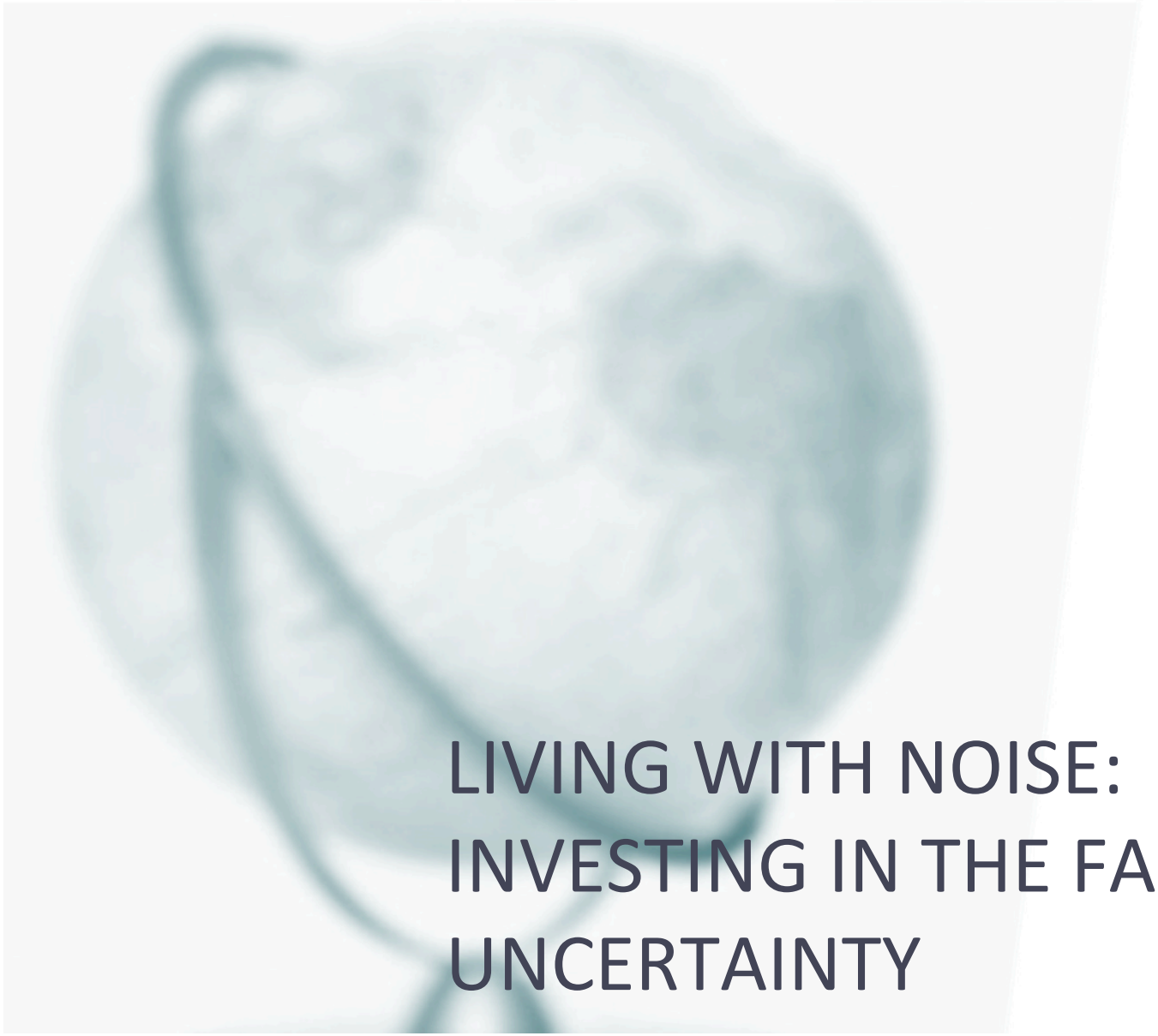


LIVING WITH NOISE: INVESTING IN THE FACE OF UNCERTAINTY

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.

Forecasting in the face of uncertainty. A test:

- In which of these two cities would you find it easier to forecast the weather?

Weather changeability for Honolulu, Hawaii

Temperature	Last Month	Last Year
Average change in high temperature day-to-day	1.7°	1.2°
Average change in low temperature day-to-day	1.5°	2.0°

Precipitation	Last Month	Last Year
Chance of dry day after a precip day	67%	81%
Chance of precip day after a dry day	7%	13%

Weather changeability for Epping, North Dakota

Temperature	Last Month	Last Year
Average change in high temperature day-to-day	8.5°	7.7°
Average change in low temperature day-to-day	7.1°	8.6°

Precipitation	Last Month	Last Year
Chance of dry day after a precip day	50%	65%
Chance of precip day after a dry day	38%	20%

But the payoff is greatest where there is the most uncertainty…

5

Weather changeability for Honolulu, Hawaii

Temperature	Last Month	Last Year
Average change in high temperature day-to-day	1.7°	1.2°
Average change in low temperature day-to-day	1.5°	2.0°

Precipitation	Last Month	Last Year
Chance of dry day after a precip day	67%	81%
Chance of precip day after a dry day	7%	13%

Further changeability analysis »

Weather forecast accuracy for Honolulu, Hawaii

Last Month	
MeteoGroup	**88.44%**
Persistence	**81.80%**
CustomWeather	**78.23%**
The Weather Channel	73.12%
AccuWeather	69.89%
Weather Underground	62.10%
National Weather Service	48.39%
Foreca	44.35%
WeatherBug	32.26%

Last Year	
MeteoGroup	**88.50%**
CustomWeather	**85.87%**
AccuWeather	**81.82%**
The Weather Channel	81.56%
Persistence	80.44%
Weather Underground	67.07%
National Weather Service	59.90%
Foreca	57.52%
WeatherBug	37.09%

Weather changeability for Epping, North Dakota

Temperature	Last Month	Last Year
Average change in high temperature day-to-day	8.5°	7.7°
Average change in low temperature day-to-day	7.1°	8.6°

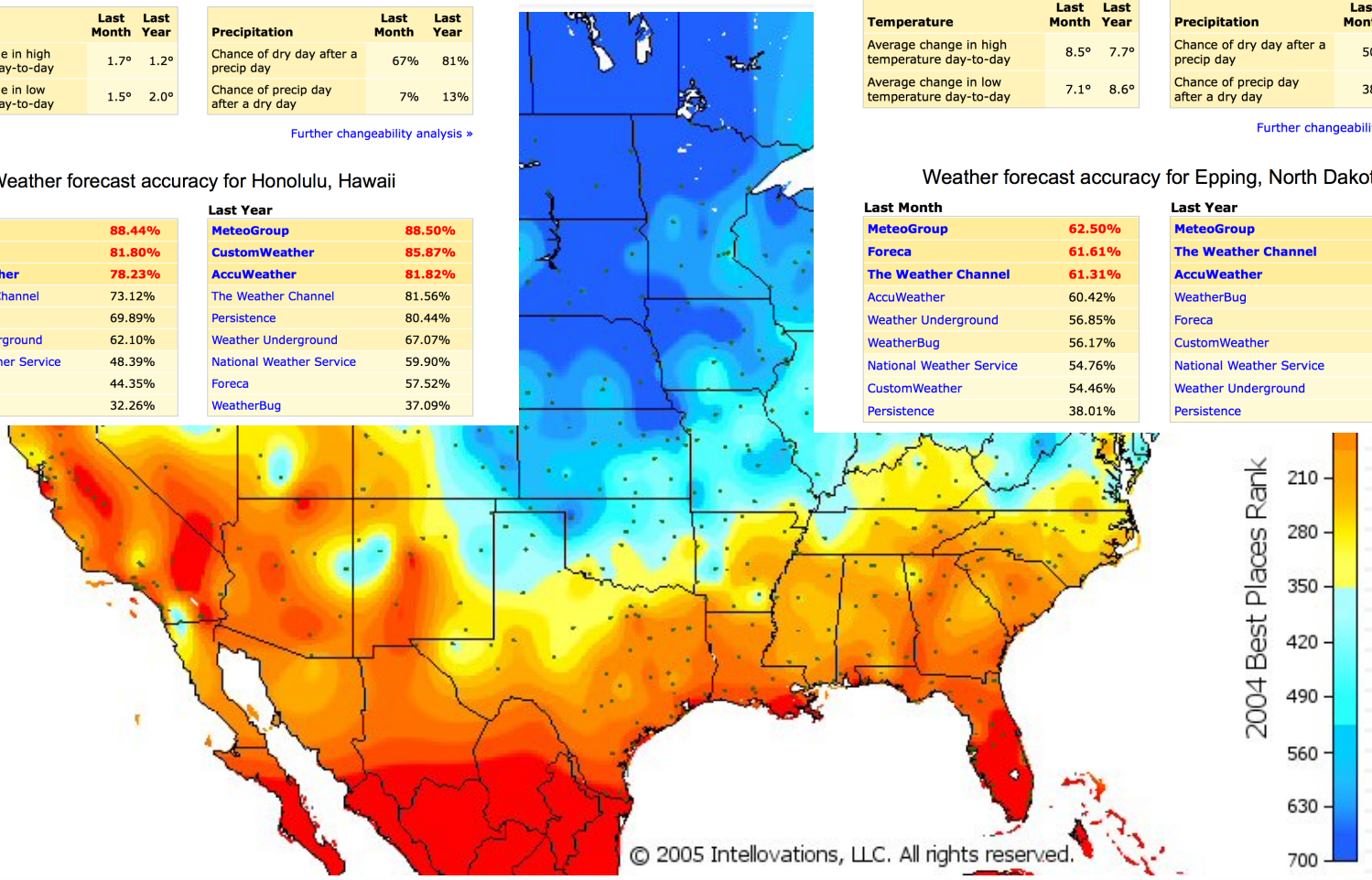
Precipitation	Last Month	Last Year
Chance of dry day after a precip day	50%	65%
Chance of precip day after a dry day	38%	20%

