



LIVING WITH NOISE
INVESTING IN THE FACE OF
UNCERTAINTY

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Uncertainty is a feature, not a bug.

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And we deal with uncertainty as humans always have...

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- Divine Intervention: Praying for intervention from a higher power is the oldest and most practiced risk management system of all.
- Paralysis & Denial: When faced with uncertainty, some of us get paralyzed. Accompanying the paralysis is the hope that if you close your eyes to it, the uncertainty will go away
- Mental short cuts (rules of thumb): Behavioral economists note that investors faced with uncertainty adopt mental short cuts that have no basis in reality. And here is the clincher. More intelligent people are more likely to be prone to this.
- Herding: When in doubt, it is safest to go with the crowd.. The herding instinct is deeply engrained and very difficult to fight.
- Outsourcing: Assuming that there are experts out there who have the answers does take a weight off your shoulders, even if those experts have no idea of what they are talking about.

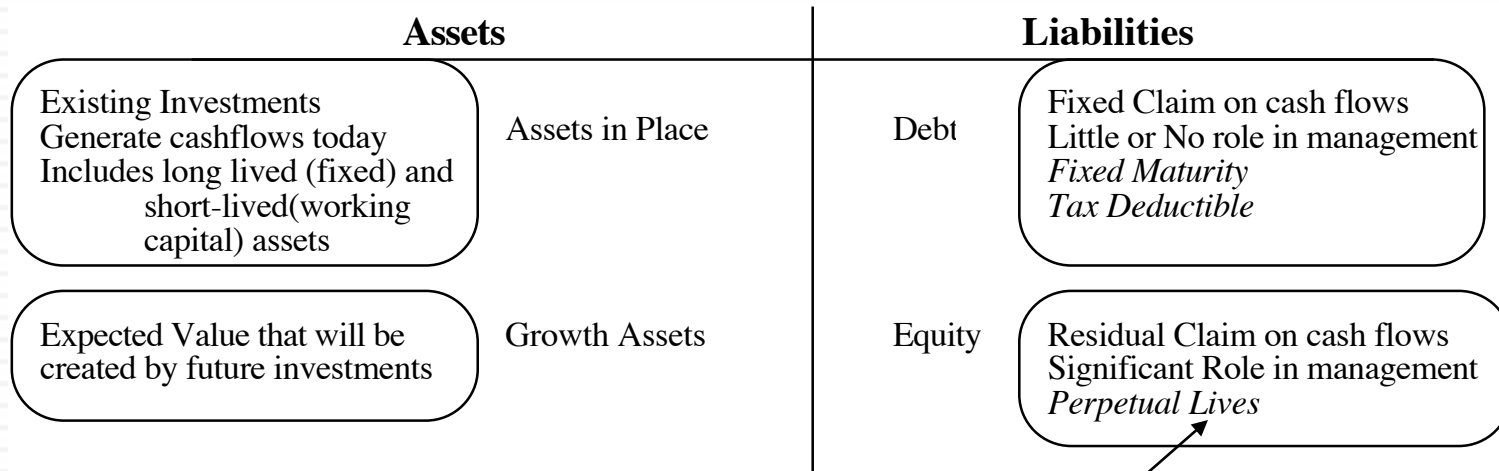


SETTING THE TABLE: THE BASICS OF INTRINSIC VALUE

The value drivers

DCF Choices: Equity Valuation versus Firm Valuation

Firm Valuation: Value the entire business



Equity valuation: Value just the equity claim in the business

The essence of intrinsic value

- In **intrinsic valuation**, you value an asset based upon its intrinsic characteristics.
- For cash flow generating assets, the intrinsic value will be a function of the magnitude of the expected cash flows on the asset over its lifetime and the uncertainty about receiving those cash flows.
- Discounted cash flow valuation is a tool for estimating intrinsic value, where the expected value of an asset is written as the present value of the expected cash flows on the asset, with either the cash flows or the discount rate adjusted to reflect the risk.

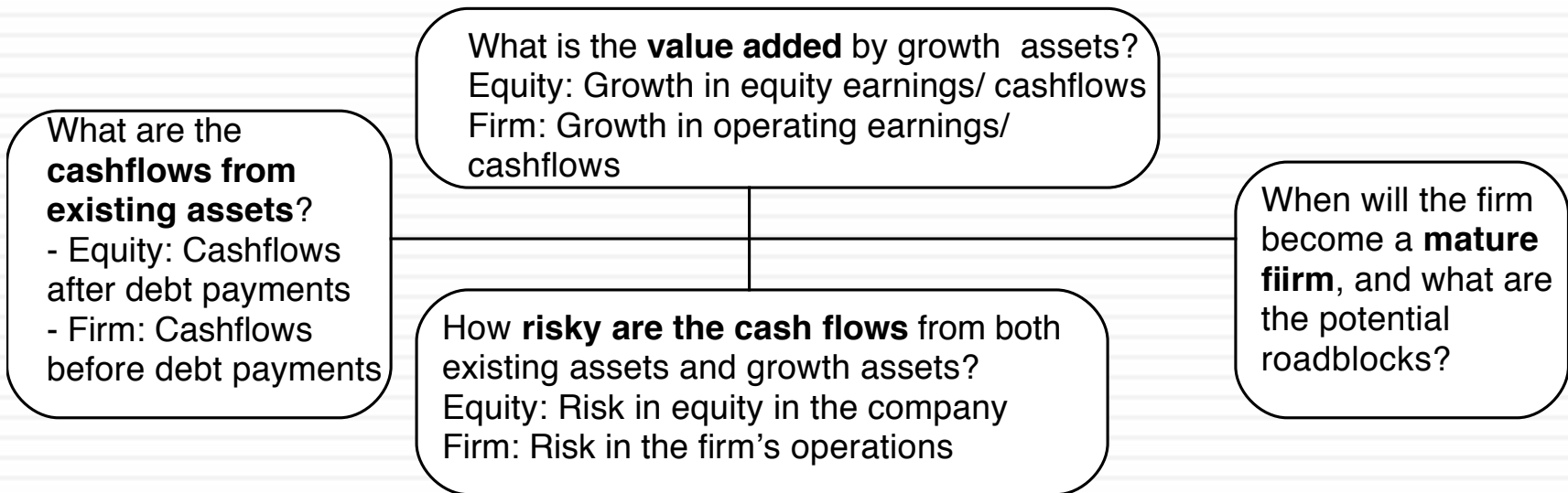
Risk Adjusted Value: Three Basic Propositions

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

$$\text{Value of asset} = \frac{E(\text{CF}_1)}{(1+r)} + \frac{E(\text{CF}_2)}{(1+r)^2} + \frac{E(\text{CF}_3)}{(1+r)^3} \dots + \frac{E(\text{CF}_n)}{(1+r)^n}$$

- Proposition 1: If “it” does not affect the cash flows or alter risk (thus changing discount rates), “it” cannot affect value.
- Proposition 2: For an asset to have value, the expected cash flows have to be positive some time over the life of the asset.
- Proposition 3: Assets that generate cash flows early in their life will be worth more than assets that generate cash flows later; the latter may however have greater growth and higher cash flows to compensate.

The fundamental determinants of value...



