



LIVING WITH NOISE: INVESTING IN THE FACE OF UNCERTAINTY

Aswath Damodaran

<http://www.damodaran.com>

Uncertainty is part of human existence, but we deal with it badly..

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

Forecasting in the face of uncertainty. A test:

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- 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...

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Weather changeability for Honolulu, Hawaii

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Average change in high temperature day-to-day	1.7°	1.2°	Chance of dry day after a precip day	67%	81%
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[Further changeability analysis >](#)

Weather forecast accuracy for Honolulu, Hawaii

Last Month		Last Year	
MeteoGroup	88.44%	MeteoGroup	88.50%
Persistence	81.80%	CustomWeather	85.87%
CustomWeather	78.23%	AccuWeather	81.82%
The Weather Channel	73.12%	The Weather Channel	81.56%
AccuWeather	69.89%	Persistence	80.44%
Weather Underground	62.10%	Weather Underground	67.07%
National Weather Service	48.39%	National Weather Service	59.90%
Foreca	44.35%	Foreca	57.52%
WeatherBug	32.26%	WeatherBug	37.09%

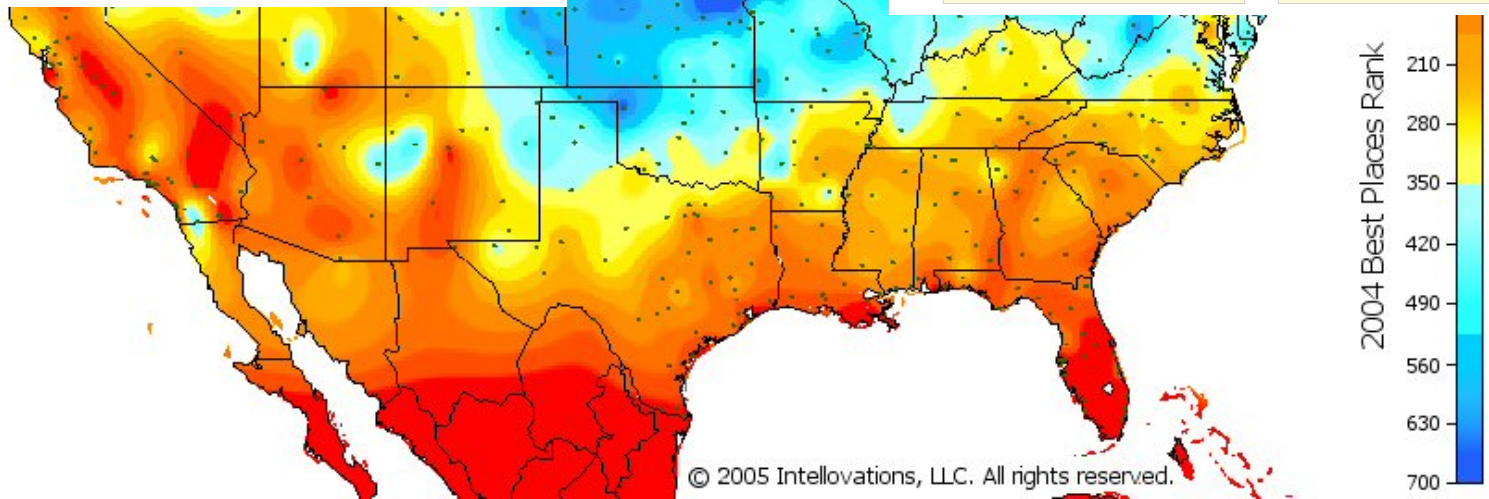
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[Further changeability analysis >](#)

Weather forecast accuracy for Epping, North Dakota

Last Month		Last Year	
MeteoGroup	62.50%	MeteoGroup	66.97%
Foreca	61.61%	The Weather Channel	66.73%
The Weather Channel	61.31%	AccuWeather	64.86%
AccuWeather	60.42%	WeatherBug	64.80%
Weather Underground	56.85%	Foreca	62.75%
WeatherBug	56.17%	CustomWeather	62.70%
National Weather Service	54.76%	National Weather Service	62.64%
CustomWeather	54.46%	Weather Underground	61.38%
Persistence	38.01%	Persistence	44.09%



Intrinsic Value: Three Basic Propositions

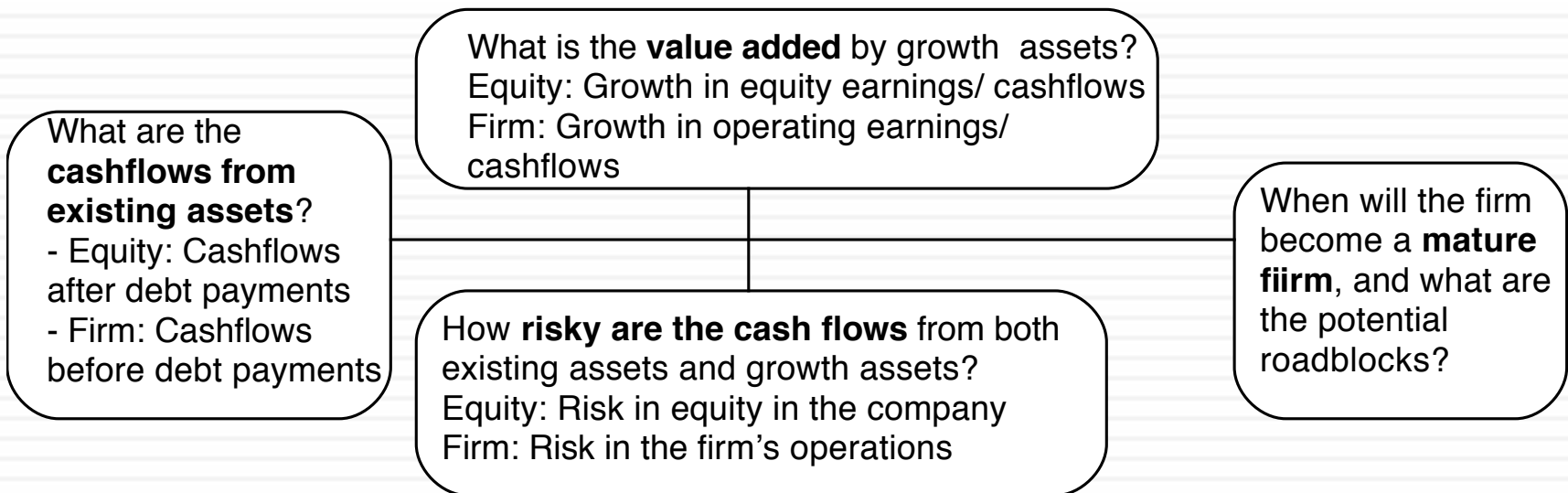
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- The value of an asset is the present value of the expected cash flows on that asset, over its expected life:

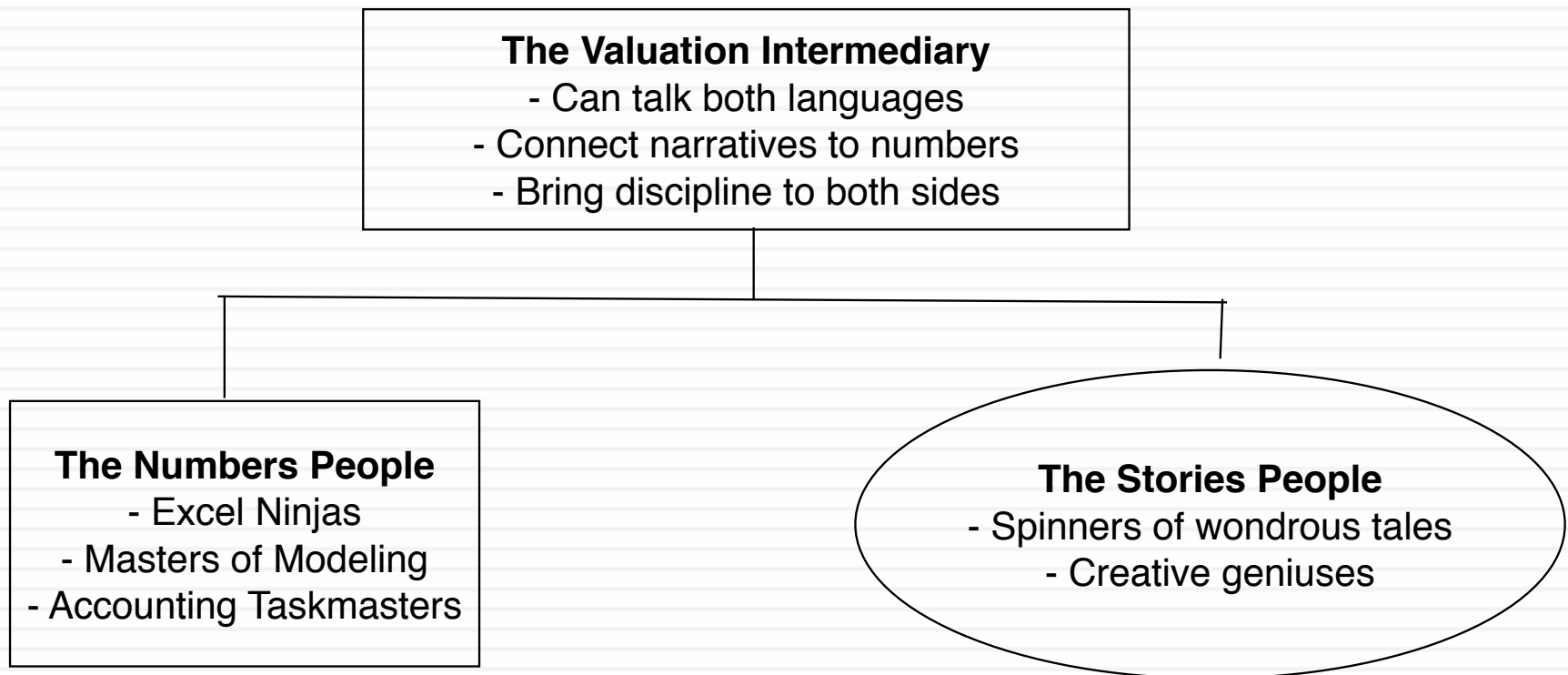
$$\text{Value of asset} = \frac{E(CF_1)}{(1+r)} + \frac{E(CF_2)}{(1+r)^2} + \frac{E(CF_3)}{(1+r)^3} \dots + \frac{E(CF_n)}{(1+r)^n}$$

1. The “IT” proposition: If IT does not affect the expected cash flows or the riskiness of the cash flows, IT cannot affect value.
2. The “DUH” proposition: For an asset to have value, the expected cash flows have to be positive some time over the life of the asset.
3. The “DON’T FREAK OUT” proposition: Assets that generate cash flows early in their life will be worth more than assets that generate cash flows later; the latter may however have greater growth and higher cash flows to compensate.

The fundamental determinants of value...



The Set Up



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)
 $.30 \times .25 = .075$
 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 Value₅ = $2645 / (.0676 - .03) = 70,409$

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

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

Value/Share \$ 83.55

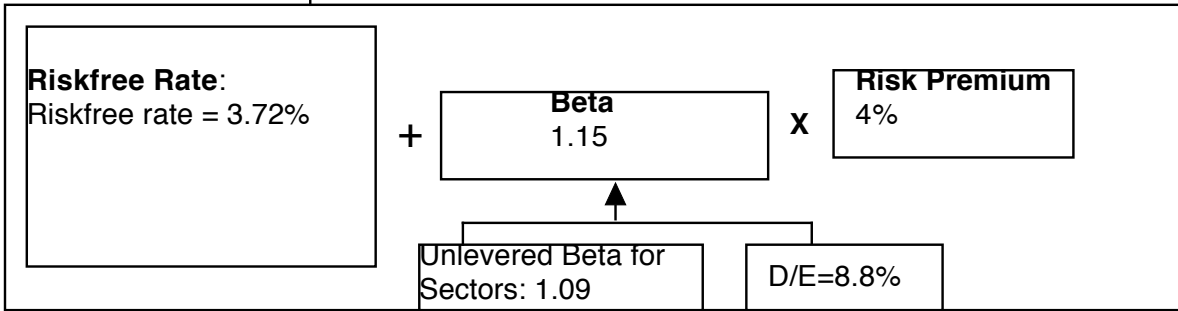
Cost of capital = 8.32% (0.92) + 2.91% (0.08) = 7.88%