Further changeability analysis »

Weather forecast accuracy for Epping, North Dakota

Last Month	
MeteoGroup	**62.50%**
Foreca	**61.61%**
The Weather Channel	**61.31%**
AccuWeather	60.42%
Weather Underground	56.85%
WeatherBug	56.17%
National Weather Service	54.76%
CustomWeather	54.46%
Persistence	38.01%

Last Year	
MeteoGroup	**66.97%**
The Weather Channel	**66.73%**
AccuWeather	**64.86%**
WeatherBug	64.80%
Foreca	62.75%
CustomWeather	62.70%
National Weather Service	62.64%
Weather Underground	61.38%
Persistence	44.09%



Intrinsic Value: Three Basic Propositions

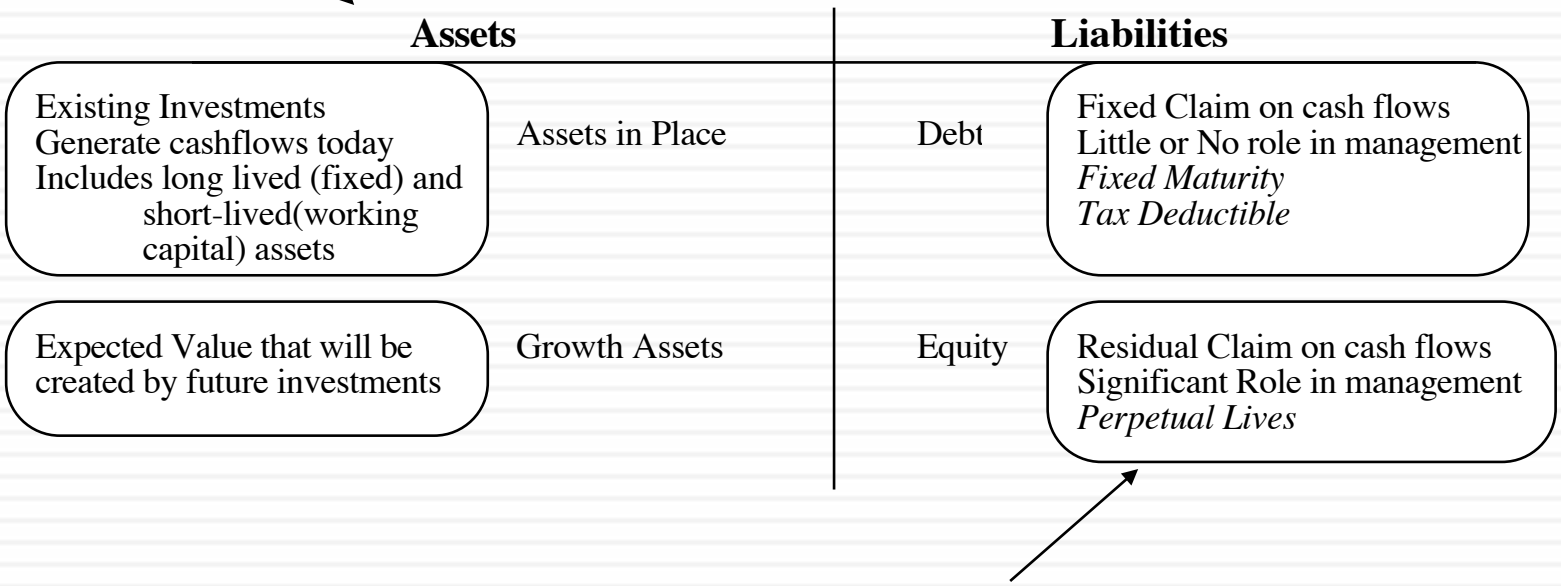
- The value of an asset is the present value of the expected cash flows on that asset, over its expected life:

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

- 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.

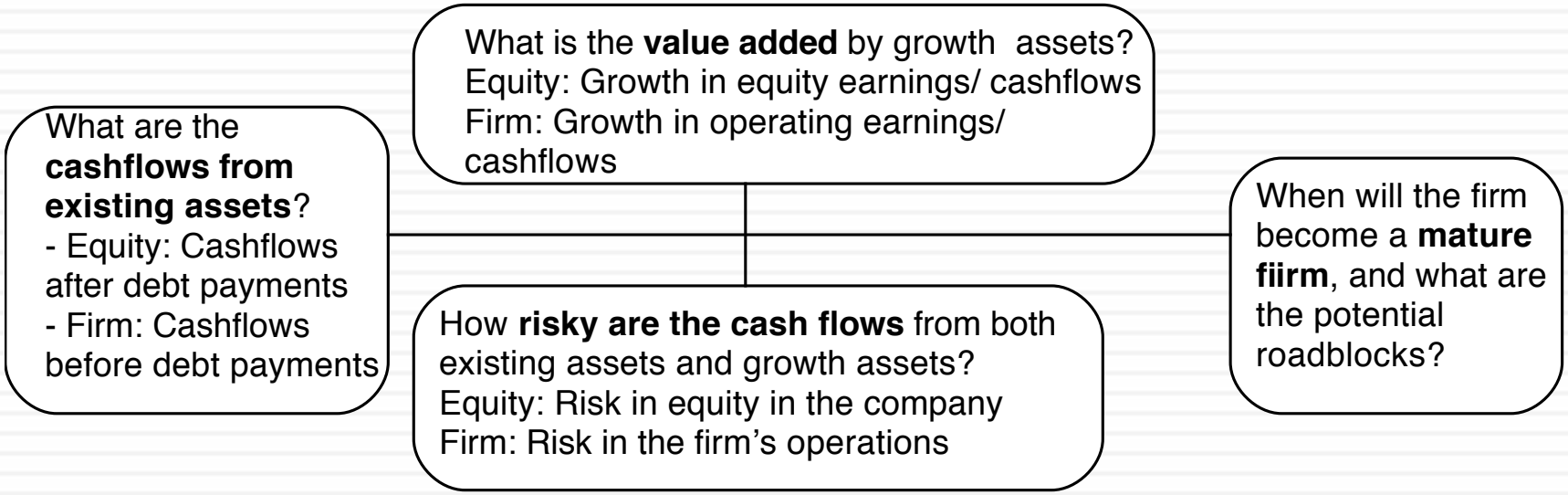
DCF Choices: Equity Valuation versus Firm Valuation

Firm Valuation: Value the entire business

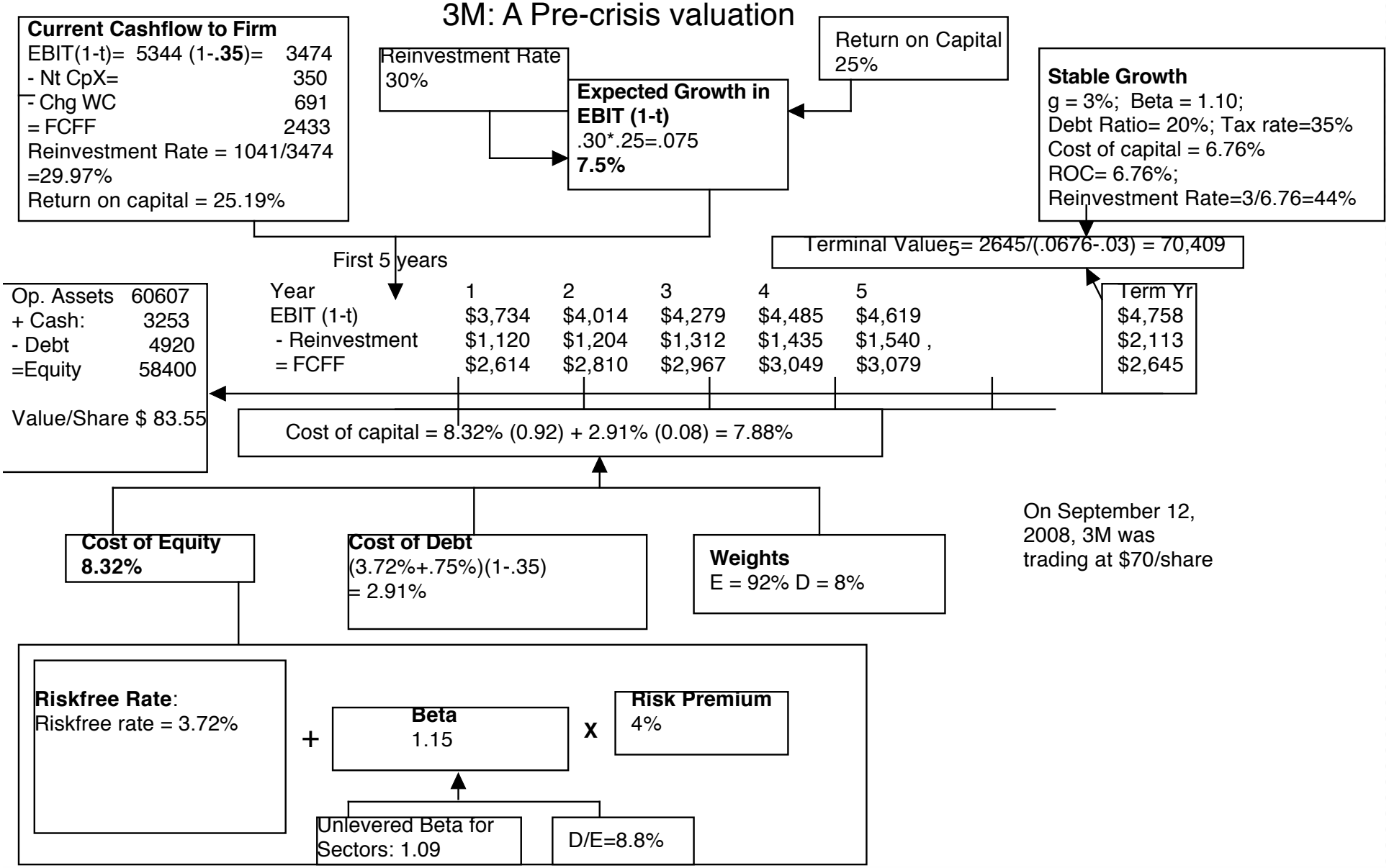


Equity valuation: Value just the equity claim in the business

The fundamental determinants of value…



3M: A Pre-crisis valuation



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

Valuing Vale in November 2013 (in US dollars)