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

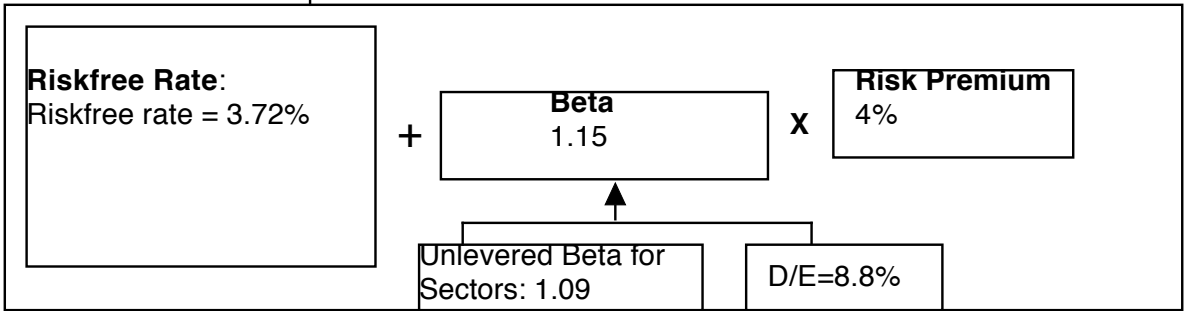
Cost of capital = 8.32% (0.92) + 2.91% (0.08) = 7.88%

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%

Unlevered Beta for
 Sectors: 1.04

Firm's D/E
 Ratio: 33%

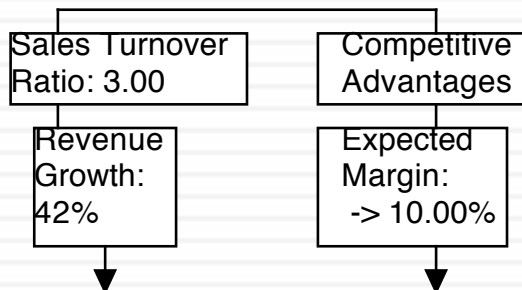
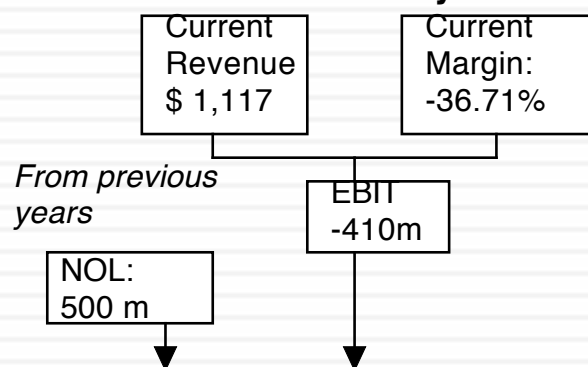
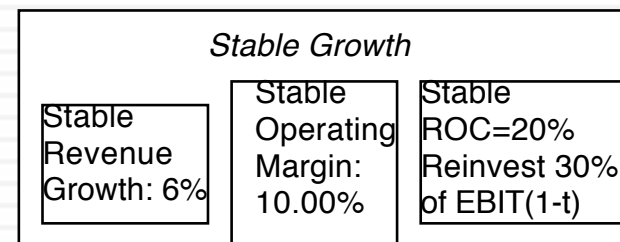
Country Default
 Spread
 3%

X

Rel Equity
 Mkt Vol
 1.50

9a. Amazon in January 2000

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



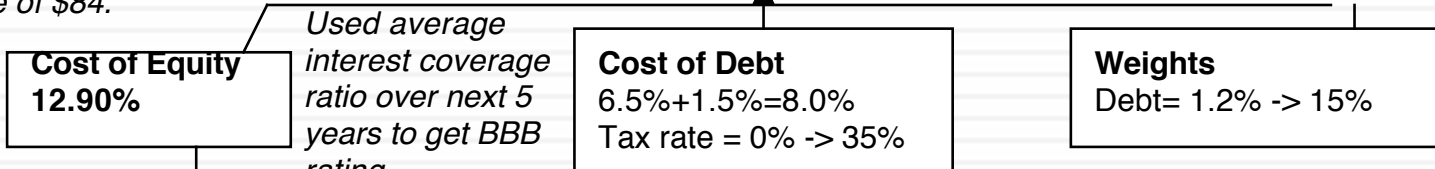
Terminal Value = $1881 / (.0961 - .06) = 52,148$

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

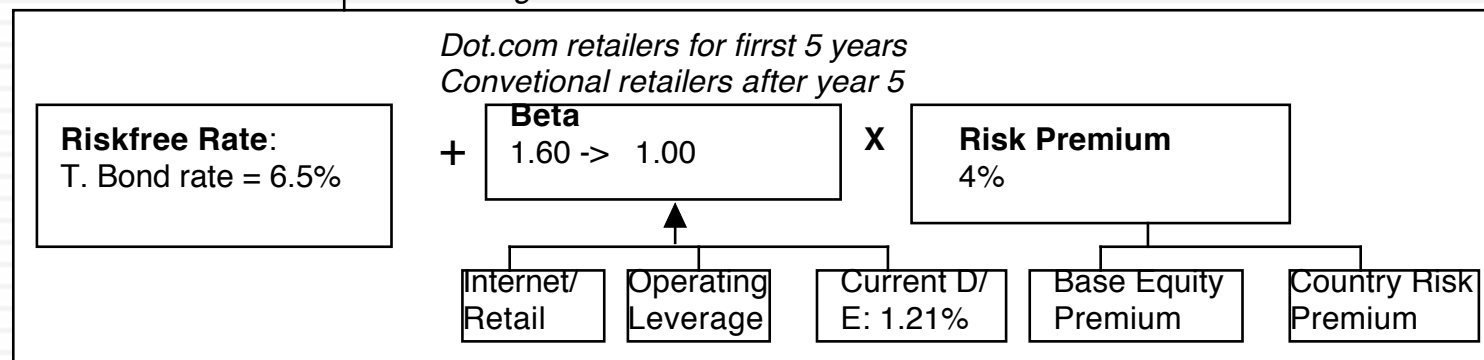
All existing options valued as options, using current stock price of \$84.

	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%	



Amazon was trading at \$84 in January 2000.



Pushed debt ratio to retail industry average of 15%.

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 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

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

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%

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



CATEGORIZING AND RESPONDING TO UNCERTAINTY



I. Estimation versus Economic Uncertainty

- Estimation versus Economic uncertainty
 - Estimation uncertainty reflects the possibility that you could have the “wrong model” or estimated inputs incorrectly within this model.
 - Economic uncertainty comes from real sources: that markets and economies can change over time and that even the best models will fail to capture these unexpected changes.
- Estimation uncertainty can be mitigated by doing your homework, collecting more data or building better models, but economic uncertainty is here to stay.

II. Micro versus Macro Uncertainty

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

III. Discrete versus Continuous Uncertainty

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

Assessing uncertainty...

- Rank the four firms in terms of uncertainty (least to most) in your estimate:
 - 3M in 2007
 - Tata Motors in 2010
 - Amazon in 2000
 - Twitter in 2013
- With each company, specify the type of uncertainty that you face:

Company	Estimation or Economic	Micro or Macro	Discrete or Continuous
3M (2007)			
Tata Motors (2010)			
Amazon (2000)			
Twitter (2013)			



DEALING WITH UNCERTAINTY:
BAD WAYS AND GOOD WAYS...



Ten suggestions for dealing with uncertainty...

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

1. Less is more

- The principle of parsimony: When faced with uncertainty, go for less detail, rather than more. That may sound counterintuitive, but here is why it makes sense:
 - You have a better shot at estimating an aggregate number, rather than individual numbers (Examples: Forecast the operating margin rather than individual operating expenses, total working capital instead of individual working capital items)
 - Estimation requires information and trying to estimate individual items, in the absence of information, is not only frustrating but an exercise in futility.
- Auto pilot rules: The uncertainty you face will increase as you go forward in time (it is much more difficult to estimate year 5 than year 1). Thus, it is best to create simple algorithms that estimate year-specific numbers as you go further out in time.

To illustrate: Revenues & Margins for Amazon

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

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...

