410m

From previous years

NOL: 500 m

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

Sales Turnover Ratio: 3.00

Revenue Growth: 42%

Competitive Advantages

Expected Margin: -> 10.00%

Stable Growth

Stable Revenue Growth: 6%

Stable Operating Margin: 10.00%

Stable ROC=20% Reinvest 30% of EBIT(1-t)

Terminal Value= 1881/(.0961-.06) =52,148

Term. Year
$41,346
10.00%
35.00%
$2,688
$ 807
$1,881

Revenues	$2,793	5,585	9,774	14,661	19,059	23,862	28,729	33,211	36,798	39,006
EBIT	-$373	-$94	$407	$1,038	$1,628	$2,212	$2,768	$3,261	$3,646	$3,883
EBIT (1-t)	-$373	-$94	$407	$871	$1,058	$1,438	$1,799	$2,119	$2,370	$2,524
- 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

	1	2	3	4	5	6	7	8	9	10
Cost of Equity	12.90%	12.90%	12.90%	12.90%	12.90%	12.42%	12.30%	12.10%	11.70%	10.50%
Cost of Debt	8.00%	8.00%	8.00%	8.00%	8.00%	7.80%	7.75%	7.67%	7.50%	7.00%
AT cost of debt	8.00%	8.00%	8.00%	6.71%	5.20%	5.07%	5.04%	4.98%	4.88%	4.55%
Cost of Capital	12.84%	12.84%	12.84%	12.83%	12.81%	12.13%	11.96%	11.69%	11.15%	9.61%

Forever

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

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

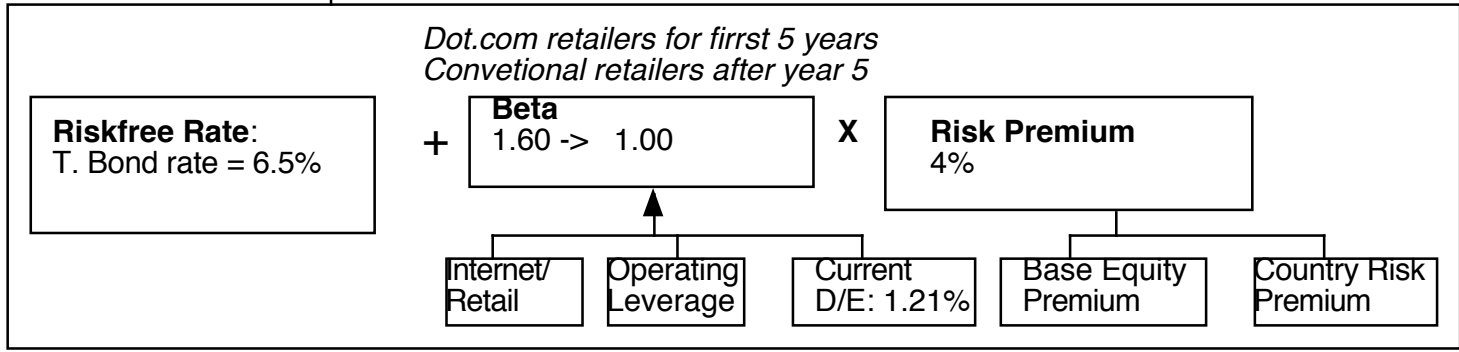Amazon was trading at $84 in January 2000.

Cost of Equity 12.90%

Used average interest coverage ratio over next 5 years to get BBB rating.

Cost of Debt 6.5%+1.5%=8.0% Tax rate = 0% -> 35%

Weights Debt= 1.2% -> 15%

Pushed debt ratio to retail industry average of 15%.

Dot.com retailers for firrst 5 years Convetional retailers after year 5

Riskfree Rate: T. Bond rate = 6.5%

+ **Beta** 1.60 -> 1.00

X **Risk Premium** 4%

Internet/ Retail

Operating Leverage

Current D/E: 1.21%

Base Equity Premium

Country Risk Premium

Twitter Pre-IPO Valuation: October 27, 2013

Starting numbers

	Last 10K	Trailing 12 month
Revenues	$316.93	$534.46
Operating income	-$77.06	-$134.91
Adjusted Operating Income		$7.67
Invested Capital		$955.00
Adjusted Operatng Margin		1.44%
Sales/ Invested Capital		0.56
Interest expenses	$2.49	$5.30

Revenue
Revenue growth of 51.5% a year for 5 years, tapering down to 2.5% in year 10

Pre-tax operating margin
Pre-tax operating margin increases to 25% over the next 10 years

Sales to capital ratio of 1.50 for incremental sales

Stable Growth
g = 2.5%; Beta = 1.00;
Cost of capital = 8%
ROC= **12**%;
Reinvestment Rate=2.5%/12% = 20.83%

Terminal Value$_{10}$= 1466/(.08-.025) = $26,657

	Operating assets	$9,705
	+ Cash	321
	+ IPO Proceeds	1295
	- Debt	214
	Value of equity	11,106
	- Options	713
	Value in stock	10,394
	/ # of shares	582.46
	Value/share	$17.84

	1	2	3	4	5	6	7	8	9	10
Revenues	$ 810	$1,227	$1,858	$2,816	$4,266	$6,044	$7,973	$9,734	$10,932	$11,205
Operating Income	$ 31	$ 75	$ 158	$ 306	$ 564	$ 941	$1,430	$1,975	$ 2,475	$ 2,801
Operating Income after tax	$ 31	$ 75	$ 158	$ 294	$ 395	$ 649	$ 969	$1,317	$ 1,624	$ 1,807
- Reinvestment	$ 183	$ 278	$ 421	$ 638	$ 967	$1,186	$1,285	$1,175	$ 798	$ 182
FCFF	$(153)	$ (203)	$ (263)	$ (344)	$ (572)	$ (537)	$ (316)	$ 143	$ 826	$ 1,625

Terminal year (11)