Let's start with some history & estimate what a normalized year will look like

Year	Operating Income ($)	Effective tax rate	BV of Debt	BV of Equity	Cash	Invested capital	Return on capital
2009	$6,057	27.79%	$18,168	$42,556	$12,639	$48,085	9.10%
2010	$23,033	18.67%	$23,613	$59,766	$11,040	$72,339	25.90%
2011	$30,206	18.54%	$27,668	$70,076	$9,913	$87,831	28.01%
2012	$13,346	18.96%	$23,116	$78,721	$3,538	$98,299	11.00%
2013 (TTM)	$15,487	20.65%	$30,196	$75,974	$5,818	$100,352	12.25%
Normalized	**$17,626**	**20.92%**					**17.25%**

Estimate the costs of equity & capital for Vale

Business	*Sample size*	*Unlevered beta of business*	*Revenues*	*Peer Group EV/Sales*	*Value of Business*	*Proportion of Vale*
Metals & Mi	48	0.86	$9,013	1.97	$17,739	16.65%
Iron Ore	78	0.83	$32,717	2.48	$81,188	76.20%
Fertilizers	693	0.99	$3,777	1.52	$5,741	5.39%
Logistics	223	0.75	$1,644	1.14	$1,874	1.76%
Vale Operations		*0.8440*	*$47,151*		*$106,543*	*100.00%*

Market D/E = 54.99%
Marginal tax rate = 34.00% (Brazil)
Levered Beta = 0.844 (1+(1-.34)(.5499)) = 1.15
Cost of equity = 2.75% + 1.15 (7.38%) = 10.87%

	% of revenues	ERP
US & Canada	4.90%	5.50%
Brazil	16.90%	8.50%
Rest of Latin America	1.70%	10.09%
China	37.00%	6.94%
Japan	10.30%	6.70%
Rest of Asia	8.50%	8.61%
Europe	17.20%	6.72%
Rest of World	3.50%	10.06%
Vale ERP	**100.00%**	**7.38%**

Vale's rating: A-
Default spread based on rating = 1.30%
Cost of debt (pre-tax) = 2.75% + 1.30% = 4.05%

Cost of capital = 11.23% (.6452) + 4.05% (1-.34) (.3548) = 8.20%

Assume that the company is in stable growth, growing 2% a year in perpetuity

$$Reinvestment\ Rate = \frac{g}{ROC} = \frac{2\%}{17.25\%} = 11.59\%$$

$$Value\ of\ Operating\ Assets = \frac{17{,}626\ (1-.2092)(1-\ .1159)}{(.082-.02)} = \$202{,}832$$

Value of operating assets	= $202,832
+ Cash & Marketable Securities	= $ 7,133
- Debt	= $ 42,879
Value of equity	= $167,086
Value per share	=$ 32.44
Stock price (11/2013)	= $ 13.57

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

	1	2	3	4	5	6	7	8	9	10	Term. Year
Revenue Growth	150.00%	100.00%	75.00%	50.00%	30.00%	25.20%	20.40%	15.60%	10.80%	6.00%	6%
Revenues	$ 2,793	$ 5,585	$ 9,774	$ 14,661	$ 19,059	$ 23,862	$ 28,729	$ 33,211	$ 36,798	$ 39,006	$ 41,346
Operating Margin	-13.35%	-1.68%	4.16%	7.08%	8.54%	9.27%	9.64%	9.82%	9.91%	9.95%	10.00%
EBIT	-$373	-$94	$407	$1,038	$1,628	$2,212	$2,768	$3,261	$3,646	$3,883	$4,135
EBIT(1-t)	-$373	-$94	$407	$871	$1,058	$1,438	$1,799	$2,119	$2,370	$2,524	$2,688
- Reinvestment	$600	$967	$1,420	$1,663	$1,543	$1,688	$1,721	$1,619	$1,363	$961	$155
FCFF	-$931	-$1,024	-$989	-$758	-$408	-$163	$177	$625	$1,174	$1,788	$1,881

Forever

Cost of Equity	12.90%	12.90%	12.90%	12.90%	12.90%	12.42%	11.94%	11.46%	10.98%	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%
After-tax 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%	11.62%	11.08%	10.49%	9.61%

Value of Op Assets	$ 15,170
+ Cash	$ 26
= Value of Firm	$14,936
- Value of Debt	$ 349
= Value of Equity	$14,847
- Equity Options	$ 2,892
Value per share	$ 35.08

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

Starting numbers

Twitter Pre-IPO Valuation: October 5, 2013

	2012	Trailing 2013
Revenues	$316.9	$448.2
Operating Income	-$77.1	-$92.9
Adj Op Inc		$4.3
Invested Capital		$549.1
Operating Margin		0.96%
Sales/Capital		0.82

Revenue growth of 55% a year for 5 years, tapering down to 2.7% in year 10

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 = 2.7%; Beta = 1.00;
Cost of capital = 8%
ROC= **12**%;
Reinvestment Rate=2.7%/12% = 22.5%

Terminal Value$_{10}$= 1433/(.08-.027) = $27.036

	1	2	3	4	5	6	7	8	9	10
Revenues	$ 694.7	$ 1,076.8	$ 1,669.1	$ 2,587.1	$ 4,010.0	$ 5,796.0	$ 7,771.3	$ 9,606.8	$10,871.1	$11,164.6
Operating Income	$ 23.3	$ 62.0	$ 136.3	$ 273.5	$ 520.3	$ 891.5	$ 1,382.2	$ 1,939.7	$ 2,456.3	$ 2,791.2
Operating Income after taxes	$ 23.3	$ 62.0	$ 136.3	$ 265.3	$ 364.2	$ 614.2	$ 937.1	$ 1,293.8	$ 1,611.4	$ 1,800.3
Reinvestment	$ 164.3	$ 254.7	$ 394.8	$ 612.0	$ 948.6	$ 1,190.7	$ 1,316.8	$ 1,223.7	$ 842.8	$ 195.7
FCFF	$ (141.0)	$ (192.7)	$ (258.5)	$ (346.6)	$ (584.4)	$ (576.5)	$ (379.7)	$ 70.0	$ 768.5	$ 1,604.6

Terminal year (11)

EBIT (1-t)	$1,849
- Reinvestment	$ 416
FCFF	$1,433

Operating assets	$9,611
+ Cash	375
+ IPO Proceeds	1000
- Debt	207
Value of equity	10,779
- Options	805
Value in stock	9,974
/ # of shares	574.44
Value/share	$17.36

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

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

Cost of Equity
11.32%

Cost of Debt
(2.7%+5.3%)(1-.40)
= 5.16%

Weights
E = 98.31% D = 1.69%

Riskfree Rate:
Riskfree rate = 2.7%

+

Beta
1.40

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

D/E=1.71%

x

Risk Premium
6.15%

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

On October 5, 2013, Twitter had not been priced yet, but the company's most recent acquisition suggested a price of about $20/share.

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.

Assessing uncertainty…

- Rank the four firms in terms of uncertainty (least to most) in your estimate:
  - 3M in 2007
  - Vale in 2013
  - Amazon in 2000
  - Twitter in 2013
- With each company, specify the type of uncertainty that you face:

Company	Estimation or Economic	Micro or Macro	Discrete or Continuous
3M (2007)			
Vale (2013)			
Amazon (2000)			
Twitter (2013)			

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 kill you…

1. Less is more

Year	Revenue Growth	Sales	Operating Margin	EBIT	EBIT (1-t)
Tr 12 mths		$1,117	-36.71%	-$410	-$410
1	150.00%	$2,793	-13.35%	-$373	-$373
2	100.00%	$5,585	-1.68%	-$94	-$94
3	75.00%	$9,774	4.16%	$407	$407
4	50.00%	$14,661	7.08%	$1,038	$871
5	30.00%	$19,059	8.54%	$1,628	$1,058
6	25.20%	$23,862	9.27%	$2,212	$1,438
7	20.40%	$28,729	9.64%	$2,768	$1,799
8	15.60%	$33,211	9.82%	$3,261	$2,119
9	10.80%	$36,798	9.91%	$3,646	$2,370
10	6.00%	$39,006	9.95%	$3,883	$2,524
TY	6.00%	$41,346	10.00%	$4,135	$2,688

Use “auto pilot” approaches to estimate future years

Principle of parsimony: Estimate fewer inputs when faced with uncertainty.