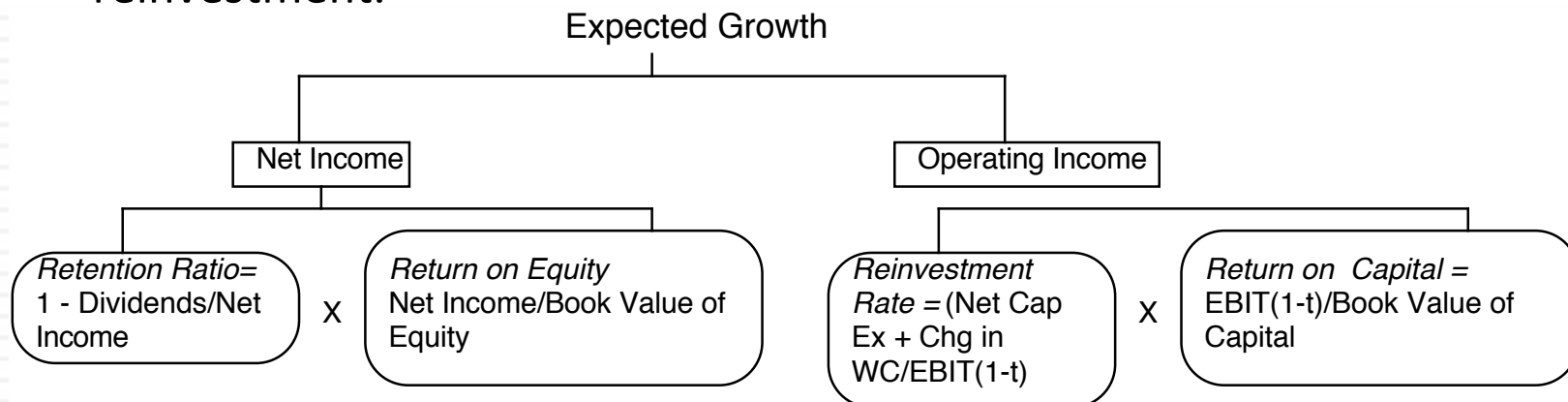
- While you may be forecasting individual items in valuation, and you are uncertain about each item, you can create internal checks to make sure that your assumptions are not at war with each other.
- In particular, you should make sure that as you approach your terminal year, the company that you are creating on your spreadsheet is one that is feasible and viable in terms of
 - ▣ Size, relative to the market that it serves... Your market share obviously cannot exceed 100% but there may be tighter constraints (your market share cannot exceed that of the largest company in the sector)
 - ▣ Profitability, as measured in terms of operating margins and returns on capital. In particular, the return on capital should be supportable, given the industry average return on capital and the cost of capital.

To illustrate: The reinvestment in Amazon

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%

And the growth rate in 3M

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

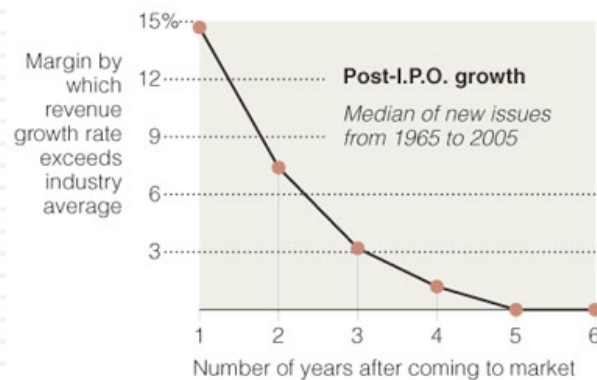


- To estimate the growth rate in 3M in the pre-crisis valuation in 2008:
 - Reinvestment rate = 30% (close to most recent year's 29.97%)
 - Return on capital = 25% (close to most recent year's 25.19%)
 - Expected growth rate = 30% * 25% = 7.5%

Follow up propositions on growth...

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

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



Source: Andrew Metrick

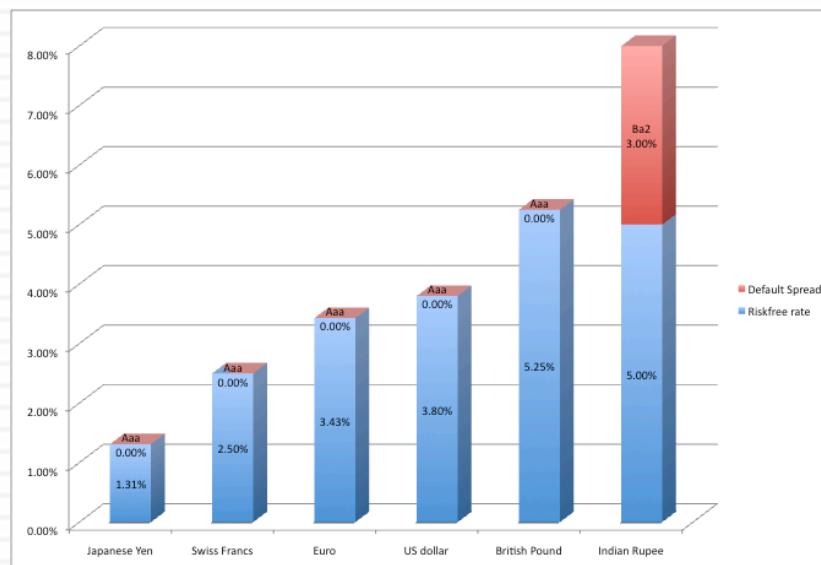
The New York Times

3. Use consistency tests...

- While you can not grade a valuation on “correctness” (since different analysts can make different assumptions about growth and risk), you can grade it on consistency.
- For a valuation to be consistent, your estimates of cash flows have to be consistent with your discount rate definition.
 1. Equity versus Firm: If the cash flows being discounted are cash flows to equity, the appropriate discount rate is a cost of equity. If the cash flows are cash flows to the firm, the appropriate discount rate is the cost of capital.
 2. Currency: The currency in which the cash flows are estimated should also be the currency in which the discount rate is estimated.
 3. Nominal versus Real: If the cash flows being discounted are nominal cash flows (i.e., reflect expected inflation), the discount rate should be nominal

To illustrate: The “currency effect”

- Currency Invariance: You can value any company in any currency and if you do it correctly, your value should be invariant to the currency used.
- Puzzle: How can currency invariance apply, if the risk free rates are higher in some currencies and lower in others?



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)

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

- When doing valuation, you are free to make assumptions about how your company will evolve over time in the market that it operates, but you are not free to violate first principles in economics and mathematics.
- Put differently, there are assumptions in valuation that are either mathematically impossible or violate first laws of economics and cannot be ever justified.

To illustrate: The growth rate in terminal value

- When a firm's cash flows grow at a “constant” rate forever, the present value of those cash flows can be written as:
 - $\text{Value} = \text{Expected Cash Flow Next Period} / (r - g)$
- The stable growth rate cannot exceed the growth rate of the economy but it can be set lower.
 - If you assume that the economy is composed of high growth and stable growth firms, the growth rate of the latter will probably be lower than the growth rate of the economy.
 - The stable growth rate can be negative. The terminal value will be lower and you are assuming that your firm will disappear over time.
 - If you use nominal cashflows and discount rates, the growth rate should be nominal in the currency in which the valuation is denominated.
- One simple proxy for the nominal growth rate of the economy is the riskfree rate:
 - $\text{Riskfree rate} = \text{Expected inflation} + \text{Expected real interest rate}$
 - $\text{Nominal growth rate in GDP} = \text{Expected inflation} + \text{Expected real growth rate}$

And the “excess return” effect...