Cost of Equity
8.32%

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

Weights
 E = 92% D = 8%

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



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.
 $70 \cdot 17.16 = 0.1201$

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 = $g/ROC = 5/10.39 = 48.11\%$

Rs Cashflows

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

Terminal Value₅ = $23493 / (.1039 - .05) = \text{Rs } 435,686$

45278
 21785
 23493

Op. Assets Rs 210,813
 + Cash: 11418
 + Other NO 140576
 - Debt 109198
 = Equity 253,628

Value/Share Rs 614

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%

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Aswath Damodaran

Unlevered Beta for
 Sectors: 1.04

Firm's D/E
 Ratio: 33%

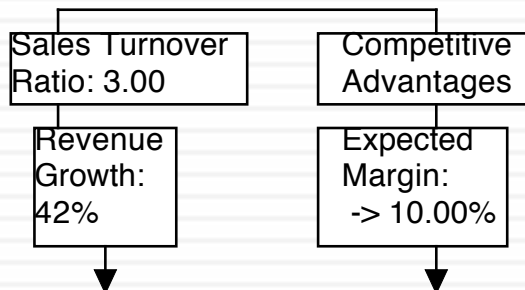
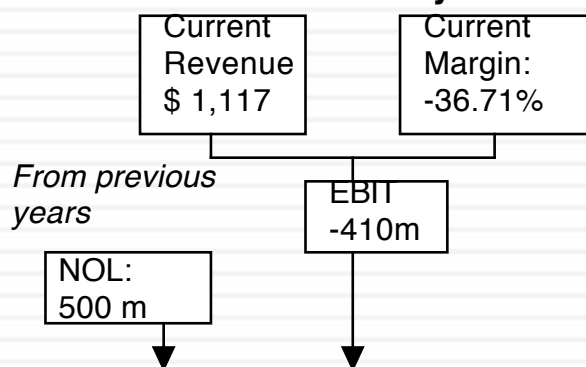
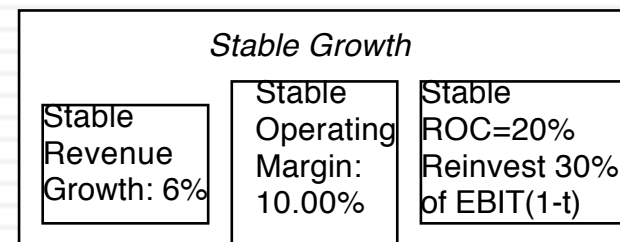
Country Default
 Spread
 3%

X

Rel Equity
 Mkt Vol
 1.50

9a. Amazon in January 2000

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



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

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.

	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

	1	2	3	4	5	6	7	8	9	10	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%	

Term. Year
6%
\$ 41,346
10.00%
\$4,135
\$2,688
\$155
\$1,881

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%

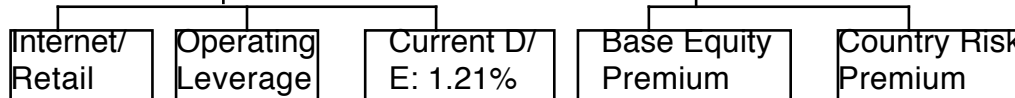
Amazon was trading at \$84 in January 2000.

*Dot.com retailers for first 5 years
Conventional retailers after year 5*

Pushed debt ratio to retail industry average of 15%.

Riskfree Rate:
T. Bond rate = 6.5%

+ **Beta** 1.60 -> 1.00 X **Risk Premium** 4%



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
 $g = 2.7\%$; $\text{Beta} = 1.00$;
 Cost of capital = 8%
 $\text{ROC} = 12\%$;
 $\text{Reinvestment Rate} = 2.7\%/12\% = 22.5\%$

Terminal Value₁₀ = $1433 / (.08 - .027) = \$27.036$

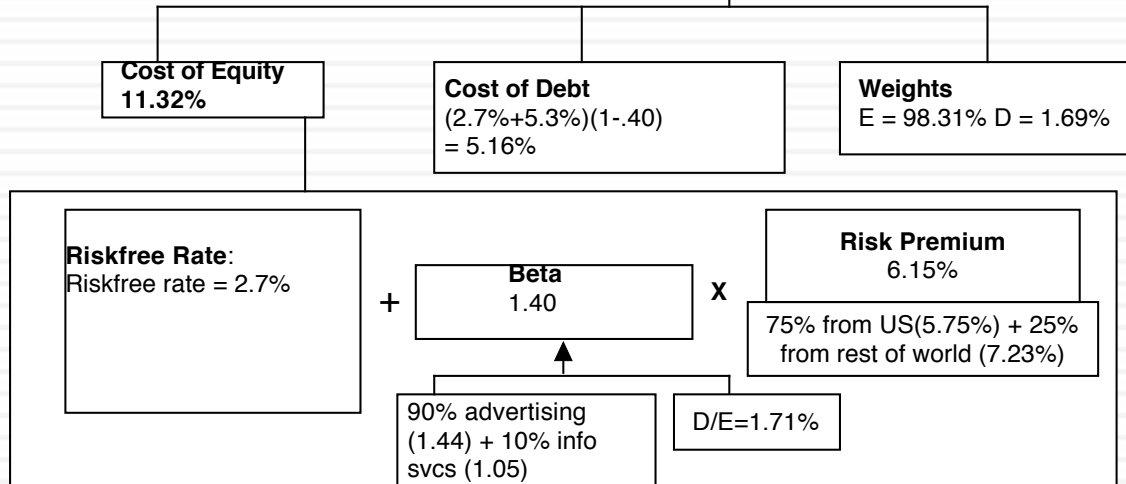
	1	2	3	4	5	6	7	8	9	10
Revenues	\$ 694.7	\$ 1,076.8	\$ 1,669.1	\$ 2,587.1	\$ 4,010.0	\$ 5,796.0	\$ 7,771.3	\$ 9,606.8	\$10,871.1	\$11,164.6
Operating Income	\$ 23.3	\$ 62.0	\$ 136.3	\$ 273.5	\$ 520.3	\$ 891.5	\$ 1,382.2	\$ 1,939.7	\$ 2,456.3	\$ 2,791.2
Operating Income after taxes	\$ 23.3	\$ 62.0	\$ 136.3	\$ 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



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 models 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
 - Tata Motors in 2010
 - 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)			
Tata Motors (2010)			
Amazon (2000)			
Twitter (2013)			

Ten suggestions for dealing with uncertainty...