A tougher task at Twitter

	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

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

2. Build in "internal" checks for reasonableness…

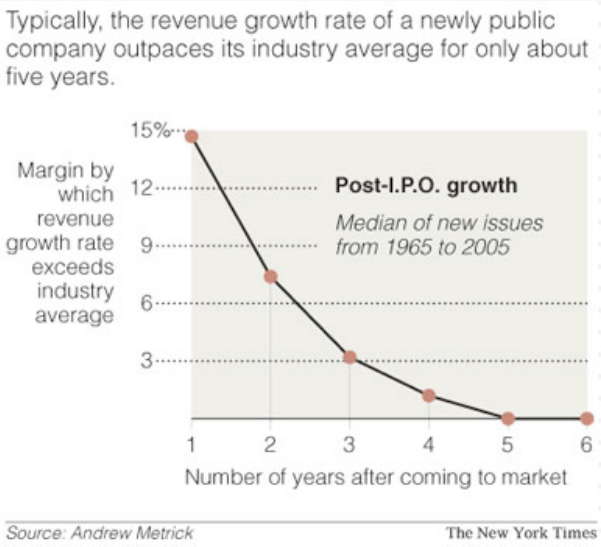
Year	Revenues	Δ Revenue	Sales/Cap	Δ Investment	Invested Capital	EBIT (1-t)	Imputed ROC
Tr 12 mths	$1,117				$ 487	-$410	
1	$2,793	$1,676	3.00	$559	$ 1,045	-$373	-76.62%
2	$5,585	$2,793	3.00	$931	$ 1,976	-$94	-8.96%
3	$9,774	$4,189	3.00	$1,396	$ 3,372	$407	20.59%
4	$14,661	$4,887	3.00	$1,629	$ 5,001	$871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

Check total revenues, relative to the market that it serves… Your market share obviously cannot exceed 100% but there may be tighter constraints.

Are the margins and imputed returns on capital 'reasonable' in the outer years?

Follow up propositions on growth…

- If you accept the proposition that 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 to deliver, 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.
  - 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.
  - Currency: The currency in which the cash flows are estimated should also be the currency in which the discount rate is estimated.
  - Nominal versus Real: If the cash flows being discounted are nominal cash flows (i.e., reflect expected inflation), the discount rate should be nominal

Vale: Valuations In $R and US dollars

	$R	*US Dollars*
Risk free Rate	10.81%	2.75%
Expected Inflation Rate	10.00%	2.00%
Cost of Capital	16.69%	8.20%
Expected Growth Rate	10.00%	2.00%
Value Per Share	R$ 76.23 (At 2.35R$/$ = $32.44)	$32.44

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.

And the "excess return" effect…

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%

5. Use the market as a crutch… ERP as an illustration

	Arithmetic Average		Geometric Average	
	Stocks - T. Bills	Stocks - T. Bonds	Stocks - T. Bills	Stocks - T. Bonds
1928-2013	7.93%	6.29%	6.02%	4.62%
Std Error	*2.19%*	*2.34%*		
1964-2013	6.18%	4.32%	4.83%	3.33%
Std Error	*2.42%*	*2.75%*		
2004-2013	7.55%	4.41%	5.80%	3.07%
Std Error	*6.02%*	*8.66%*		

← *Historical premium*

Base year cash flow
Dividends (TTM): 34.32
+ Buybacks (TTM): 49.85
= Cash to investors (TTM): 84.16
Earnings in TTM:

Expected growth in next 5 years
Top down analyst estimate of earnings growth for S&P 500 with stable payout: 4.28%

E(Cash to investors) 87.77 91.53 95.45 99.54 103.80

S&P 500 on 1/1/14 = 1848.36

Beyond year 5
Expected growth rate = Riskfree rate = 3.04%
Terminal value = 103.8(1.0304)/(,08 - .0304)

$$\frac{87.77}{(1+r)^1}+\frac{91.53}{(1+r)^2}+\frac{95.45}{(1+r)^3}+\frac{99.54}{(1+r)^4}+\frac{103.80}{(1+r)^5}+\frac{103.80(1.0304)}{(r-.0304)(1+r)^5}=1848.36$$

r = Implied Expected Return on Stocks = 8.00%

Minus

Risk free rate = T.Bond rate on 1/1/14=3.04%

Equals

Implied Equity Risk Premium (1/1/14) = 8% - 3.04% = 4.96%

ERP : Jan 2014

Andorra	6.80%	1.80%
Austria	5.00%	0.00%
Belgium	5.90%	0.90%
Cyprus	20.00%	15.00%
Denmark	5.00%	0.00%
Finland	5.00%	0.00%
France	5.60%	0.60%
Germany	5.00%	0.00%
Greece	20.00%	15.00%
Iceland	8.30%	3.30%
Ireland	8.75%	3.75%
Italy	7.85%	2.85%
Liechtenstein	5.00%	0.00%
Luxembourg	5.00%	0.00%
Malta	6.80%	1.80%
Netherlands	5.00%	0.00%
Norway	5.00%	0.00%
Portugal	10.40%	5.40%
Spain	8.30%	3.30%
Sweden	5.00%	0.00%
Switzerland	5.00%	0.00%
Turkey	8.30%	3.30%
United Kingdom	5.60%	0.60%
Western Europe	**6.29%**	**1.29%**

Canada	5.00%	0.00%
United States of America	5.00%	0.00%
North America	**5.00%**	**0.00%**

Argentina	14.75%	9.75%
Belize	18.50%	13.50%
Bolivia	10.40%	5.40%
Brazil	7.85%	2.85%
Chile	5.90%	0.90%
Colombia	8.30%	3.30%
Costa Rica	8.30%	3.30%
Ecuador	16.25%	11.25%
El Salvador	10.40%	5.40%
Guatemala	8.75%	3.75%
Honduras	13.25%	8.25%
Mexico	7.40%	2.40%
Nicaragua	14.75%	9.75%
Panama	7.85%	2.85%
Paraguay	10.40%	5.40%
Peru	7.85%	2.85%
Suriname	10.40%	5.40%
Uruguay	8.30%	3.30%
Venezuela	16.25%	11.25%
Latin America	**8.62%**	**3.62%**

Angola	10.40%	5.40%
Benin	13.25%	8.25%
Botswana	6.28%	1.28%
Burkina Faso	13.25%	8.25%
Cameroon	13.25%	8.25%
Cape Verde	13.25%	8.25%
DR Congo	14.75%	9.75%
Egypt	16.25%	11.25%
Gabon	10.40%	5.40%
Ghana	11.75%	6.75%
Kenya	11.75%	6.75%
Morocco	8.75%	3.75%
Mozambique	11.75%	6.75%
Namibia	8.30%	3.30%
Nigeria	10.40%	5.40%
Rep Congo	10.40%	5.40%
Rwanda	13.25%	8.25%
Senegal	11.75%	6.75%
South Africa	7.40%	2.40%
Tunisia	10.40%	5.40%
Uganda	11.75%	6.75%
Zambia	11.75%	6.75%
Africa	**10.04%**	**5.04%**

Albania	11.75%	6.75%
Armenia	9.50%	4.50%
Azerbaijan	8.30%	3.30%
Belarus	14.75%	9.75%
Bosnia and Herzegovina	14.75%	9.75%
Bulgaria	7.85%	2.85%
Croatia	8.75%	3.75%
Czech Republic	6.05%	1.05%
Estonia	6.05%	1.05%
Georgia	10.40%	5.40%
Hungary	8.75%	3.75%
Kazakhstan	7.85%	2.85%
Latvia	7.85%	2.85%
Lithuania	7.40%	2.40%
Macedonia	10.40%	5.40%
Moldova	14.75%	9.75%
Montenegro	10.40%	5.40%
Poland	6.28%	1.28%
Romania	8.30%	3.30%
Russia	7.40%	2.40%
Serbia	11.75%	6.75%
Slovakia	6.28%	1.28%
Slovenia	8.75%	3.75%
Ukraine	16.25%	11.25%
E. Europe & Russia	**7.96%**	**2.96%**

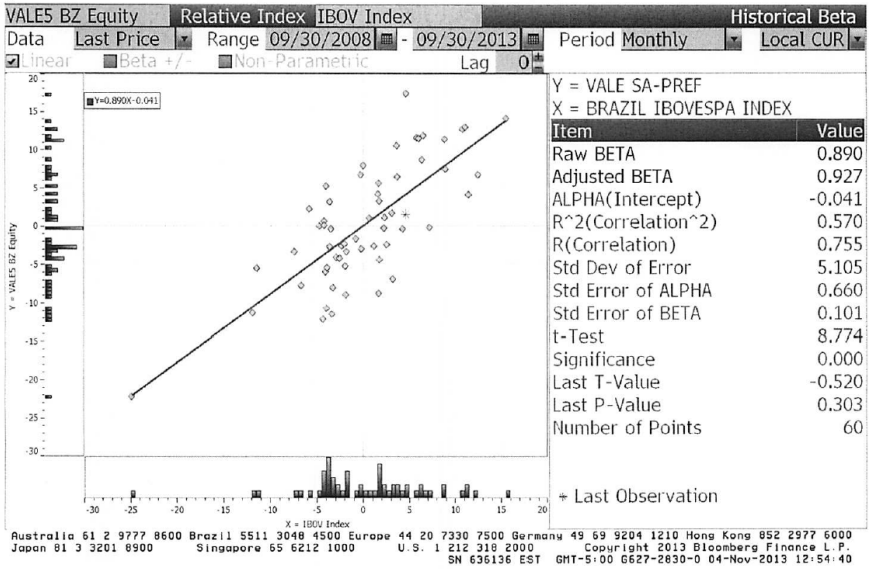
Abu Dhabi	5.75%	0.75%
Bahrain	7.85%	2.85%
Israel	6.05%	1.05%
Jordan	11.75%	6.75%
Kuwait	5.75%	0.75%
Lebanon	11.75%	6.75%
Oman	6.05%	1.05%
Qatar	5.75%	0.75%
Saudi Arabia	5.90%	0.90%
United Arab Emirates	5.75%	0.75%
Middle East	**6.14%**	**1.14%**