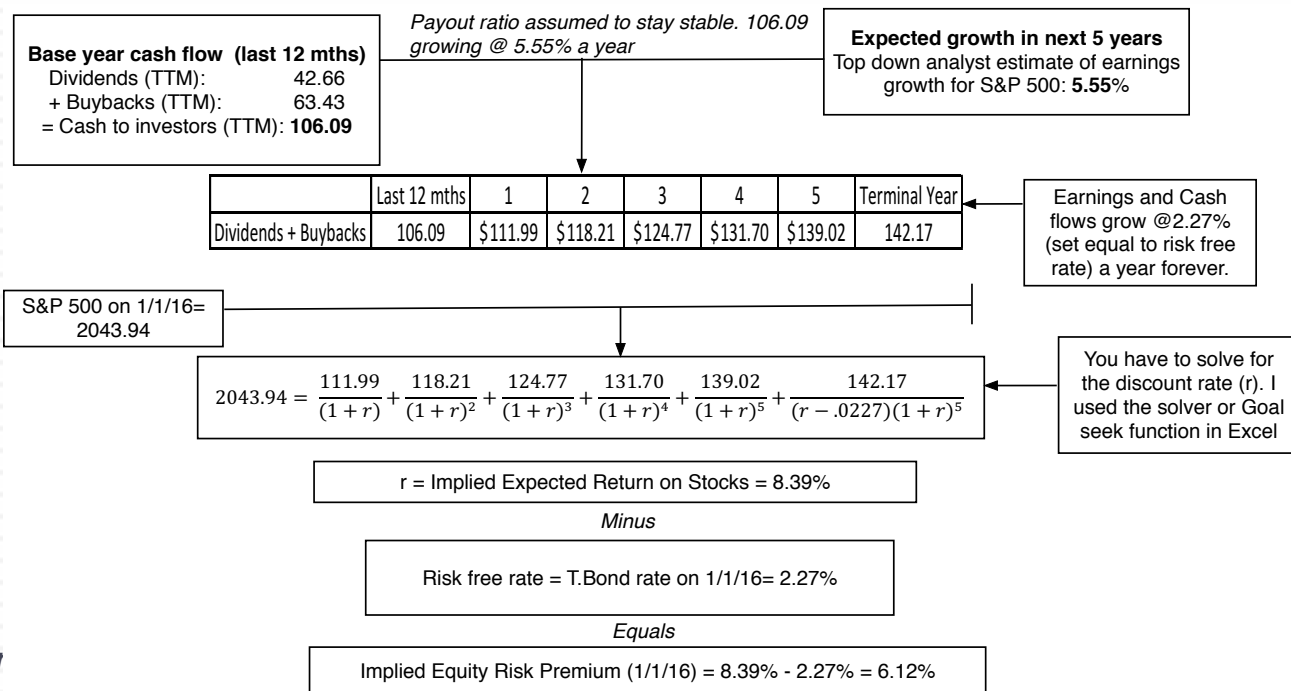
<i>Stable growth rate</i>	<i>3M</i>	<i>Tata Motors</i>	<i>Amazon</i>	<i>Twitter</i>
0%	\$70,409	435,686₹	\$26,390	\$23,111
1%	\$70,409	435,686₹	\$28,263	\$24,212
2%	\$70,409	435,686₹	\$30,595	\$25,679
3%	\$70,409	435,686₹	\$33,594	
4%		435,686₹	\$37,618	
5%		435,686₹	\$43,334	
			\$52,148	
Riskfree rate	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...

- In intrinsic valuation, you start with the presumption that the market is not always right and that your value may yield a better estimate of the “true” value of a business than the market’s estimate of that value.
- While that is a reasonable (albeit debatable) belief, you can still use market values either as inputs for some variables or as checks on your inputs. That will allow you to value your company in a more bounded environment, where you are not making assumptions about variables that you either should not be bringing in your point of view on and/or are unequipped to do so.

Here is an example: Equity Risk Premiums

	Arithmetic Average		Geometric Average	
	Stocks - T. Bills	Stocks - T. Bonds	Stocks - T. Bills	Stocks - T. Bonds
1928-2015	7.92%	6.18%	6.05%	4.54%
Std Error	2.15%	2.29%		
1966-2015	6.05%	3.89%	4.69%	2.90%
Std Error	2.42%	2.74%		
2006-2015	7.87%	3.88%	6.11%	2.53%
Std Error	6.06%	8.66%		



Extending to country risk premium...

- Assume that the equity risk premium for the US and other mature equity markets is 5.8%.
- To estimate the additional risk premium for an emerging market, you can start with a country default spread, using one of two approaches:
 - ▣ Default spread, given the country's bond rating (estimated either by looking at a US \$ or Euro government bond issued by that country)
 - ▣ CDS spread for the country, from the market
- Adjusted for equity risk: The country equity risk premium is based upon the volatility of the market in question relative to U.S market.
 - ▣ Total equity risk premium = Default SpreadCountry* $(\sigma_{\text{Country Equity}} / \sigma_{\text{Country Bond}})$
 - ▣ Standard Deviation in Bovespa = 30%
 - ▣ Standard Deviation in Brazilian government bond= 20%
 - ▣ Default spread for Brazil= 1.75%
 - ▣ Additional risk premium for Brazil = 1.75% (30/20) = 2.63%

ERP : Jan 2016

Andorra	9.28%	3.28%	Jersey (States of)	6.59%	0.59%
Austria	6.00%	0.00%	Liechtenstein	6.00%	0.00%
Belgium	6.90%	0.90%	Luxembourg	6.00%	0.00%
Cyprus	12.71%	6.71%	Malta	7.79%	1.79%
Denmark	6.00%	0.00%	Netherlands	6.00%	0.00%
Finland	6.00%	0.00%	Norway	6.00%	0.00%
France	6.74%	0.74%	Portugal	9.72%	3.72%
Germany	6.00%	0.00%	Spain	8.84%	2.84%
Greece	20.90%	14.90%	Sweden	6.00%	0.00%
Guernsey	6.59%	0.59%	Switzerland	6.00%	0.00%
Iceland	8.84%	2.84%	Turkey	9.28%	3.28%
Ireland	8.38%	2.38%	United Kingdom	6.59%	0.59%
Isle of Man	6.59%	0.59%	Western Europe	7.16%	1.16%
Italy	8.84%	2.84%			

Albania	12.71%	6.71%
Armenia	11.37%	5.37%
Azerbaijan	9.28%	3.28%
Belarus	17.17%	11.17%
Bosnia	15.70%	9.70%
Bulgaria	8.84%	2.84%
Croatia	9.72%	3.72%
Czech Republic	7.05%	1.05%
Estonia	7.05%	1.05%
Georgia	11.37%	5.37%
Hungary	9.72%	3.72%
Kazakhstan	8.84%	2.84%
Latvia	7.79%	1.79%
Lithuania	7.79%	1.79%
Macedonia	11.37%	5.37%
Moldova	15.70%	9.70%
Montenegro	11.37%	5.37%
Poland	7.26%	1.26%
Romania	9.28%	3.28%
Russia	9.72%	3.72%
Serbia	12.71%	6.71%
Slovakia	7.26%	1.26%
Slovenia	9.28%	3.28%
Ukraine	20.90%	14.90%
Eastern Europe & Russia	9.65%	3.65%

Frontier Markets (not rated)							
Algeria	63.0	12.71%	6.71%	Malawi	57.0	17.17%	11.17%
Brunei	72.8	8.84%	2.84%	Mali	62.5	12.71%	6.71%
Gambia	62.0	14.20%	8.20%	Myanmar	63.3	12.71%	6.71%
Guinea	53.8	17.17%	11.17%	Niger	51.0	17.17%	11.17%
Guinea-Bissau	62.3	12.71%	6.71%	Sierra Leone	56.5	17.17%	11.17%
Guyana	63.5	12.71%	6.71%	Somalia	42.5	20.90%	14.90%
Haiti	57.0	17.17%	11.17%	Sudan	48.3	20.90%	14.90%
Iran	67.8	10.48%	4.48%	Syria	35.8	25.00%	19.00%
Iraq	56.0	17.17%	11.17%	Tanzania	63.0	12.71%	6.71%
Korea, D.P.R.	56.0	17.17%	11.17%	Togo	63.8	12.71%	6.71%
Liberia	50.5	17.17%	11.17%	Yemen, Republic	50.3	17.17%	11.17%
Libya	52.8	17.17%	11.17%	Zimbabwe	54.5	17.17%	11.17%
Madagascar	61.3	14.20%	8.20%				