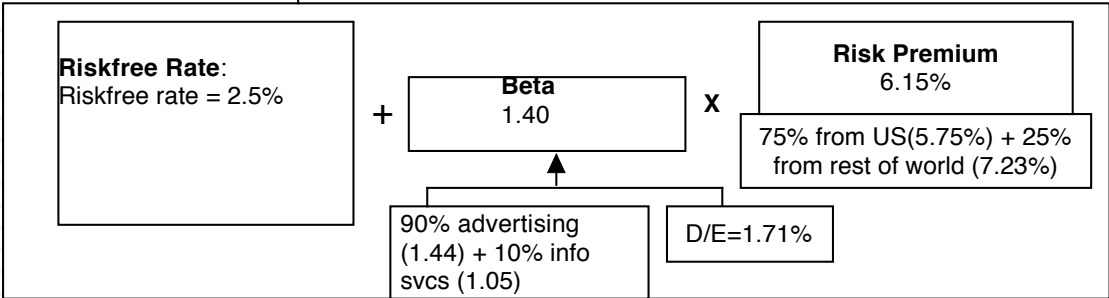|	
EBIT (1-t)	$ 1,852
- Reinvestment	$ 386
FCFF	$ 1,466

Cost of capital = 11.12% (.981) + 5.16% (.019) = 11.01%

Cost of capital decreases to 8% from years 6-10

Cost of Equity
11.12%

Cost of Debt
(2.5%+5.5%)(1-.40)
= 5.16%

Weights
E = 98.1% D = 1.9%

Riskfree Rate:
Riskfree rate = 2.5%

+

Beta
1.40

X

Risk Premium
6.15%

75% from US(5.75%) + 25% from rest of world (7.23%)

90% advertising (1.44) + 10% info svcs (1.05)

D/E=1.71%

The sources of 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 the fact that markets and economies can change over time and that even the best medals will fail to capture these unexpected changes.
- Micro uncertainty versus Macro uncertainty
  - Micro uncertainty refers to uncertainty about the potential market for a firm's 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.
- Discrete versus continuous uncertainty
  - Discrete risk: Risks that lie dormant for periods but show up at points in time. (Examples: A drug working its way through the FDA pipeline may fail at some stage of the approval process or a company in Venezuela may be nationalized)
  - Continuous risk: Risks changes in interest rates or economic growth occur continuously and affect value as they happen.

Unhealthy ways of dealing with uncertainty

1. <u>Paralysis & Denial</u>: 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

2. <u>Mental short cuts (rules of thumb)</u>: 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.

3. <u>Herding</u>: When in doubt, it is safest to go with the crowd.. The herding instinct is deeply engrained and very difficult to fight.

4. <u>Outsourcing</u>: 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.

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Healthy responses to uncertainty

1. Less is more.

2. Build in internal checks on reasonableness.

3. Don't sweat the discount rate

4. Use the offsetting principle (risk free rates & inflation at Tata Motors)

5. Draw on economic first principles (Terminal value at all the companies)

6. Confront uncertainty, if you can.

1. Less is more
Revenues & Margins for Twitter, pre-IPO

Put intermediate numbers on autopilot

Year	Revenue growth rate	Revenues	Operating Margin	EBIT	EBIT (1-t)
Base		$534.46	1.44%	$7.67	
1	51.50%	$809.71	3.79%	$30.70	$30.70
2	51.50%	$1,226.71	6.15%	$75.42	$75.42
3	51.50%	$1,858.47	8.50%	$158.06	$158.06
4	51.50%	$2,815.58	10.86%	$305.81	$294.22
5	51.50%	$4,265.60	13.22%	$563.82	$394.67
6	41.70%	$6,044.35	15.57%	$941.36	$648.60
7	31.90%	$7,972.50	17.93%	$1,429.53	$969.22
8	22.10%	$9,734.43	20.29%	$1,974.84	$1,317.22
9	12.30%	$10,931.76	22.64%	$2,475.34	$1,623.82
10	2.50%	$11,205.05	25.00%	$2,801.26	$1,806.81
TY	2.50%	$11,485.18	25.00%	$2,871.29	$1,851.99

The NOLs are embedded in the taxes and cash flows.

Be parsimonious: Estimate the big numbers (revenues and margin in year 10)

Revenue Judgment: The existing players

	2011		2012		2013	
	%	$	%	$	%	$
Google	32.09%	$27.74	31.46%	$32.73	33.24%	$38.83
Facebook	3.65%	$3.15	4.11%	$4.28	5.04%	$5.89
Yahoo!	3.95%	$3.41	3.37%	$3.51	3.10%	$3.62
Microsoft	1.27%	$1.10	1.63%	$1.70	1.78%	$2.08
IAC	1.15%	$0.99	1.39%	$1.45	1.47%	$1.72
AOL	1.17%	$1.01	1.02%	$1.06	0.95%	$1.11
Amazon	0.48%	$0.41	0.59%	$0.61	0.71%	$0.83
Pandora	0.28%	$0.24	0.36%	$0.37	0.50%	$0.58
Twitter	0.16%	$0.14	0.28%	$0.29	0.50%	$0.58
Linkedin	0.18%	$0.16	0.25%	$0.26	0.32%	$0.37
Millennial Media	0.05%	$0.04	0.07%	$0.07	0.10%	$0.12
Other	55.59%	$48.05	55.47%	$57.71	52.29%	$61.09
Total Market	100%	$86.43	100.00%	$104.04	100.00%	$116.82

The Total Advertising Market in 2013

	2011	2012	2013	Growth rate
Newspapers	$96.7	$93.2	$91.3	-2.83%
Magazines	$45.0	$43.2	$42.3	-3.05%
Television	$190.1	$197.6	$205.5	3.97%
Radio	$33.7	$34.3	$35.2	2.20%
Cinema	$2.5	$2.7	$2.8	5.83%
Outdoor	$31.7	$32.3	$33.2	2.34%
Online	$76.9	$88.6	$101.5	14.89%
Total	$476.6	$491.9	$511.8	3.63%

The Online Ad market in 2023

		Annual growth rate in Global Advertising Spending				
		2.00%	2.50%	3.00%	3.50%	4.00%
Online advertising share of market	20%	$124.78	$131.03	$137.56	$144.39	$151.52
	25%	$155.97	$163.79	$171.95	$180.49	$189.40
	30%	$187.16	$196.54	$206.34	$216.58	$227.28
	35%	$218.36	$229.30	$240.74	$252.68	$265.16
	40%	$249.55	$262.06	$275.13	$288.78	$303.04