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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

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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

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

Use “auto pilot” approaches to estimate future years

A tougher task at Twitter

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	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...

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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.

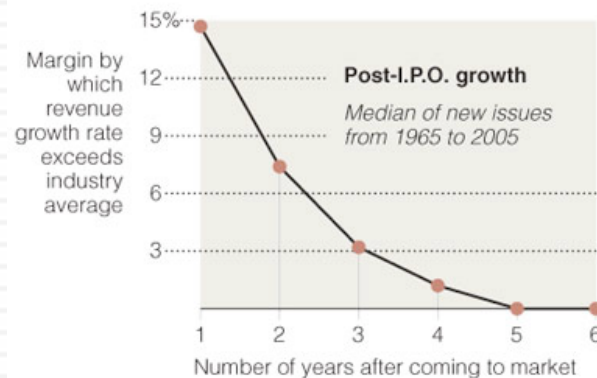
Are the margins and imputed returns on capital ‘reasonable’ in the outer years?

Follow up propositions on growth...

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- 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.

Typically, the revenue growth rate of a newly public company outpaces its industry average for only about five years.



Source: Andrew Metrick

The New York Times

3. Use consistency tests...

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- 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

Tata Motors: In Rupees and US dollars

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

	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)

4. Draw on economic first principles and mathematical limits...

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- 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...

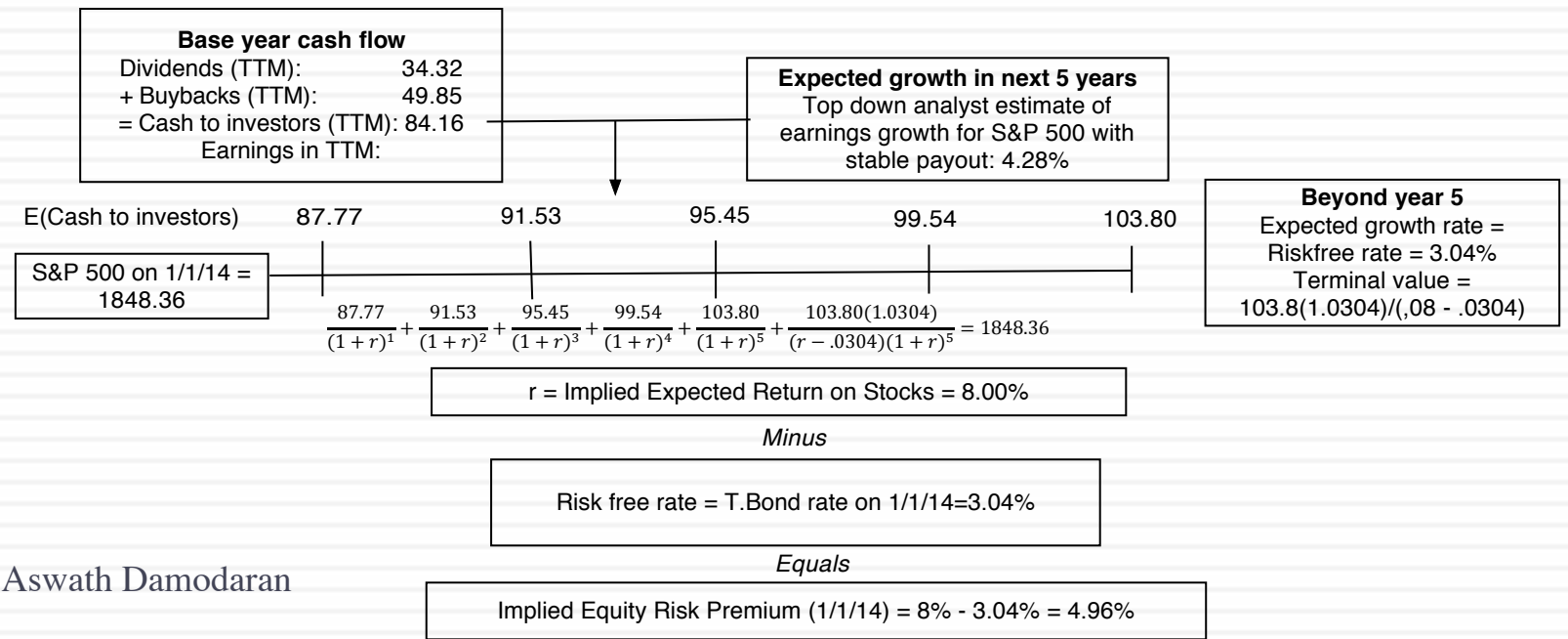
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<i>Stable growth rate</i>	<i>3M</i>	<i>Tata Motors</i>	<i>Amazon</i>	<i>Twitter</i>
0%	\$70,409	435,686₹	\$26,390	\$23,111
1%	\$70,409	435,686₹	\$28,263	\$24,212
2%	\$70,409	435,686₹	\$30,595	\$25,679
3%	\$70,409	435,686₹	\$33,594	
4%		435,686₹	\$37,618	
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*



ERP : Jan 2014

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

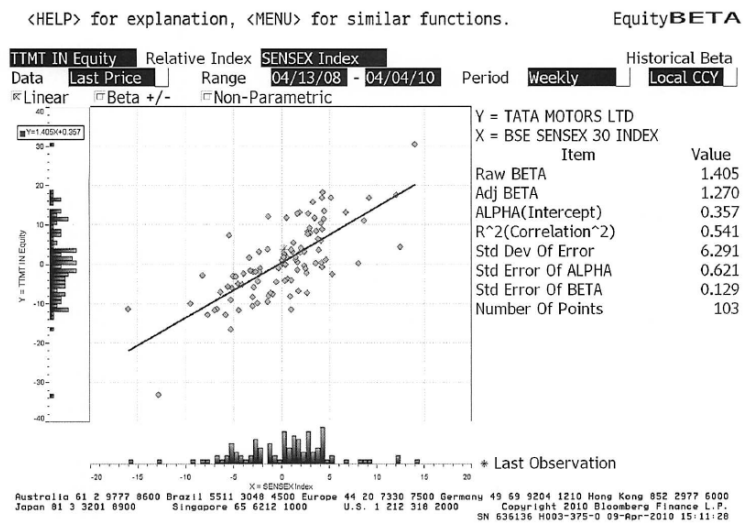
Australia	5.00%	0.00%
Cook Islands	11.75%	6.75%
New Zealand	5.00%	0.00%
Australia & New Zealand	5.00%	0.00%