Bangladesh	10.40%	5.40%
Cambodia	13.25%	8.25%
China	5.90%	0.90%
Fiji	11.75%	6.75%
Hong Kong	5.60%	0.60%
India	8.30%	3.30%
Indonesia	8.30%	3.30%
Japan	5.90%	0.90%
Korea	5.90%	0.90%
Macao	5.90%	0.90%
Malaysia	6.80%	1.80%
Mauritius	7.40%	2.40%
Mongolia	11.75%	6.75%
Pakistan	16.25%	11.25%
Papua New Guinea	11.75%	6.75%
Philippines	8.30%	3.30%
Singapore	5.00%	0.00%
Sri Lanka	11.75%	6.75%
Taiwan	5.90%	0.90%
Thailand	7.40%	2.40%
Vietnam	13.25%	8.25%
Asia	**6.51%**	**1.51%**

Australia	5.00%	0.00%
Cook Islands	11.75%	6.75%
New Zealand	5.00%	0.00%
Australia & New Zealand	**5.00%**	**0.00%**

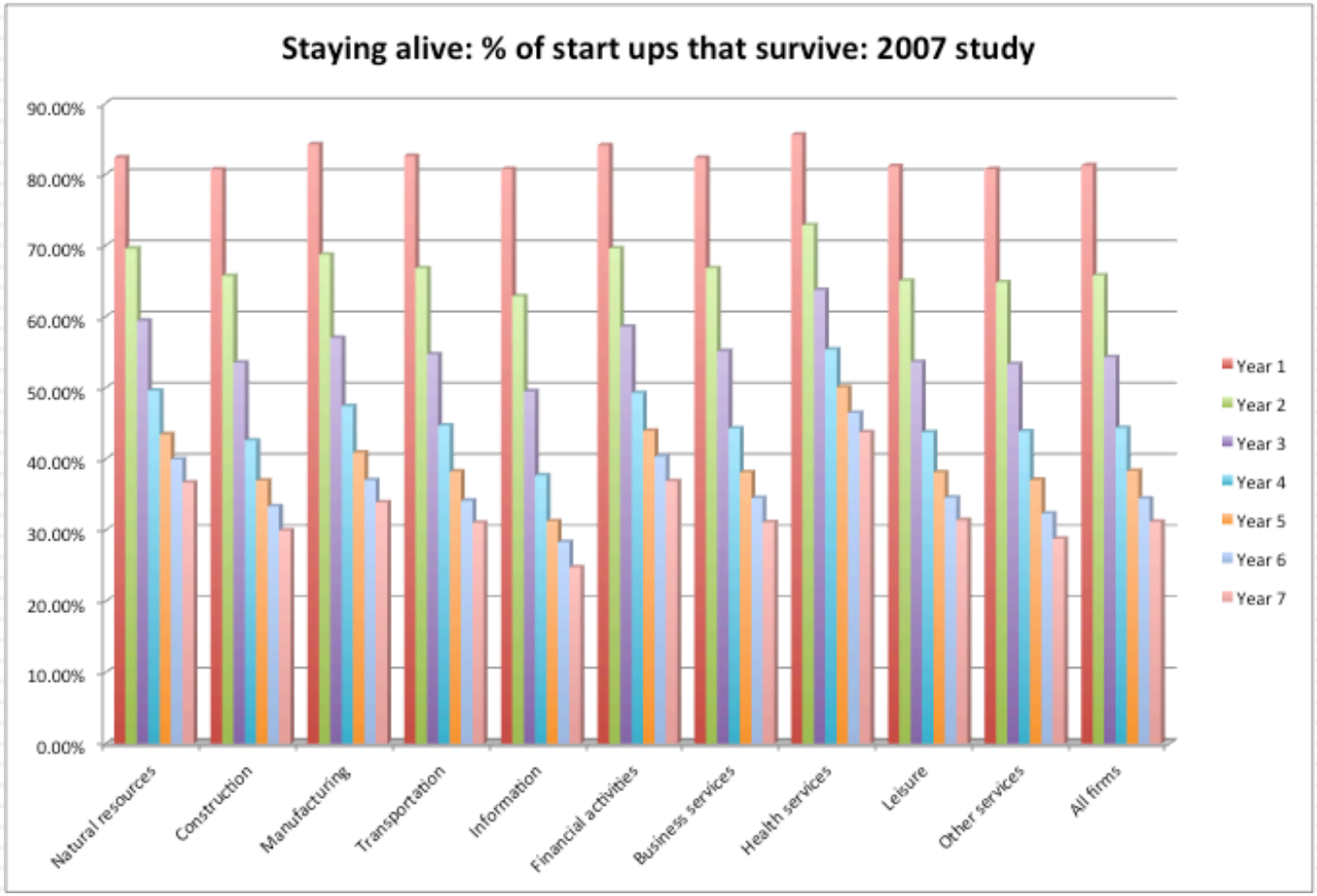
Black #: Total ERP
Red #: Country risk premium
AVG: GDP weighted average

6. Draw on the law of large numbers



Business	*Sample size*	*Unlevered beta of business*	*Revenues*	*Peer Group EV/Sales*	*Value of Business*	*Proportion of Vale*
Metals & Mi	48	0.86	$9,013	1.97	$17,739	16.65%
Iron Ore	78	0.83	$32,717	2.48	$81,188	76.20%
Fertilizers	693	0.99	$3,777	1.52	$5,741	5.39%
Logistics	223	0.75	$1,644	1.14	$1,874	1.76%
Vale Operations		*0.8440*	*$47,151*		*$106,543*	*100.00%*

7. Don’t let the discount rate become the receptacle for all your uncertainty…



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).
  - Value = (Forward Earnings in year n * Exit multiple)/ (1+ 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.
  - Value = Going concern value (Probability of survival) + Liquidation value (Probability of failure)

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.

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

Tax rate (3)
As tax benefits from investements fade and profits come back, tax rate rises to marginal tax rate.

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

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

Year	Revenue growth	Revenues	Operating Margin	Operating Income	Tax rate	After-tax Operating Income	Reinvestment Rate	Reinvestment	FCFF	Debt Ratio	Cost of capital	Present Value
Current		$4,390	4.76%	$209	26.00%	$155				73.50%		
1	1%	$4,434	5.81%	$258	26.00%	$191	-10.00%	-$19	$210	73.50%	9.88%	$191
2	2%	$4,523	6.86%	$310	26.00%	$229	-5.00%	-$11	$241	73.50%	9.88%	$200
3	20%	$5,427	7.90%	$429	26.00%	$317	0.00%	$0	$317	73.50%	9.88%	$239
4	20%	$6,513	8.95%	$583	26.00%	$431	5.00%	$22	$410	73.50%	9.88%	$281
5	20%	$7,815	10.00%	$782	26.00%	$578	10.00%	$58	$520	73.50%	9.88%	$325
6	5%	$8,206	11.40%	$935	28.40%	$670	10.00%	$67	$603	68.80%	9.79%	$343
7	5%	$8,616	12.80%	$1,103	30.80%	$763	20.00%	$153	$611	64.10%	9.50%	$317
8	5%	$9,047	14.20%	$1,285	33.20%	$858	25.00%	$215	$644	59.40%	9.01%	$307
9	5%	$9,499	15.60%	$1,482	35.60%	$954	30.00%	$286	$668	54.70%	8.32%	$294
10	5%	$9,974	17.00%	$1,696	38.00%	$1,051	33.30%	$350	$701	50.00%	7.43%	$7,298
Beyond	3%	$10,273	17%	$1,746	38.00%	1082.81468	33.30%	$325	$17,129	50.00%	7.43%	$9,793
Value of operating assets												$19,587
(Add) Cash												$3,040
(Subtract) Debt												$7,565
Value of equity												$5,268.01
Value per share (going concern)												$8.21
Probability of going concern												71.75%
Value per share (distress)												$0.00
Probability of distress												28.25%
Distress adjusted Value per share												$5.89

Terminal value (6)
With return to health, back to growth $\frac{1051\ (1.03)(1-.30)}{(.0743-.03)} = \$17,129$

Return to operating health (2)
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.

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

Risk of default (7)
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.

Default adjusted value
Weighted average of going concern value and distress sale value:
$8.25(.7175)+$0(.2125)

As for political risk..