And margin judgments

Company	Revenue	EBIT (TTM)	Operating Margin
Google Inc. (NasdaqGS:GOOG)	$55,797.00	$12,734.00	22.82%
Facebook, Inc. (NasdaqGS:FB)	$6,118.00	$1,835.00	29.99%
Yahoo! Inc. (NasdaqGS:YHOO)	$4,823.20	$665.00	13.79%
Netlfix	$3,944.00	$124.70	3.16%
Groupon	$2,417.00	$61.10	2.53%
LinkedIn Corporation (NYSE:LNKD)	$1,244.00	$64.44	5.18%
Pandora Media, Inc. (NYSE:P)	$528.00	-$48.20	-9.13%
Yelp, Inc. (NYSE:YELP)	$178.70	-$11.06	-6.19%
OpenTable, Inc. (NasdaqGS:OPEN)	$173.80	$43.27	24.90%
RetailMeNot	$168.90	$76.68	45.40%
Travelzoo Inc. (NasdaqGS:TZOO)	$156.00	$24.43	15.66%
Zillow, Inc. (NasdaqGS:Z)	$152.10	-$101.30	-66.60%
Trulia, Inc. (NYSE:TRLA)	$92.80	-$6.30	-6.79%
Aggregate	$75,793.50	$15,461.76	20.40%

2. Build in "internal" checks ...
Reinvestment and Return on Capital

Year	Change in revenues	Sales/Capital	Reinvestment	Invested Capital	EBIT (1-t)	ROC
Base				$955	$ 7.67	0.80%
1	$ 275.25	1.50	$ 183.50	$1,138.90	$ 30.70	2.70%
2	$ 417.00	1.50	$ 278.00	$1,416.90	$ 75.42	5.32%
3	$ 631.76	1.50	$ 421.17	$1,838.07	$ 158.06	8.60%
4	$ 957.11	1.50	$ 638.07	$2,476.15	$ 294.22	11.88%
5	$ 1,450.02	1.50	$ 966.68	$3,442.83	$ 394.67	11.46%
6	$ 1,778.75	1.50	$ 1,185.84	$4,628.66	$ 648.60	14.01%
7	$ 1,928.15	1.50	$ 1,285.43	$5,914.10	$ 969.22	16.39%
8	$ 1,761.92	1.50	$ 1,174.62	$7,088.71	$1,317.22	18.58%
9	$ 1,197.33	1.50	$ 798.22	$7,886.94	$1,623.82	20.59%
10	$ 273.29	1.50	$ 182.20	$8,069.13	$1,806.81	22.39%

Comfortable with ROC = 22.39% in year 10?
- *Check against cost of capital*
- *Check against industry average*

Sales to Invested Capital

Incremental Sales/Reinvestment: Twitter					Total Sales/ Invested Capital		
	2010	2011	2012		Twitter: 2013	Facebook: 2013	Advertising Sector
Change in revenues	$28.3	$78.0	$210.6	Revenue	$448.2	$6,118.0	
Reinvestment	$44.0	$99.3	$176.5	Invested Capital	$549.1	$4,654.0	
Sales/Invested Capital	0.64	0.79	1.19		0.82	1.31	1.40

3. Don't sweat over the discount rate: Twitter's cost of capital

Cost of capital = 11.12% (.981) + 5.16% (.019) = 11.01%

Cost of Equity
11.12%

Cost of Debt
(2.5%+5.5%)(1-.40)
= 5.16%

Weights
E = 98.11% D = 1.89%

Riskfree Rate:
Riskfree rate = 2.5%

+

Beta
1.40

X

Risk Premium
6.15%

75% from US(5.75%) + 25% from rest of world (7.23%)

90% advertising (1.44) + 10% info svcs (1.05)

D/E=1.71%
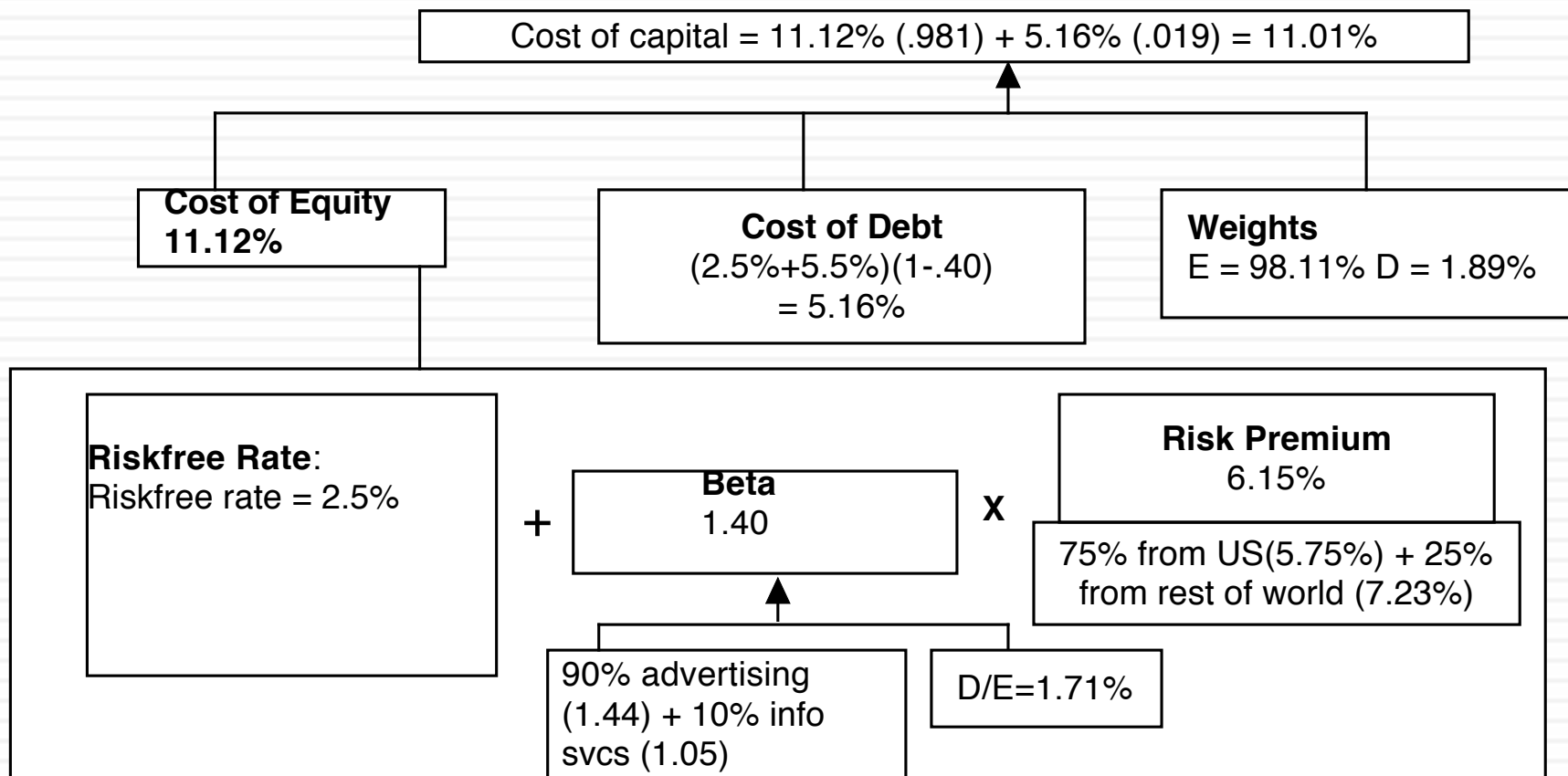
4. Just be consistent on macro variables
Tata Motors: In Rupees and US dollars