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

6. Draw on the law of large numbers...

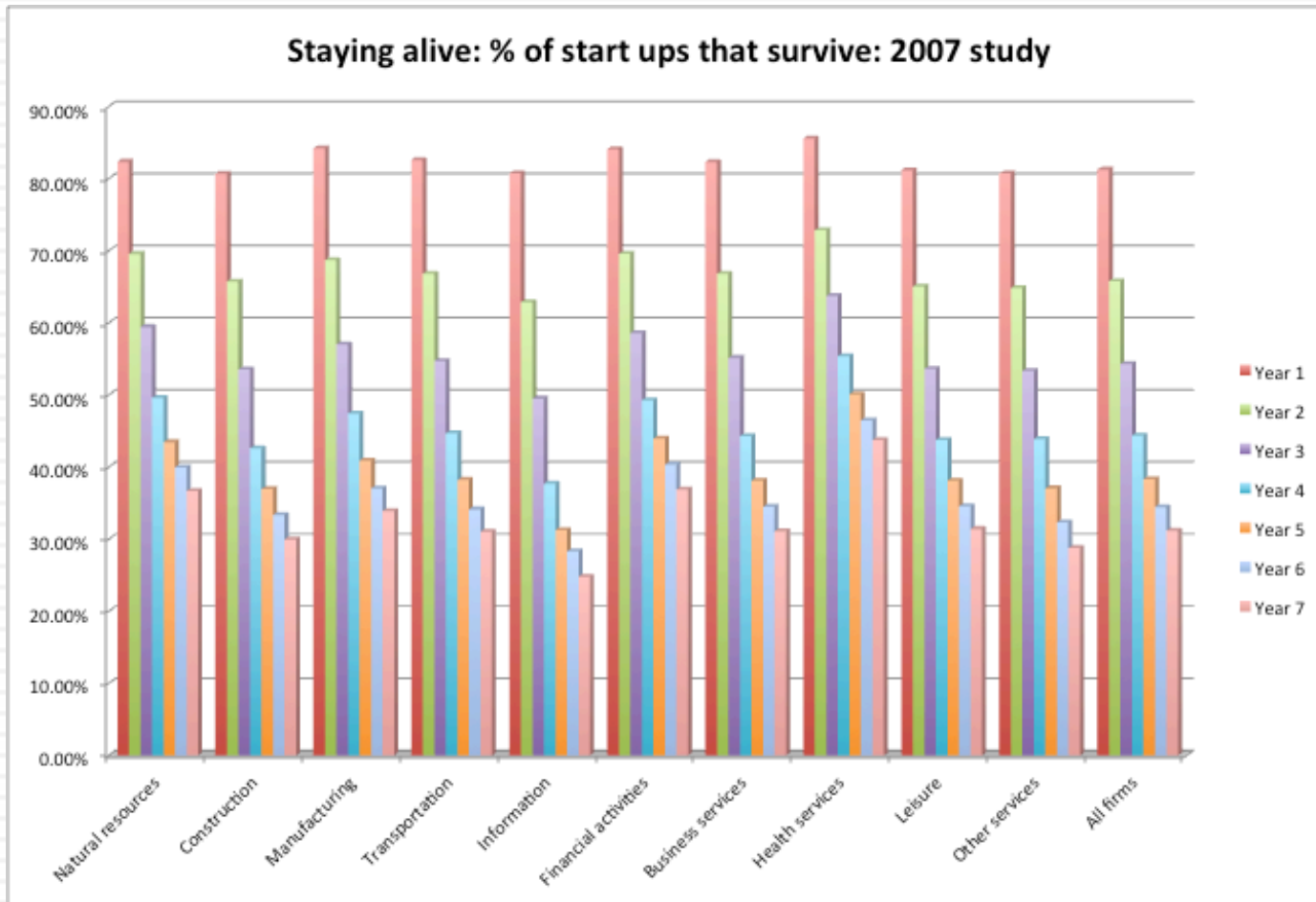
25

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



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

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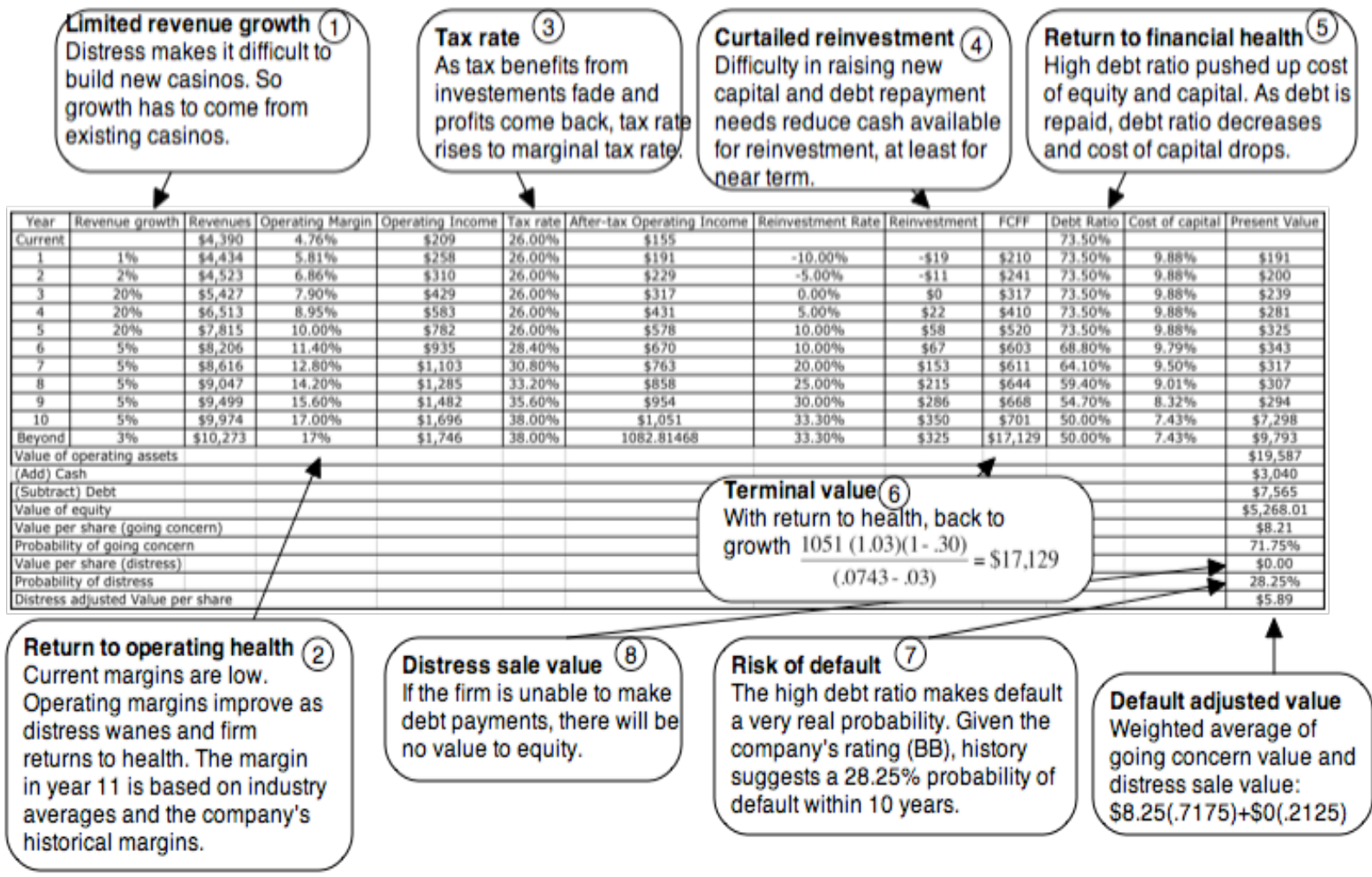
Contrasting ways of dealing with survival risk...

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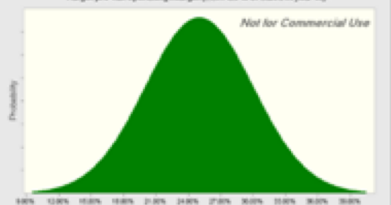
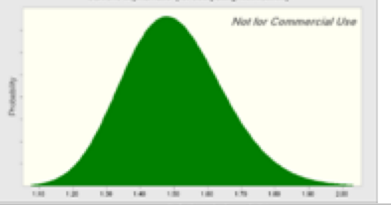

- The Venture Capital approach: In the venture capital approach, you hike the “discount rate” well above what would be appropriate for a going concern and then use this “target” rate to discount your “exit value” (which is estimated using a multiple and forward earnings).
 - ▣ Value = (Forward Earnings 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.