1. Political instability = Economic instability: This risk is best shown as a country risk premium and built into your cost of equity and capital.
2. Nationalization/Appropriation risk: This is not suited for discount rates, but can be adjusted for by assigning a probability that the company will be nationalized and the consequences for equity investors in the company.
3. Political interference in corporate decisions: For companies that are viewed as being in the "national interest", there is the danger of governments using official powers (with golden shares) or unofficial ones (through management appointments/influence) to get the company to take value destructive paths. These effects are best captured in your input numbers (investment, financing & dividend decisions)>

Measuring country risk

- Emerging markets offer growth opportunities but they are also riskier. If we want to count the growth, we have to also consider the risk.
- Two ways of estimating the country risk premium:
  - Sovereign Default Spread: In this approach, the country equity risk premium is set equal to the default spread of the bond issued by the country.
    - Equity Risk Premium for mature market = 4.50%
    - Default Spread for India = 3.00% (based on rating)
    - Equity Risk Premium for India = 4.50% + 3.00%
  - Adjusted for equity risk: The country equity risk premium is based upon the volatility of the equity market relative to the government bond rate.
    - Country risk premium= Default Spread* $\text{Std Deviation}_{\text{Country Equity}} / \text{Std Deviation}_{\text{Country Bond}}$
    - Standard Deviation in Sensex = 21%
    - Standard Deviation in Indian government bond= 14%
    - Default spread on Indian Bond= 3%
    - Additional country risk premium for India = 3% (21/14) = 4.5%

ERP : Jan 2014

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Finland	5.00%	0.00%
France	5.60%	0.60%
Germany	5.00%	0.00%
Greece	20.00%	15.00%
Iceland	8.30%	3.30%
Ireland	8.75%	3.75%
Italy	7.85%	2.85%
Liechtenstein	5.00%	0.00%
Luxembourg	5.00%	0.00%
Malta	6.80%	1.80%
Netherlands	5.00%	0.00%
Norway	5.00%	0.00%
Portugal	10.40%	5.40%
Spain	8.30%	3.30%
Sweden	5.00%	0.00%
Switzerland	5.00%	0.00%
Turkey	8.30%	3.30%
United Kingdom	5.60%	0.60%
Western Europe	**6.29%**	**1.29%**

Canada	5.00%	0.00%
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Argentina	14.75%	9.75%
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Bolivia	10.40%	5.40%
Brazil	7.85%	2.85%
Chile	5.90%	0.90%
Colombia	8.30%	3.30%
Costa Rica	8.30%	3.30%
Ecuador	16.25%	11.25%
El Salvador	10.40%	5.40%
Guatemala	8.75%	3.75%
Honduras	13.25%	8.25%
Mexico	7.40%	2.40%
Nicaragua	14.75%	9.75%
Panama	7.85%	2.85%
Paraguay	10.40%	5.40%
Peru	7.85%	2.85%
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Cameroon	13.25%	8.25%
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DR Congo	14.75%	9.75%
Egypt	16.25%	11.25%
Gabon	10.40%	5.40%
Ghana	11.75%	6.75%
Kenya	11.75%	6.75%
Morocco	8.75%	3.75%
Mozambique	11.75%	6.75%
Namibia	8.30%	3.30%
Nigeria	10.40%	5.40%
Rep Congo	10.40%	5.40%
Rwanda	13.25%	8.25%
Senegal	11.75%	6.75%
South Africa	7.40%	2.40%
Tunisia	10.40%	5.40%
Uganda	11.75%	6.75%
Zambia	11.75%	6.75%
Africa	**10.04%**	**5.04%**

Albania	11.75%	6.75%
Armenia	9.50%	4.50%
Azerbaijan	8.30%	3.30%
Belarus	14.75%	9.75%
Bosnia and Herzegovina	14.75%	9.75%
Bulgaria	7.85%	2.85%
Croatia	8.75%	3.75%
Czech Republic	6.05%	1.05%
Estonia	6.05%	1.05%
Georgia	10.40%	5.40%
Hungary	8.75%	3.75%
Kazakhstan	7.85%	2.85%
Latvia	7.85%	2.85%
Lithuania	7.40%	2.40%
Macedonia	10.40%	5.40%
Moldova	14.75%	9.75%
Montenegro	10.40%	5.40%
Poland	6.28%	1.28%
Romania	8.30%	3.30%
Russia	7.40%	2.40%
Serbia	11.75%	6.75%
Slovakia	6.28%	1.28%
Slovenia	8.75%	3.75%
Ukraine	16.25%	11.25%
E. Europe & Russia	**7.96%**	**2.96%**

Abu Dhabi	5.75%	0.75%
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Israel	6.05%	1.05%
Jordan	11.75%	6.75%
Kuwait	5.75%	0.75%
Lebanon	11.75%	6.75%
Oman	6.05%	1.05%
Qatar	5.75%	0.75%
Saudi Arabia	5.90%	0.90%
United Arab Emirates	5.75%	0.75%
Middle East	**6.14%**	**1.14%**

Bangladesh	10.40%	5.40%
Cambodia	13.25%	8.25%
China	5.90%	0.90%
Fiji	11.75%	6.75%
Hong Kong	5.60%	0.60%
India	8.30%	3.30%
Indonesia	8.30%	3.30%
Japan	5.90%	0.90%
Korea	5.90%	0.90%
Macao	5.90%	0.90%
Malaysia	6.80%	1.80%
Mauritius	7.40%	2.40%
Mongolia	11.75%	6.75%
Pakistan	16.25%	11.25%
Papua New Guinea	11.75%	6.75%
Philippines	8.30%	3.30%
Singapore	5.00%	0.00%
Sri Lanka	11.75%	6.75%
Taiwan	5.90%	0.90%
Thailand	7.40%	2.40%
Vietnam	13.25%	8.25%
Asia	**6.51%**	**1.51%**

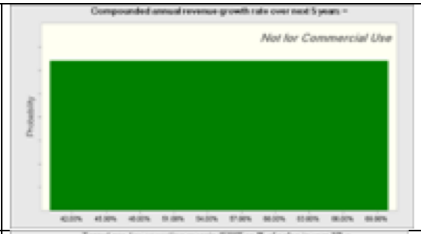
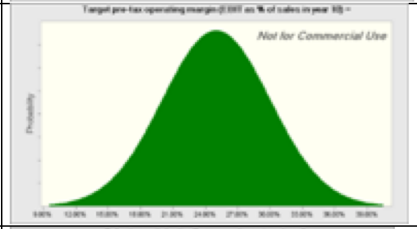
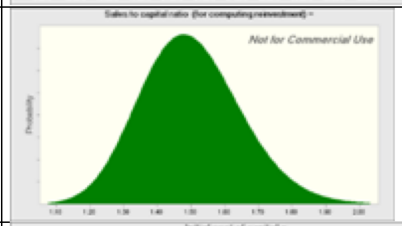
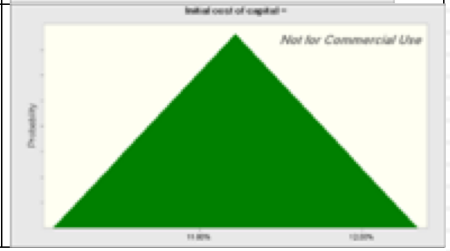
Australia	5.00%	0.00%
Cook Islands	11.75%	6.75%
New Zealand	5.00%	0.00%
Australia & New Zealand	**5.00%**	**0.00%**

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

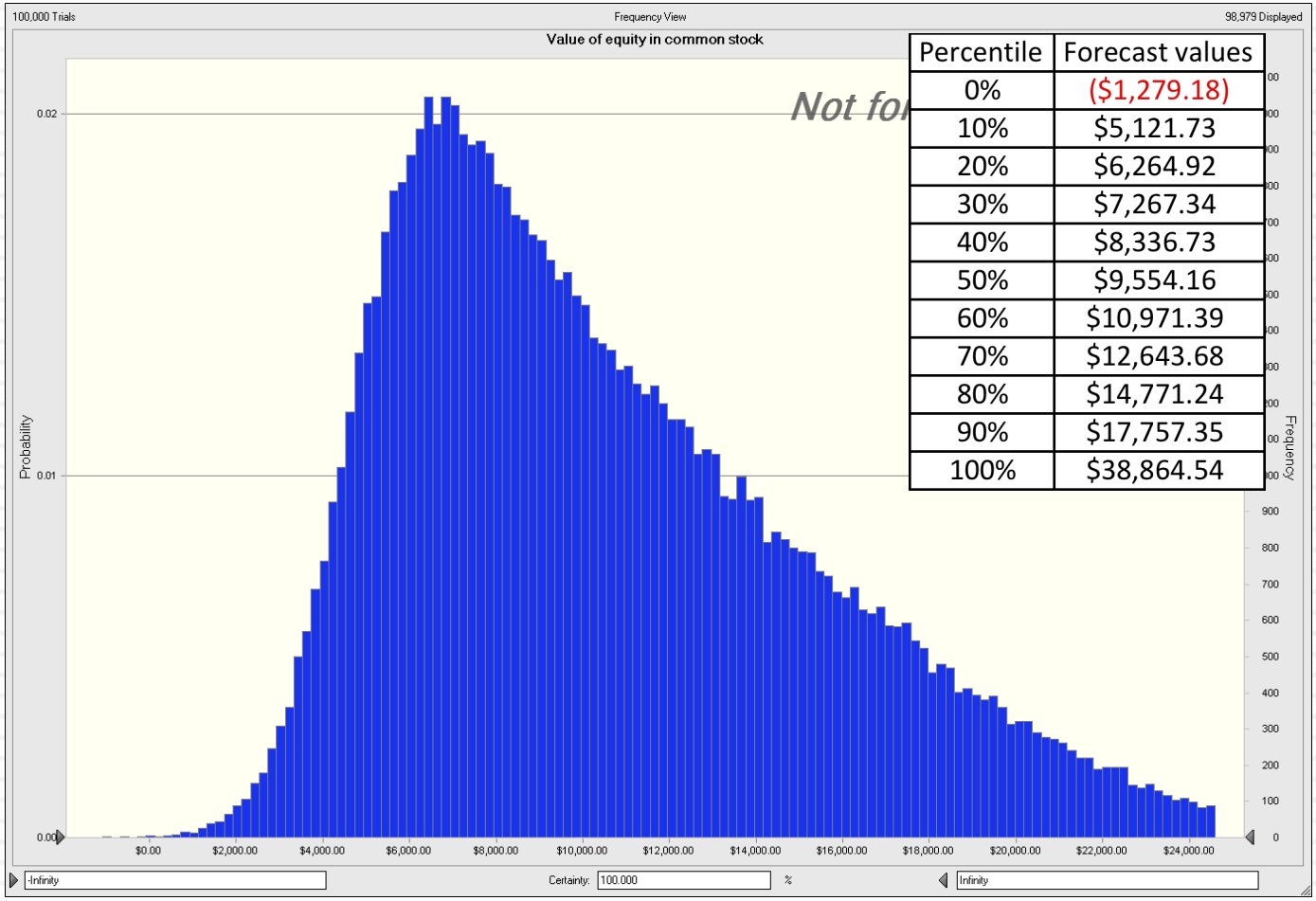
And company risk, for Vale

	% of revenues	ERP
US & Canada	4.90%	5.50%
Brazil	16.90%	8.50%
Rest of Latin America	1.70%	10.09%
China	37.00%	6.94%
Japan	10.30%	6.70%
Rest of Asia	8.50%	8.61%
Europe	17.20%	6.72%
Rest of World	3.50%	10.06%
Vale ERP	**100.00%**	**7.38%**