(1.125)*(1.01/1.04)-1 = .0925

	In Indian Rupees	In US $
Risk free Rate	5.00%	2.00%
Expected inflation rate	4.00%	1.00%
Cost of capital		
- High Growth	12.50%	9.25%
- Stable Growth	10.39%	7.21%
Expected growth rate		
- High Growth	12.01%	8.78%
- Stable Growth	5.00%	2.00%
Return on Capital		
- High Growth	17.16%	13.78%
- Stable Growth	10.39%	7.21%
Value per share	Rs 614	$12.79/share (roughly Rs 614 at current exchange rate)

Equity versus Firm: If cash flows are post-debt and to equity, you should discount at the cost of equity. Pre-debt cash flows should be discounted at the cost of capital.

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

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5. Draw on Econ 101 and Math 101; The terminal value limits
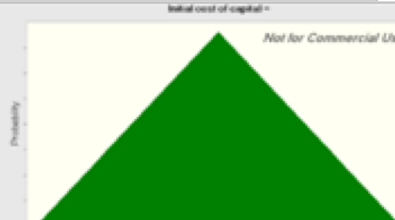
Stable growth rate	3M	Tata Motors	Amazon	Twitter
0%	$70,409	435,686₹	$26,390	$23,111
1%	$70,409	435,686₹	$28,263	$24,212
2%	$70,409	435,686₹	$30,595	$25,679
3%	$70,409	435,686₹	$33,594	
4%		435,686₹	$37,618	
5%		435,686₹	$43,334	
			$52,148	
Riskfree rate	3.72%	5%	6.60%	2.70%
ROIC	6.76%	10.39%	20%	12.00%
Cost of capital	6.76%	10.39%	9.61%	8.00%

And the market share cannot > 100%

Company	Market Capitalization	Enterprise Value	Current Revenues	Breakeven Revenues (2023)	% from Online Ads (2012)	Imputed Online Ad Revenue (2023)	Cost of capital	Target margin
Google	$291,586.00	$240,579.00	$56,594.00	$168,336.00	87.07%	$146,570.16	10%	22.49%
Facebook	$119,769.00	$111,684.00	$6,118.00	$90,959.00	84.08%	$76,478.33	10%	29.99%
Yahoo!	$34,688.00	$29,955.00	$4,823.00	$17,695.00	100%	$17,695.00	10%	25.00%
Linkedin	$27,044.00	$26,171.00	$1,244.00	$32,110.00	80.41%	$25,819.65	10%	25.00%
Twitter (Est)	$12,000.00	$11,000.00	$448.00	$7,846.00	90.00%	$7,061.40	10%	25.00%
Pandora	$4,833.00	$4,774.00	$528.00	$3,085.00	87.84%	$2,709.86	10%	25.00%
Yelp	$4,422.00	$4,325.00	$179.00	$2,825.00	94.31%	$2,664.26	10%	25.00%
Zillow	$3,192.00	$3,060.00	$152.00	$1,984.00	25.83%	$512.47	10%	25.00%
AOL	$2,586.00	$2,208.00	$2,211.00	$10,055.00	64.72%	$6,507.60	10%	9.32%
Retailmenot	$1,718.00	$1,644.00	$169.00	$1,605.00	100%	$1,605.00	10%	25.00%
OpenTable	$1,597.00	$1,505.00	$173.77	$1,361.38	74.22%	$1,010.42	10%	25.00%
US based	**$503,435.00**	**$436,905.00**	**$72,639.77**	**$337,861.38**	**$8.88**	**$288,634.13**		
Baidu	$53,589.00	$49,961.00	$4,182.00	$15,526.00	99.73%	$15,484.08	10%	25.00%
Sohu.com	$3,166.00	$2,540.00	$1,231.00	$1,338.00	36.33%	$486.10	10%	21.45%
Naver	$17,843.00	$17,595.00	$133.00	$11,227.00	62.94%	$7,066.27	10%	25.00%
Yandex	$12,654.00	$11,872.00	$1,065.00	$7,684.00	98%	$7,505.73	10%	25.00%
Global	**$590,687.00**	**$518,873.00**	**$79,250.77**	**$373,636.38**	**$11.85**	**$319,176.31**		