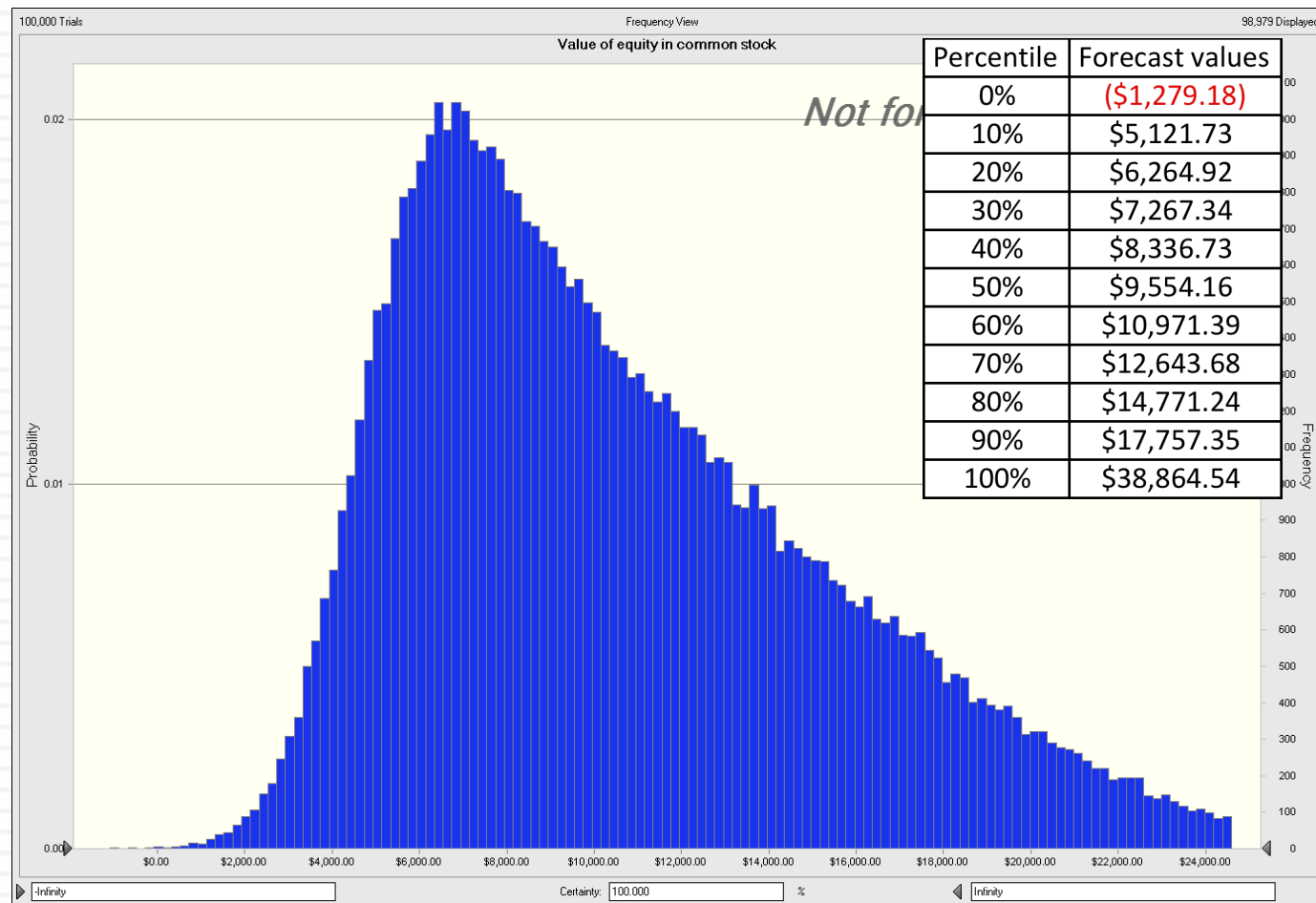


8. Confront uncertainty, if you can...

<p>Revenue Growth Rate Distribution: Uniform Expected Value = 55% Minimum Value: 40% Maximum Value: 70%</p>	<p>Compounded annual revenue growth rate over next 3 years =</p> <p><i>Not for Commercial Use</i></p> 
<p>Target Operating Margin Distribution: Normal Expected Value = 25% Standard Deviation = 5%</p>	<p>Target pre-tax operating margin (EBIT as % of sales in year 10) =</p> <p><i>Not for Commercial Use</i></p> 
<p>Sales to Capital Ratio Distribution: Lognormal Expected value: 1.50 Standard deviation: 0.15</p>	<p>Sales to capital ratio (for computing new investment) =</p> <p><i>Not for Commercial Use</i></p> 
<p>Cost of Capital Distribution: Triangular Expected value: 11.22% Minimum value: 10.02% Maximum value: 12.22%</p>	<p>Initial cost of capital =</p> <p><i>Not for Commercial Use</i></p> 

With the consequences for equity value...

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9. Don't look for precision..

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- 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

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

Stable Growth

Stable Revenue Growth: 5%	Stable Operating Margin: 9.32%	Stable ROC=16.94% Reinvest 29.5% of EBIT(1-t)
---------------------------	--------------------------------	--

NOL: 1,289 m

Current Revenue
\$ 2,465

Current Margin:
-34.60%

EBIT
-853m

Sales Turnover Ratio: 3.02

Competitive

Revenue Growth:
25.41%

Expected Margin:
-> 9.32%

Terminal Value = $1064 / (.0876 - .05)$
= \$ 28,310

Term. Year

\$24,912
\$2,302
\$1,509
\$ 445
\$1,064

	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

Value of Op Assets \$ 8,789
+ Cash & Non-op \$ 1,263
= Value of Firm \$10,052
· Value of Debt \$ 1,879
= Value of Equity \$ 8,173
· Equity Options \$ 845
Value per share \$ 20.83