Canada	6.00%	0.00%
US	6.00%	0.00%
North America	6.00%	0.00%

Caribbean	14.61%	8.61%
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Argentina	17.17%	11.17%
Belize	19.42%	13.42%
Bolivia	11.37%	5.37%
Brazil	9.28%	3.28%
Chile	6.90%	0.90%
Colombia	8.84%	2.84%
Costa Rica	9.72%	3.72%
Ecuador	15.70%	9.70%
El Salvador	11.37%	5.37%
Guatemala	9.72%	3.72%
Honduras	15.70%	9.70%
Mexico	7.79%	1.79%
Nicaragua	14.20%	8.20%
Panama	8.84%	2.84%
Paraguay	9.72%	3.72%
Peru	7.79%	1.79%
Suriname	11.37%	5.37%
Uruguay	8.84%	2.84%
Venezuela	20.90%	14.90%
Latin America	10.42%	4.42%

Country	ERP	CRP
Angola	10.48%	4.48%
Botswana	7.26%	1.26%
Burkina Faso	15.70%	9.70%
Cameroon	14.20%	8.20%
Cape Verde	14.20%	8.20%
Congo (DR)	15.70%	9.70%
Congo (Republic)	11.37%	5.37%
Côte d'Ivoire	11.37%	5.37%
Egypt	15.70%	9.70%
Ethiopia	12.71%	6.71%
Gabon	11.37%	5.37%
Ghana	15.70%	9.70%
Kenya	12.71%	6.71%
Morocco	9.72%	3.72%
Mozambique	14.20%	8.20%
Namibia	9.28%	3.28%
Nigeria	11.37%	5.37%
Rwanda	12.71%	6.71%
Senegal	12.71%	6.71%
South Africa	8.84%	2.84%
Tunisia	11.37%	5.37%
Uganda	12.71%	6.71%
Zambia	14.20%	8.20%
Africa	11.76%	5.76%

Abu Dhabi	6.74%	0.74%
Bahrain	9.28%	3.28%
Israel	7.05%	1.05%
Jordan	12.71%	6.71%
Kuwait	6.74%	0.74%
Lebanon	14.20%	8.20%
Oman	7.05%	1.05%
Qatar	6.74%	0.74%
Ras Al Khaimah	7.26%	1.26%
Saudi Arabia	6.90%	0.90%
Sharjah	7.79%	1.79%
United Arab Emirates	6.74%	0.74%
Middle East	7.11%	1.11%

Bangladesh	11.37%	5.37%
Cambodia	14.20%	8.20%
China	6.90%	0.90%
Fiji	12.71%	6.71%
Hong Kong	6.59%	0.59%
India	9.28%	3.28%
Indonesia	9.28%	3.28%
Japan	7.05%	1.05%
Korea	6.74%	0.74%
Macao	6.74%	0.74%
Malaysia	7.79%	1.79%
Mauritius	8.38%	2.38%
Mongolia	14.20%	8.20%
Pakistan	15.70%	9.70%
Papua New Guinea	12.71%	6.71%
Philippines	8.84%	2.84%
Singapore	6.00%	0.00%
Sri Lanka	12.71%	6.71%
Taiwan	6.90%	0.90%
Thailand	8.38%	2.38%
Vietnam	12.71%	6.71%
Asia	7.49%	1.49%

Australia	6.00%	0.00%
Cook Islands	12.71%	6.71%
New Zealand	6.00%	0.00%
Australia & NZ	6.00%	0.00%

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

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

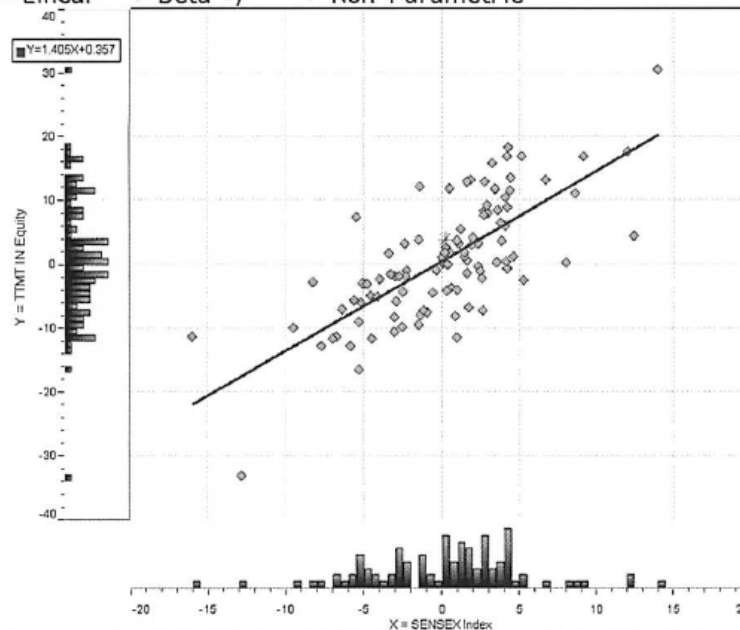
- The law of large numbers: The "law of large numbers" is one of several theorems expressing the idea that as the number of trials of a random process increases, the percentage difference between the expected and actual values goes to zero.
- The average is your friend: In pragmatic terms, when faced with uncertainty on an input, you are better off using an average (over time or across companies) than using the actual number.

To illustrate: A single regression beta is noisy...

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

Equity **BETA**

TTMT IN Equity Relative Index SENSEX Index Historical Beta
 Data Last Price Range 04/13/08 - 04/04/10 Period Weekly Local CCY
 Linear Beta +/- Non-Parametric



Y = TATA MOTORS LTD
 X = BSE SENSEX 30 INDEX

Item	Value
Raw BETA	1.405
Adj BETA	1.270
ALPHA(Intercept)	0.357
R^2(Correlation^2)	0.541
Std Dev Of Error	6.291
Std Error Of ALPHA	0.621
Std Error Of BETA	0.129
Number Of Points	103

Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
 Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000
 * Last Observation
 Copyright 2010 Bloomberg Finance L.P.
 SN 636136 H003-375-0 09-Apr-2010 15:11:28

But an average beta across companies is not...

- There are 111 publicly traded companies, globally in the automobile business.
 - ▣ Average beta across companies = 1.22
 - ▣ Average D/E ratio across companies = 35%
 - ▣ Average tax rate across companies = 30%
 - ▣ Unlevered beta for automobile company = $1.22 / (1 + (1 - .30)(.35)) = 0.98$
 - ▣ Standard error on “average” beta = $0.26 / \text{Sq root of } 111 = 0.025$
- To estimate the beta for Tata Motors
 - ▣ Unlevered beta for automobile company = 0.98
 - ▣ D/E ratio for Tata Motors = 33.87%
 - ▣ Marginal tax rate in India = 33.99%
 - ▣ Levered beta = $0.98 (1 + (1 - .3399)(.3387)) = 1.20$

Another illustration: Normalizing earnings for Tata Motors

- Tata Motors, like most cyclical companies, has had volatile earnings over time. It reported after-tax operating income of Rs 13,846 million in the most recent fiscal year on revenues of Rs 265,868 million.
- To normalize the earnings, you can start with the history of prior year's earnings. Between 2004 and 2008, Tata Motors earned an average after tax operating margin of 9.58% on revenues and paid 21% of its income in taxes.
- Applying the average pre-tax margin to the revenues in the most recent fiscal year yields a “normalized” operating income, which can then be used to estimate an after

Normalized operating income = $265,868 \times .0958 = \text{Rs } 25,465 \text{ m}$