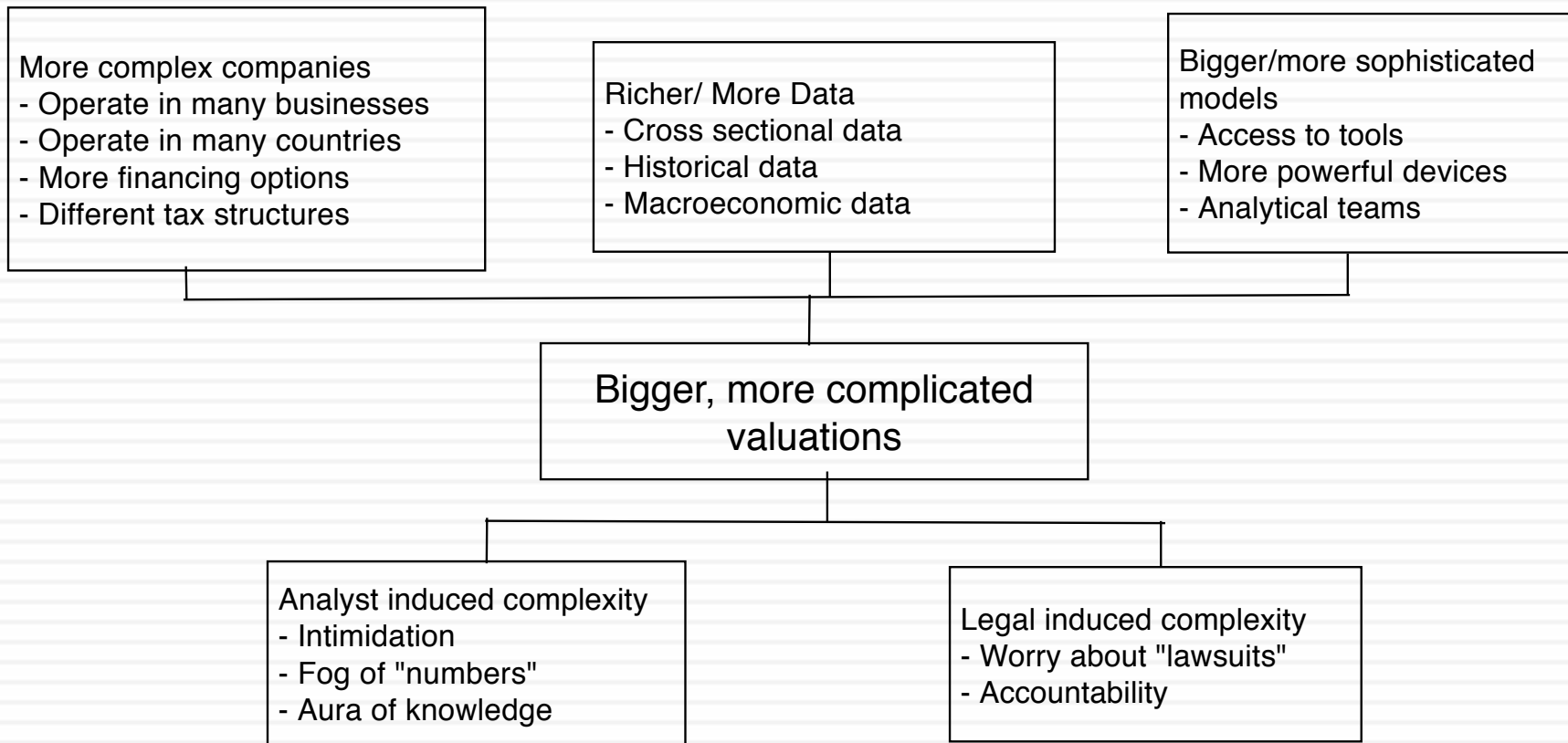# 6. Confront uncertainty, if you can...
Revisiting the Twitter valuation

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…

Percentile	Forecast values
0%	($1,279.18)
10%	$5,121.73
20%	$6,264.92
30%	$7,267.34
40%	$8,336.73
50%	$9,554.16
60%	$10,971.39
70%	$12,643.68
80%	$14,771.24
90%	$17,757.35
100%	$38,864.54
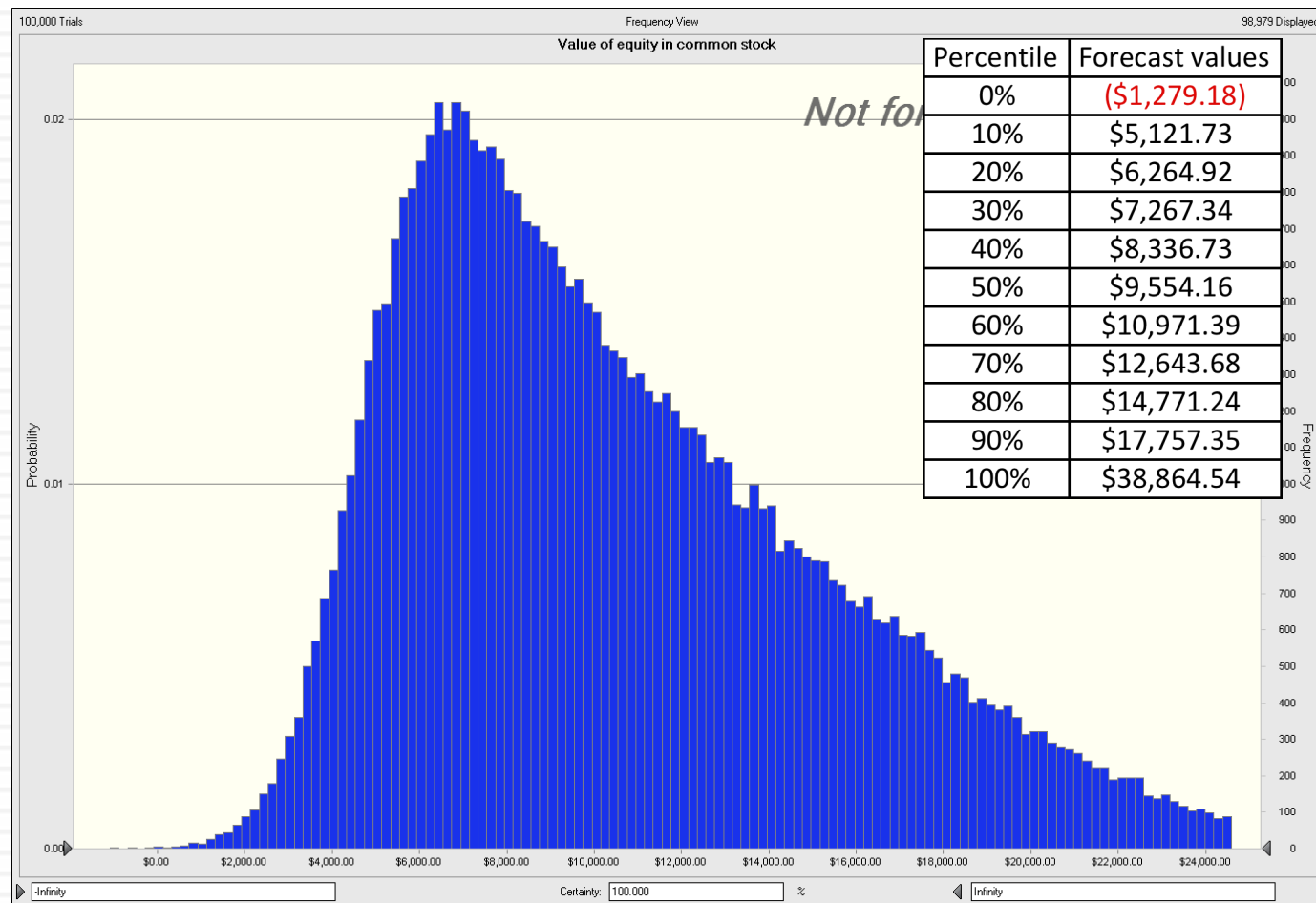
III. Complexity in valuation