8. Confront uncertainty, if you can…

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…

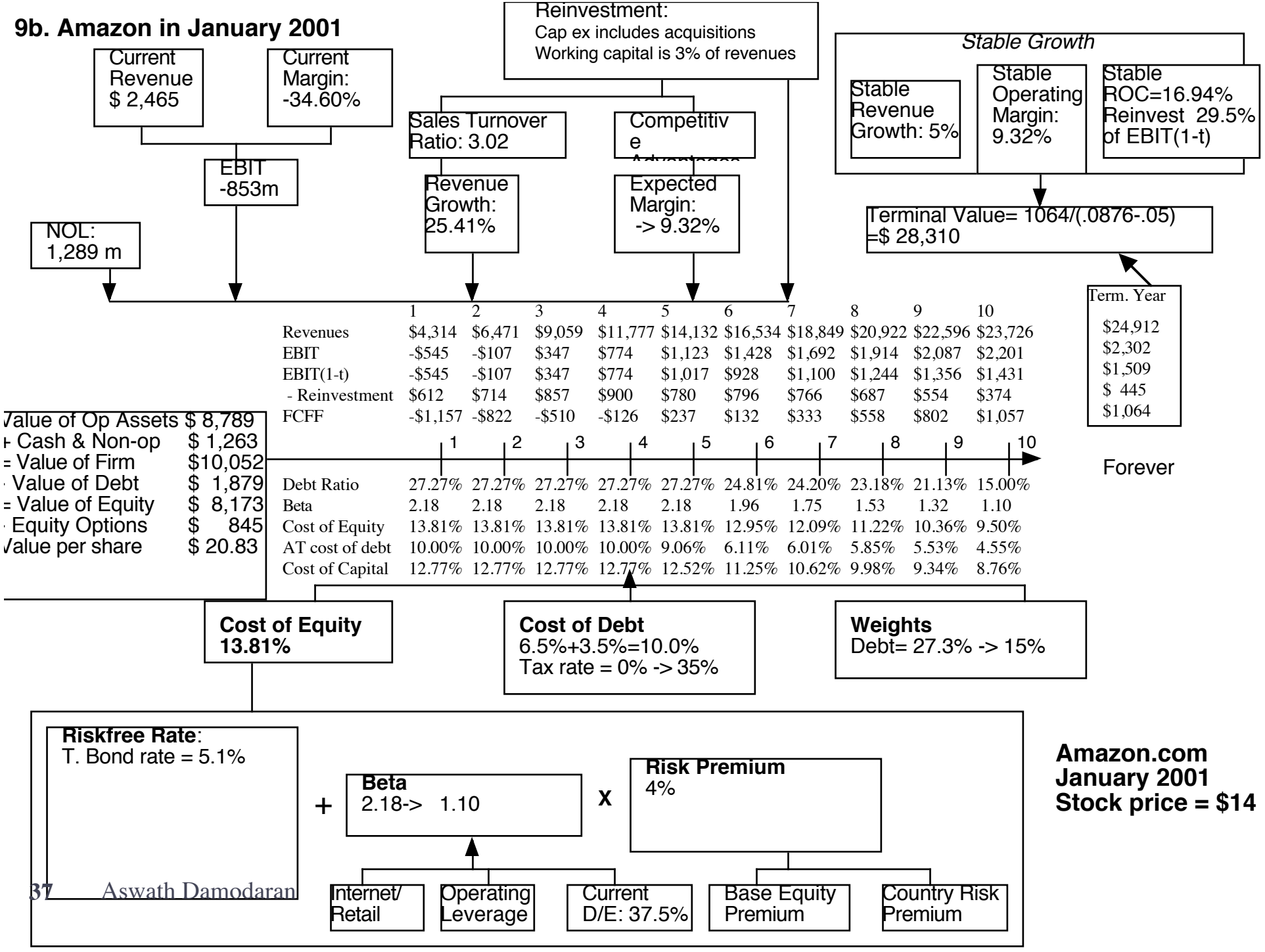


Percentile	Forecast values
0%	($1,279.18)
10%	$5,121.73
20%	$6,264.92
30%	$7,267.34
40%	$8,336.73
50%	$9,554.16
60%	$10,971.39
70%	$12,643.68
80%	$14,771.24
90%	$17,757.35
100%	$38,864.54

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

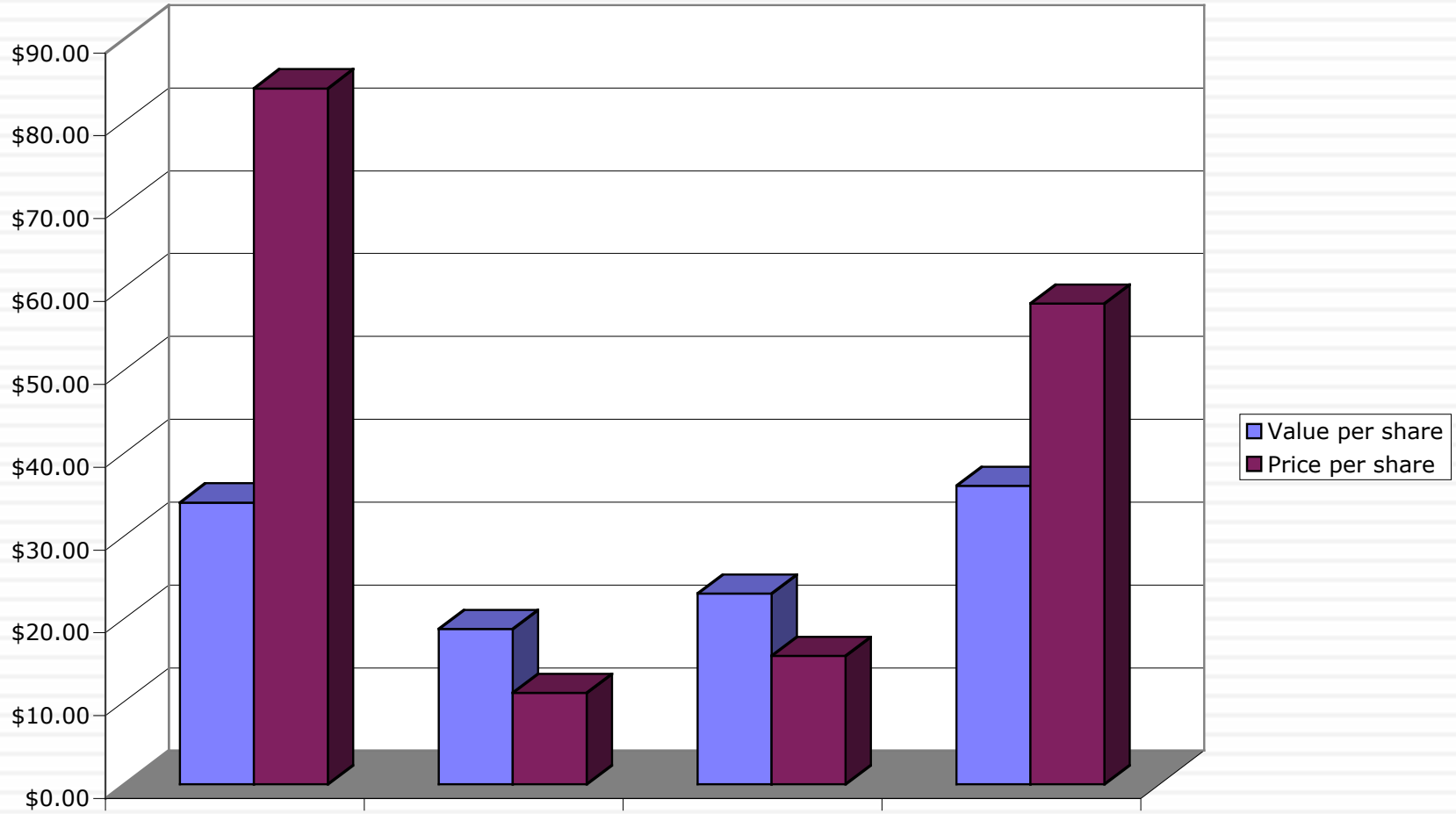


	1	2	3	4	5	6	7	8	9	10
Revenues	$4,314	$6,471	$9,059	$11,777	$14,132	$16,534	$18,849	$20,922	$22,596	$23,726
EBIT	-$545	-$107	$347	$774	$1,123	$1,428	$1,692	$1,914	$2,087	$2,201
EBIT(1-t)	-$545	-$107	$347	$774	$1,017	$928	$1,100	$1,244	$1,356	$1,431
- Reinvestment	$612	$714	$857	$900	$780	$796	$766	$687	$554	$374
FCFF	-$1,157	-$822	-$510	-$126	$237	$132	$333	$558	$802	$1,057