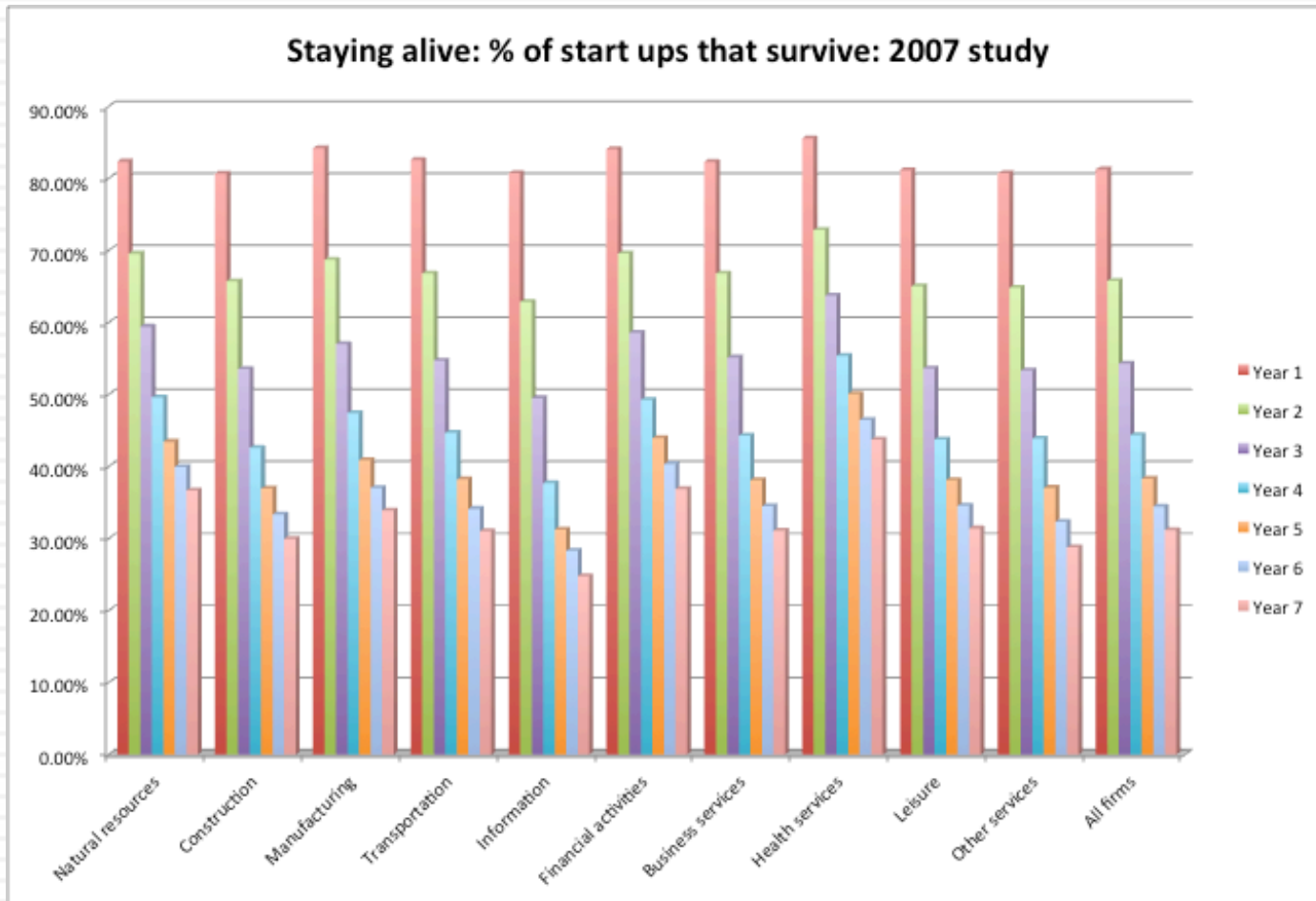
Normalized after-tax EBIT = $25465 (1-.21) = \text{Rs } 20,116 \text{ m}$

- Note that neither working capital nor net cap ex were normalized, since they did not have the same degree of volatility.

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

- In discounted cash flow valuation, it is true that risk is incorporated into the discount rate. Taking that principle to its logical limits, analysts often “hike” the discount rate to reflect any uncertainty they feel about value.
- There are several dangers with doing so:
 - You may be building in risks that will disappear in a portfolio and thus unnecessarily lowering the value of some risky investments. If you are valuing a company for a diversified investor, it is macro risks that you should be capturing in the discount rate, not micro risks.
 - Adding to the proposition, adjusting discount rates is easier to do with continuous risk (that earnings will be volatile or exchange rates will change) than for discontinuous risk.

To illustrate: Survival risk at young firms...



Contrasting ways of dealing with survival risk...

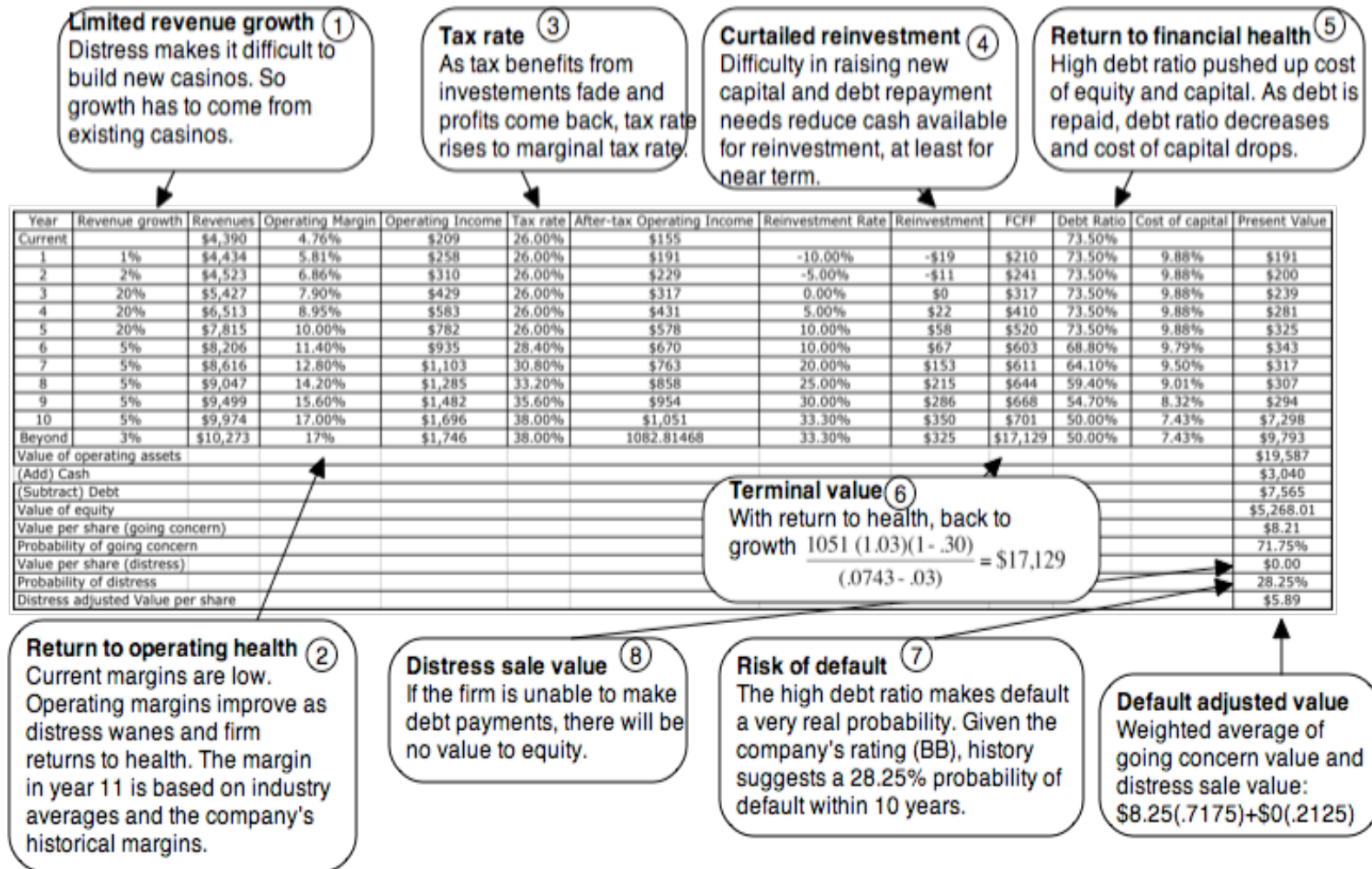
- The Venture Capital approach: In the venture capital approach, you hike the “discount rate” well above what would be appropriate for a going concern and then use this “target” rate to discount your “exit value” (which is estimated using a multiple and forward earnings).
 - Value = (Forward Earnings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