More complex companies
- Operate in many businesses
- Operate in many countries
- More financing options
- Different tax structures

Richer/ More Data
- Cross sectional data
- Historical data
- Macroeconomic data

Bigger/more sophisticated models
- Access to tools
- More powerful devices
- Analytical teams

Bigger, more complicated valuations

Analyst induced complexity
- Intimidation
- Fog of "numbers"
- Aura of knowledge

Legal induced complexity
- Worry about "lawsuits"
- Accountability

Sources of complexity

- **Globalization**: As companies globalize, valuations are getting more complex for a number of reasons:
    - Risk assessment has to factor in where a company operates and not where it is incorporated.
    - Currency choices proliferate, since a company can be valued in any of a half a dozen currencies (often to value different listings)

- **Shifting and volatile macro economic risks** have created changing risk premiums and strange interest rate/exchange rate environments.

- **More complex accounting standards** have created longer, more complicated, more difficult to read financial statements.

- **More complicated holding structures** (cross holdings, shares with different voting rights), motivated by tax and control reasons, make valuations more difficult.

Manifestations of complexity

1. <u>Mysterious terms/acronyms</u>: A feature of complex valuation is line items or terms that sound "sophisticated" but you do not know or are not sure what they mean or measure. (For an added layer of intimidation, make them Greek alphabets…)

2. <u>Longer, more detailed valuations</u>: The level of detail that you see in valuations, with hundreds of line items and dozens of inputs, is staggering (and scary).

3. <u>What if and scenario analysis</u>: While there is a place for asking what if questions and scenario analysis in valuation, the ease with which it can be done has opened the door to abuse, with the primary objective becoming cover, no matter what happens.

Unhealthy responses to complexity

1. <u>Input fatigue</u>: Analysts who are called upon to estimate dozens and dozens of inputs, often with little information to do so, will give up at some point and input "numbers" just to get done. It is "garbage in, garbage out…

2. <u>Black box models</u>: The models becomes so complicated that what happens inside the model becomes a mystery to those outside. Consequently, analysts essentially claim no ownership or responsibility for the output from the model. "The model did it" becomes the refrain.

3. <u>Suspension of common sense</u>: The dependence on models becomes so complete that analysts lose sight of common sense and mangle the valuation of the simplest assets.

Healthy responses to complexity

1. <u>Parsimonious valuations</u>: Never estimate more inputs than you absolutely have to. Less is more. When faced with the question of adding more detail/complexity, ask yourself whether it will make your valuation more precise (or just make it look more precise).

2. <u>Go back to first principles</u>: The fundamentals of valuation don't change, just because you are faced with complexity. Always fall back on first principles.

3. <u>Focus on key levers</u>: Even when there are dozens of inputs in a valuation, the valuation itself is a function of three or four key value drivers (which may be different for different companies). Keep your focus on those variables

In closing

- The problem with valuation practice is not that we do not have access to enough data or that our models are not good enough or that we don't understand valuation.

- The perils to good valuation lie in three very human failings:

  - We are biased and we don't like to admit we are biased. Instead, we delude ourselves into believing that we are being fair and objective.

  - We fear uncertainty and try to evade it or hide from it.

  - We think that bigger and more sophisticated models will make the big choices for us and spare us the pain of having to do it ourselves.

ADDENDUM: BIAS EXAMPLES

There is an anchoring bias

- Tversky & Kahnemann ran an experiment with two groups. They drew a number from a spinning wheel, say 10, and then asked people to guess whether the percent of African countries was greater or less than 10%. They then asked them to guess the actual percent. The median answer was 25%. They drew a different number for the second group (say 40) and then asked the same questions. The median value of the second group was 65%.

- I ran the same experiment on a class, where I gave the same prospectus for an IPO to two sections of the same valuation class. For one section, I threw in the number "ten" randomly into the discussion (not tied to anything with the company) and for the second, I threw in the number "twenty five" into the discussion, again randomly. The median value per share for the first group was clustered around $12/share, whereas it was closer to $30/share for the second group.

And it gets worse with unfamiliarity

Figure 2. Anchoring Effect in Experiment 2 by Subject Type

In the high condition, subjects are told about the exceptionally good real returns during the recent 20-year period in Sweden, quoting 20% real returns. In the low condition, subjects are told about the exceptionally bad real returns during the recent 20-year period in Japan, quoting 2% real returns. The respondents then make a subjective estimate of whether the future return in Europe will exceed or underperform the 20% or 2% threshold.