	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%

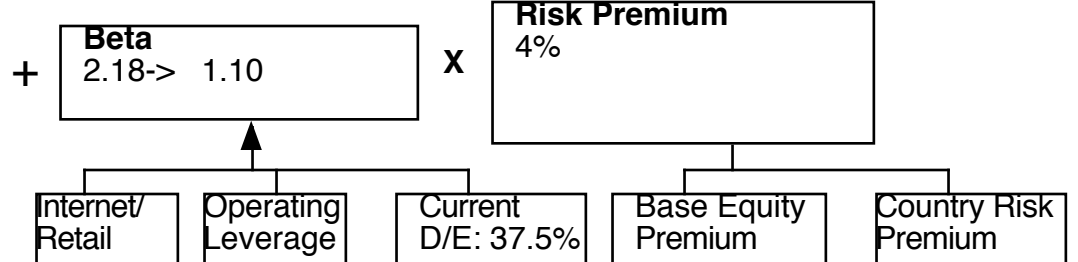
Forever

Cost of Equity
13.81%

Cost of Debt
6.5%+3.5%=10.0%
Tax rate = 0% -> 35%

Weights
Debt= 27.3% -> 15%

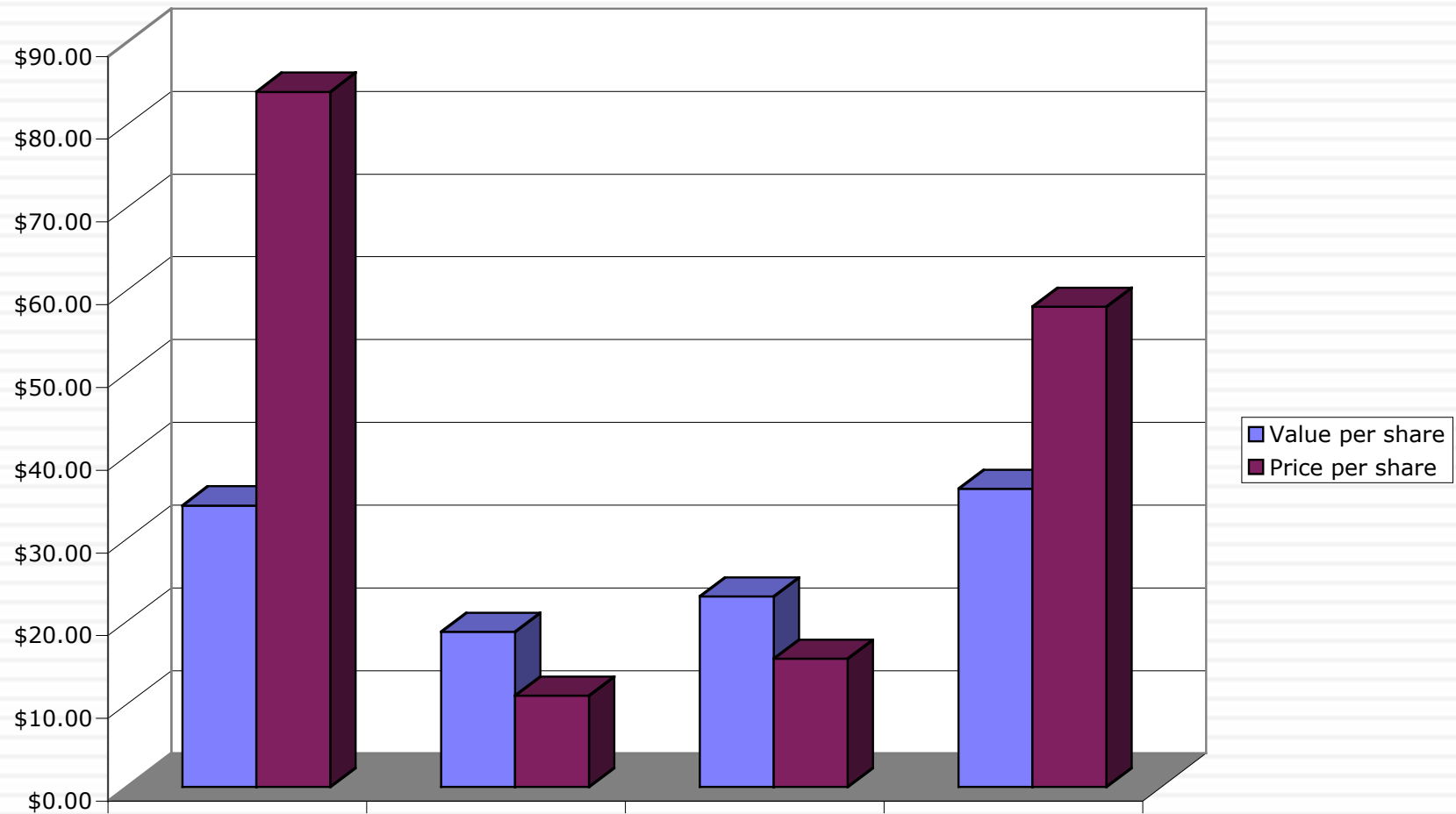
Riskfree Rate:
T. Bond rate = 5.1%



Amazon.com
January 2001
Stock price = \$14

To illustrate: Your mistakes versus market mistakes..

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10. You can make mistakes, but try to keep bias out..

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- 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...

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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