Generalizing to other “truncation” risks

- Default risk for a “distressed” company: For firms that have substantial debt, there is the possibility of default. In default, you will receive a liquidation value for your assets in place, that may not reflect their going concern value, and will lose any “growth asset” value.
 - Value = Going concern value (1- Probability of default) + Liquidation value (Probability of default)
- Nationalization risk: The primary cost of being nationalized is that what you receive for your business from the nationalizing authority is less than the fair value of the business.
 - Value = Going concern value (1- Probability of nationalization) + Liquidation value (Probability of nationalization)

Exhibit 8.2: Valuing a Distressed firm: Las Vegas Sands in early 2009


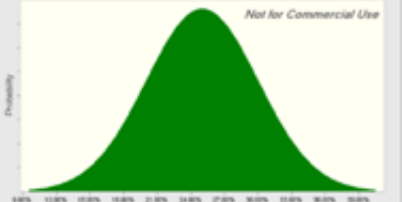
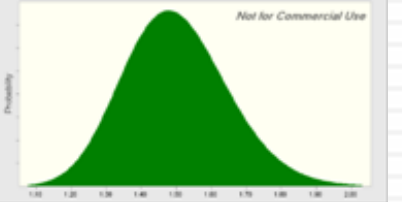

Las Vegas Sands owns and operates the Venetian Casino and Sands Convention Center in Las Vegas and the Sands Macau Casino in Macau, China. While the revenues increased from \$1.75 billion in 2005 to \$4.39 billion in 2008 and it had two other casinos in development - it ran into significant financial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



8. Confront uncertainty, if you can...

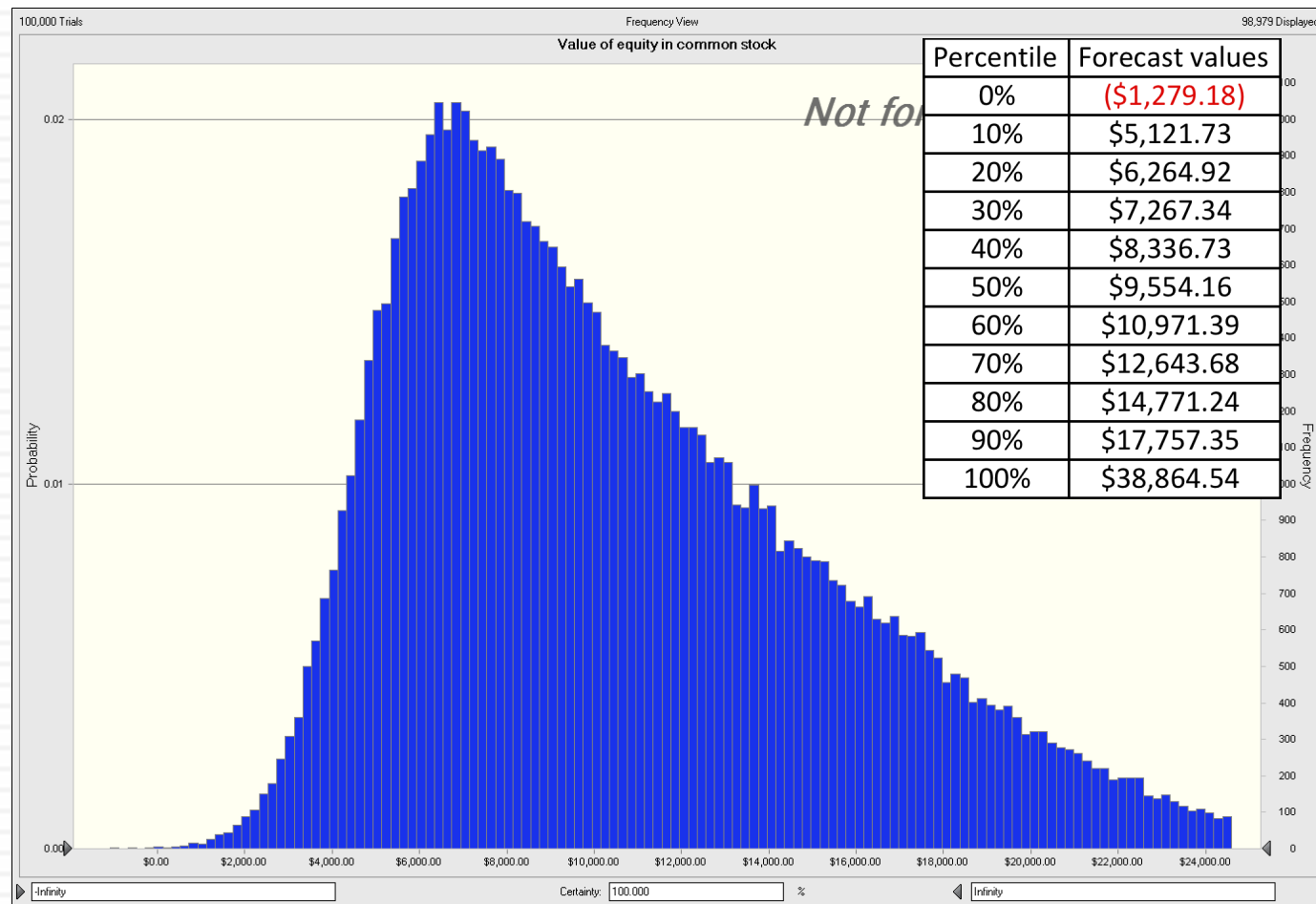
- In standard valuation, you are forced to make point estimates for inputs where you are uncertain about values. In statistical terms, you are being asked to compress a probability distribution about a variable into an expected value. You then obtain a single estimate of value, based upon your base case or expected values.
- In a simulation, you can enter distributions for variables, rather than point estimates. Rather than obtain a single estimate of value, you get a distribution of values, which can provide you with substantially more information than a single valuation.

To illustrate: Revisiting the Twitter valuation...

<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>A uniform distribution graph showing a flat green bar between 40.00% and 70.00% on the x-axis. The y-axis is labeled 'Probability'.</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>A normal distribution graph showing a bell-shaped green curve centered at 25.00% on the x-axis. The y-axis is labeled 'Probability'.</p>
<p>Sales to Capital Ratio Distribution: Lognormal Expected value: 1.50 Standard deviation: 0.15</p>	<p>Sales to capital ratio (for computing reinvestment) =</p> <p><i>Not for Commercial Use</i></p>  <p>A lognormal distribution graph showing a bell-shaped green curve centered at 1.50 on the x-axis. The y-axis is labeled 'Probability'.</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>  <p>A triangular distribution graph showing a green triangle with its peak at 11.22% on the x-axis. The y-axis is labeled 'Probability'.</p>

With the consequences for equity value...