Difference in Estimated Future Returns Between Conditions (%)

Subject Type	Value
Student, Other Major, No Experience	10.6
Student, No Experience	9.6
Student, Other Major	8.4
Student, Finance Major	6.1
Student, with Experience	5
Student, Finance Major, with Experience	3.7
Professional > 2 Years	2.5
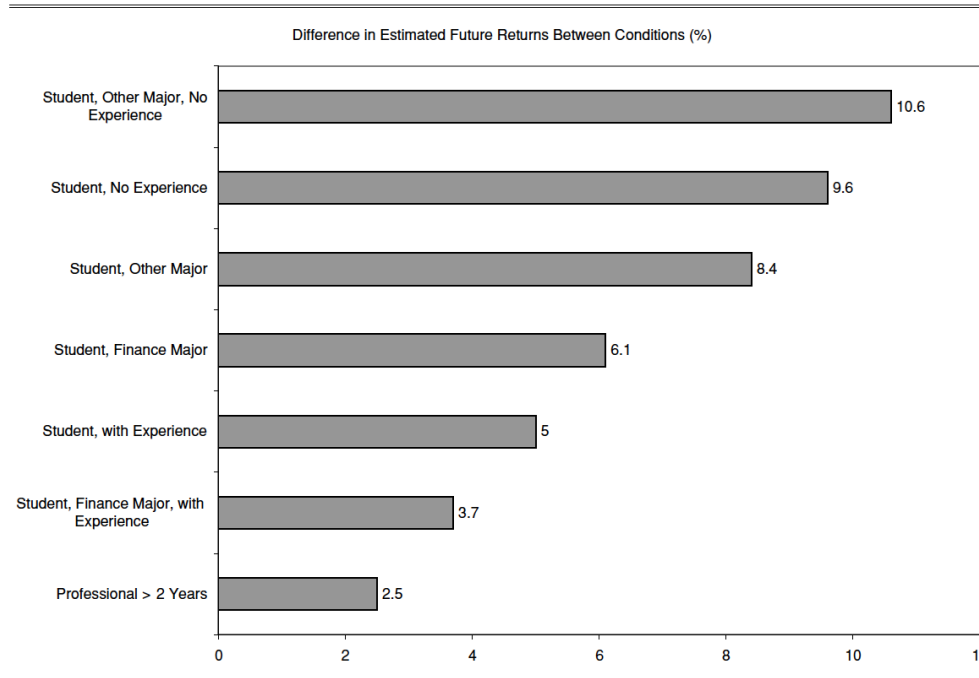
Kaustia, Alho, and Puttonen: Ran experiement with 300 financial market professionals and 213 students.

The bias of past prices
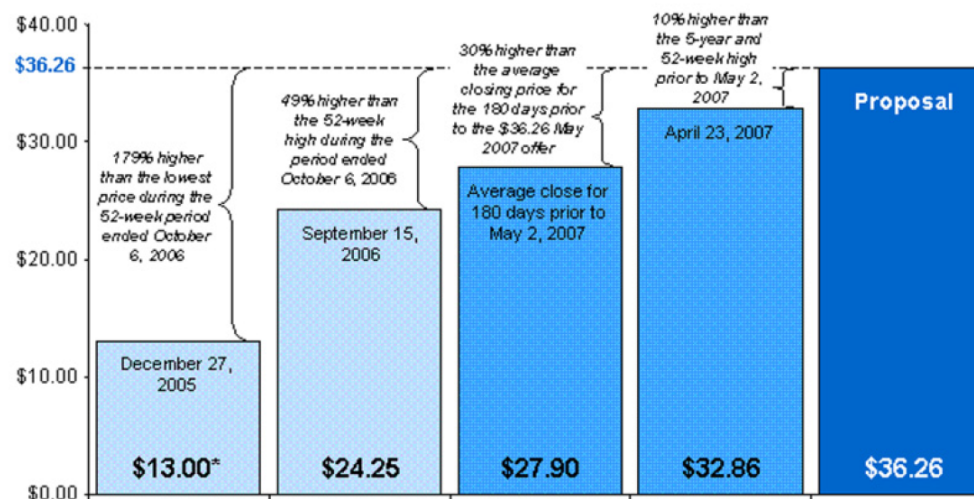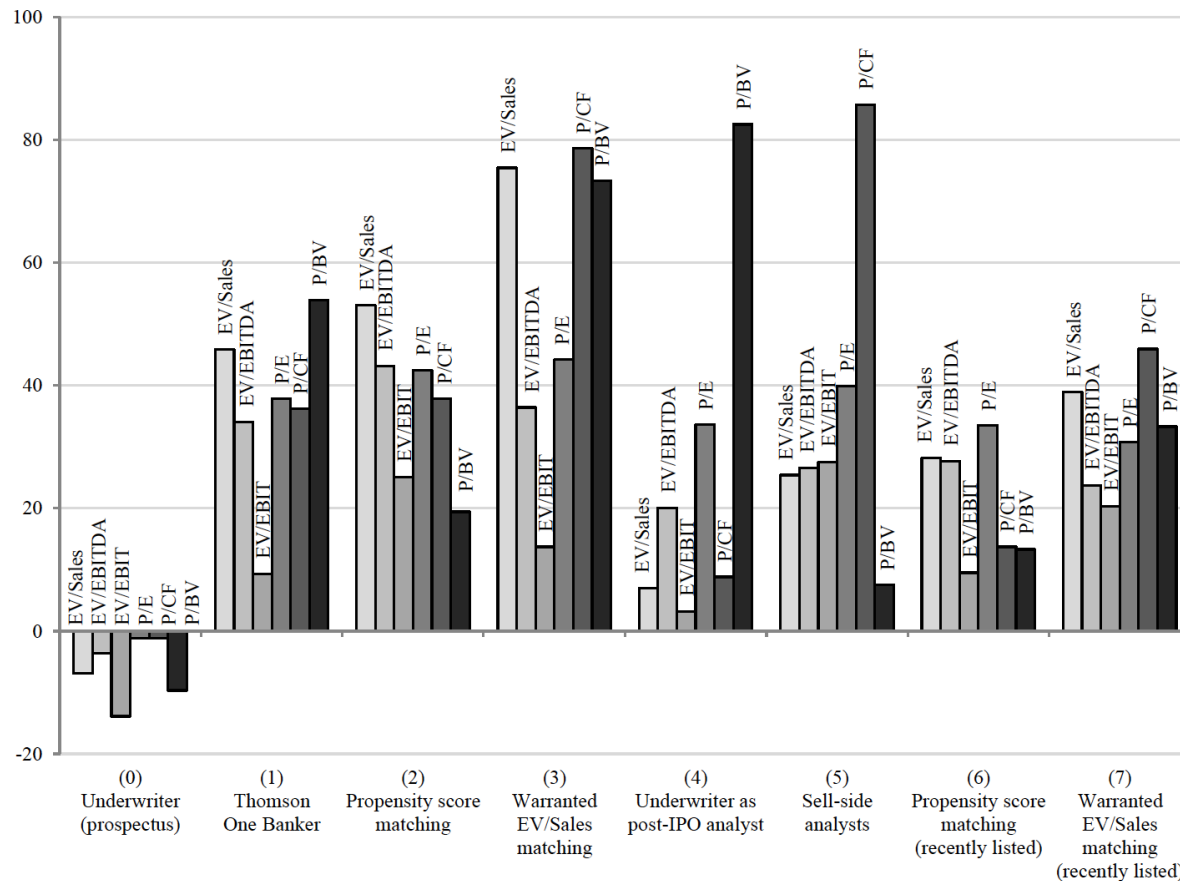