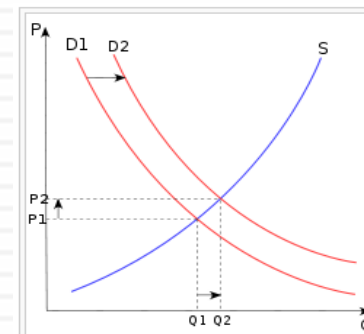
INTRINSIC
VALUE

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

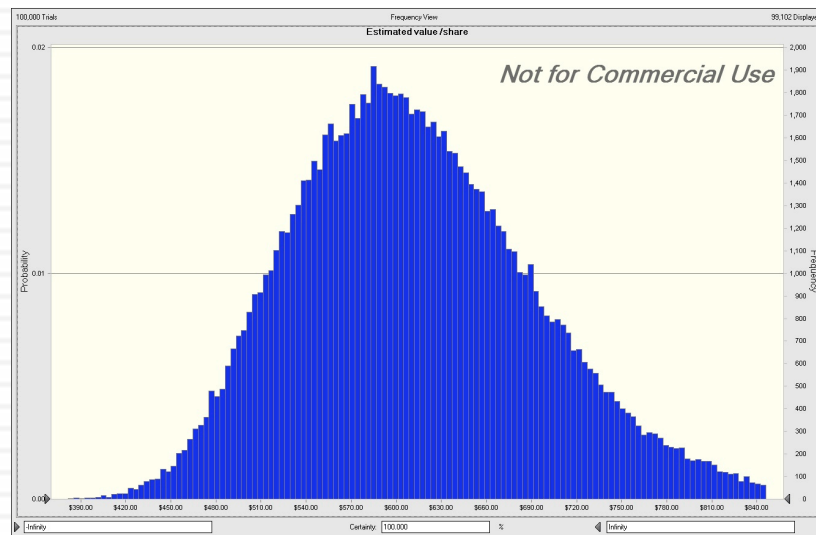
Drivers of price

- Market moods & momentum
- Surface stories about fundamentals

And here is how it plays out...

The value process

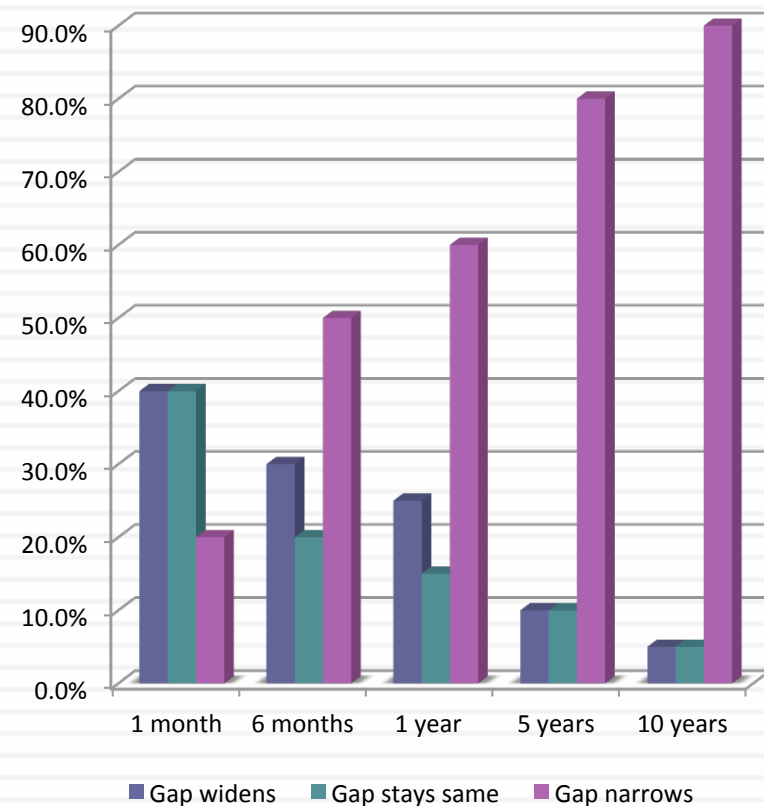
My valuation of Apple in January 2013



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

Aswath Damodaran

The Pricing Process: Apple



Strategies for managing the risk in the “closing” of the gap

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- 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.