	1	2	3	4	5	6	7	8	9	10
Debt Ratio	27.27%	27.27%	27.27%	27.27%	27.27%	24.81%	24.20%	23.18%	21.13%	15.00%
Beta	2.18	2.18	2.18	2.18	2.18	1.96	1.75	1.53	1.32	1.10
Cost of Equity	13.81%	13.81%	13.81%	13.81%	13.81%	12.95%	12.09%	11.22%	10.36%	9.50%
AT cost of debt	10.00%	10.00%	10.00%	10.00%	9.06%	6.11%	6.01%	5.85%	5.53%	4.55%
Cost of Capital	12.77%	12.77%	12.77%	12.77%	12.52%	11.25%	10.62%	9.98%	9.34%	8.76%

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 don't forget: It is not just the value that you are uncertain about…

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

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

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

Value of cashflows, adjusted for time and risk

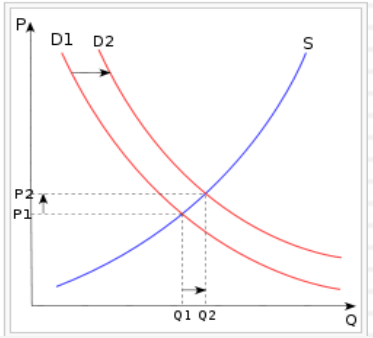
INTRINSIC VALUE

Value

THE GAP
Is there one?
Will it close?

Price

PRICE



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

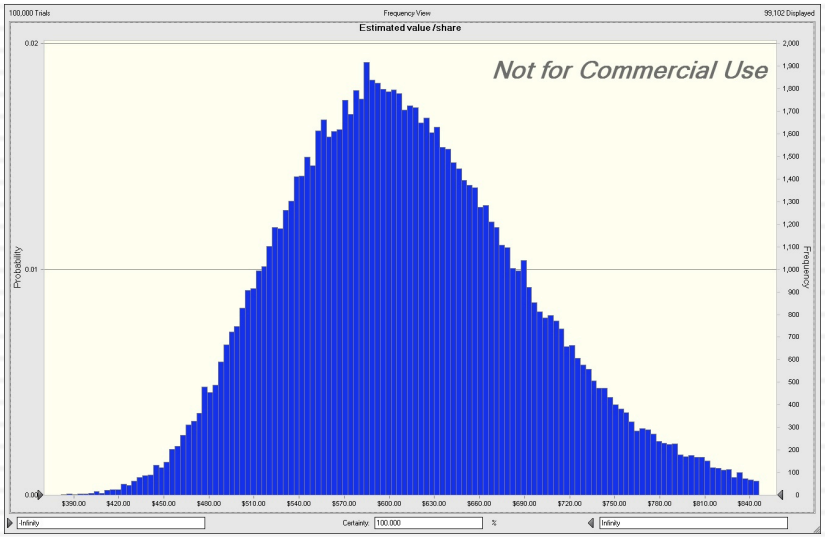
Drivers of "the gap"
- Information
- Liquidity
- Corporate governance

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

And here is how it plays out…

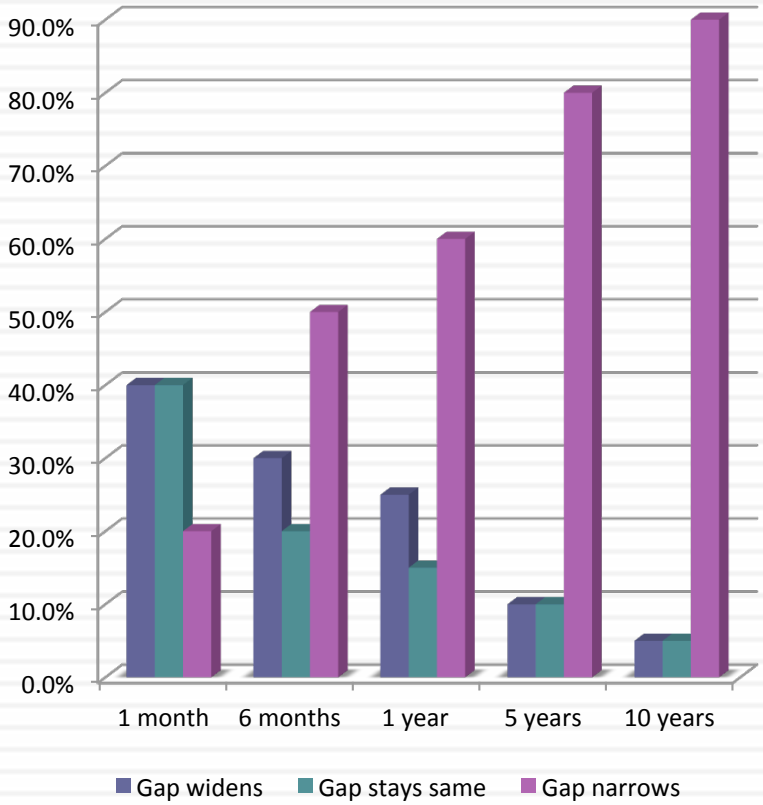
The value process

My valuation of Apple in January 2013

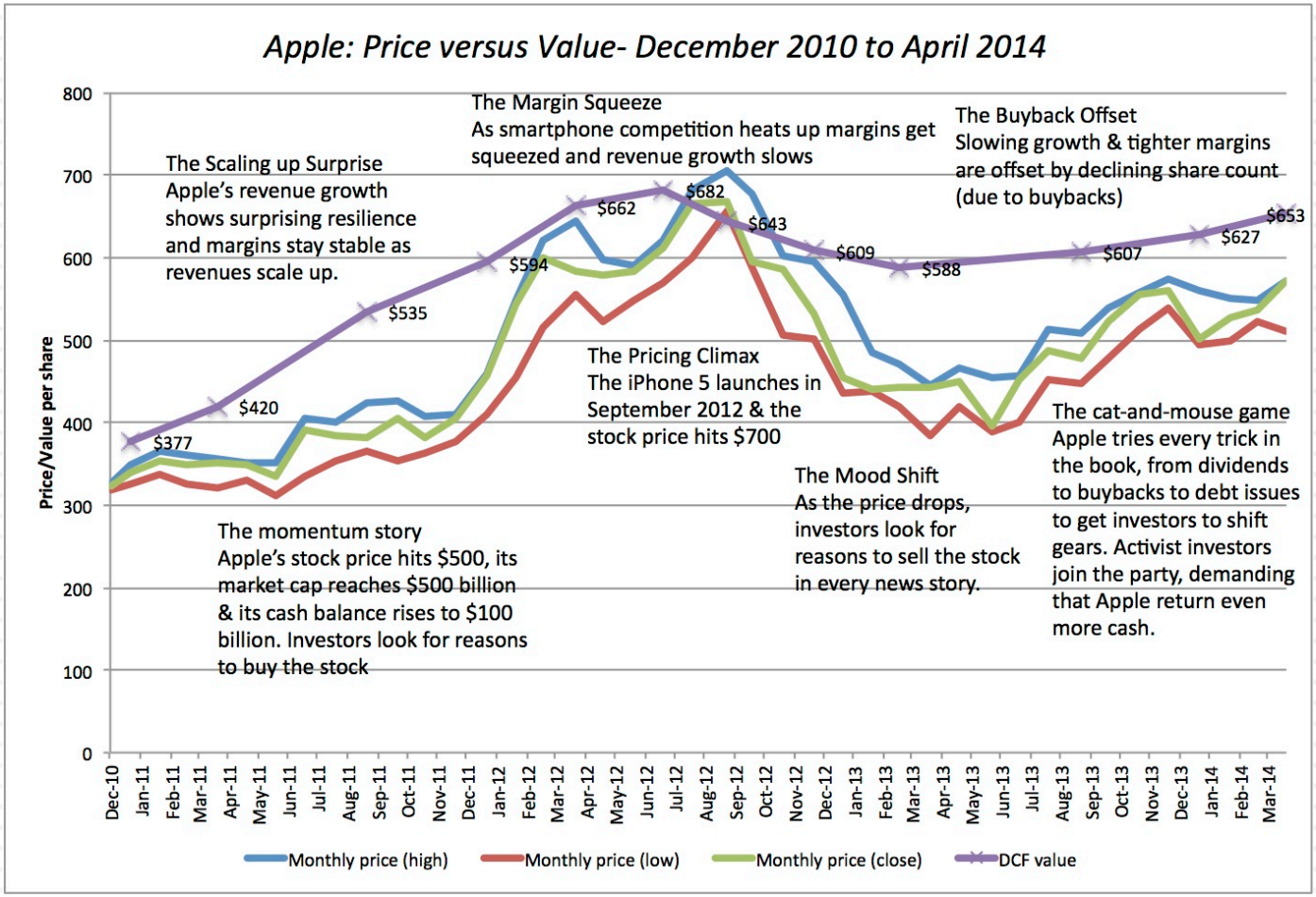


My valuation of Apple with revenue growth of 6% (Normal, σ=3%), target pre-tax margin of 30% (Uniform,25%-35%) and cost of capital of 12.5% (Triangle, 11-14%). There is a 90% chance that Apple is undervalued at $440/share.

The Pricing Process: Apple



An example: Apple – Price versus Value (my estimates) from 2011 to 2014



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.