*Source: Baker & Wurgler (2012)*
They show that acquisition pricing is often tied to 52-week high prices, rather than to valuation. This then explains why acquisitions tend to increase in up markets and down in down markets.

Biases in IPO pricing: IPO multiple versus Peer Group Multiple

Paleari, Signori and Vismara (2012): Looked at 348 IPOs in France & Italy and found that the peer groups used by underwriters to justify valuations were about 14-37% higher than peer groups using other approaches.

IPOs: Underwriting Bias

Buy recommendations from non-underwriting analysts

Buy recommendations from underwriting analysts
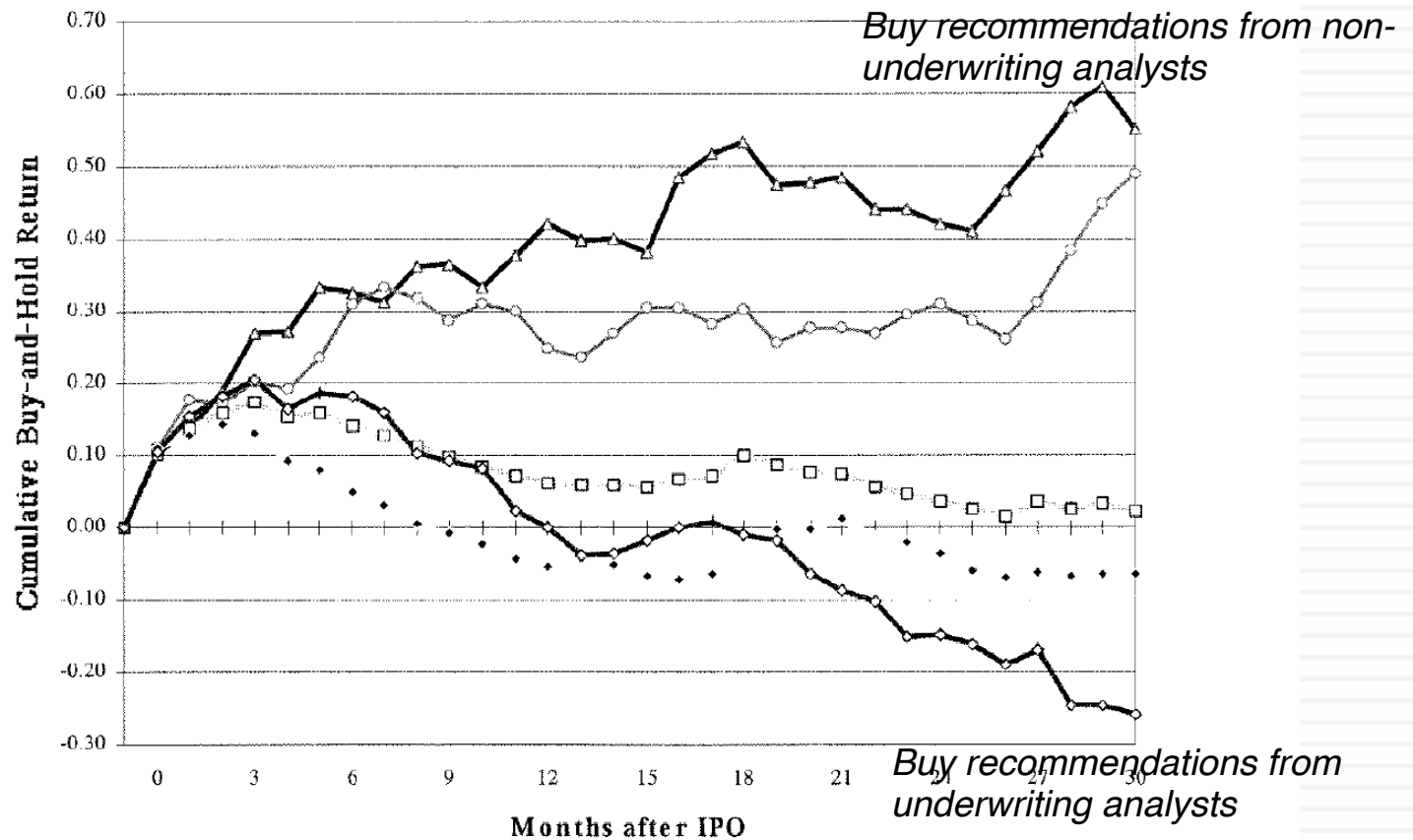
Michaely & Womack: Analysts from IPO underwriting banks are "too optimistic" in their buy recommendations.