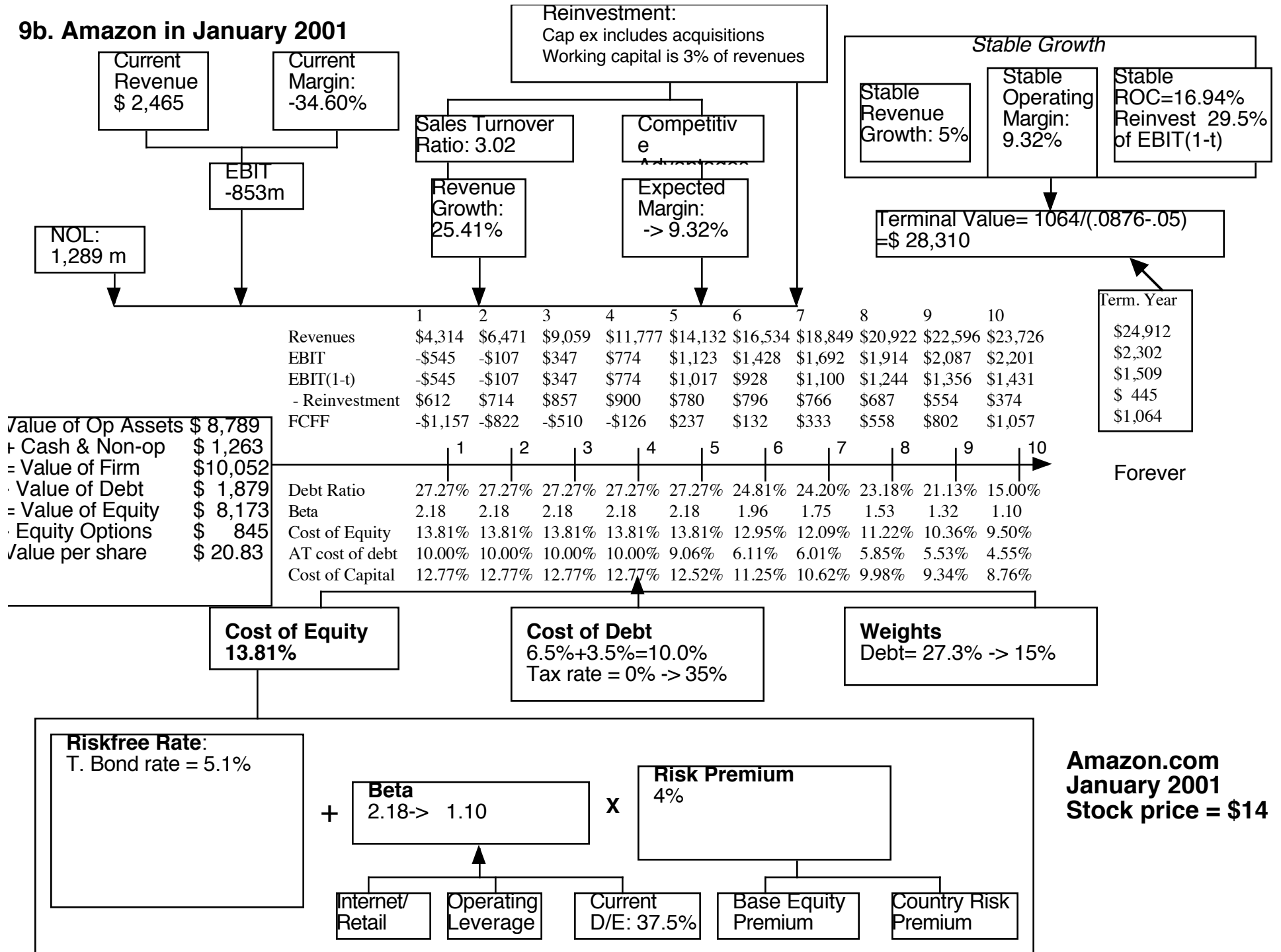
48



9. Don't look for precision..

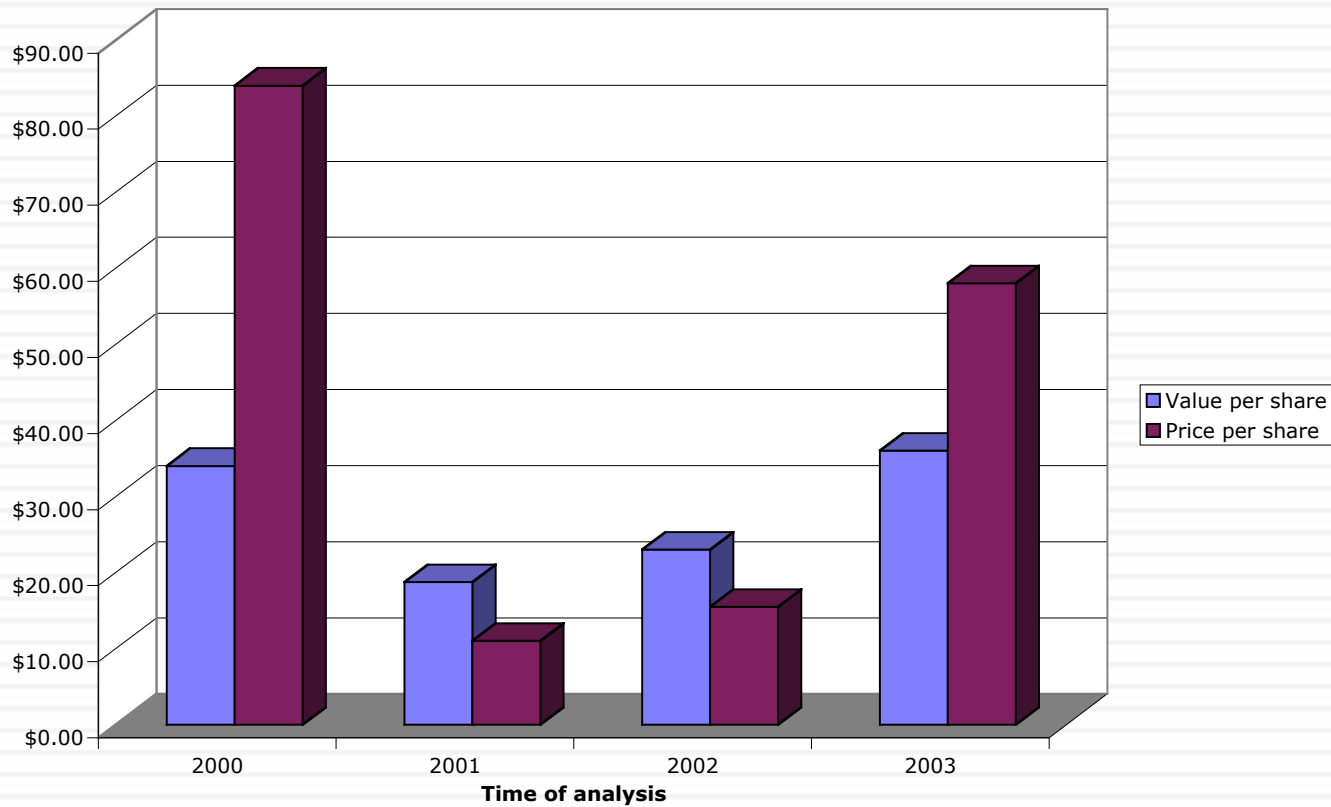
- No matter how careful you are in getting your inputs and how well structured your model is, your estimate of value will change both as new information comes out about the company, the business and the economy.
- As information comes out, you will have to adjust and adapt your model to reflect the information. Rather than be defensive about the resulting changes in value, recognize that this is the essence of risk.

9b. Amazon in January 2001



To illustrate: Your mistakes versus market mistakes..

Amazon: Value and Price



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 ITS NOT JUST VALUE THAT
YOU ARE UNCERTAIN ABOUT...



Valuation and Pricing

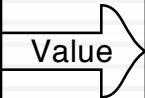
- Tools for intrinsic analysis*
- Discounted Cashflow Valuation (DCF)
 - Intrinsic multiples
 - Book value based approaches
 - Excess Return Models

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

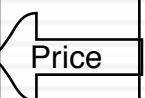
- Tools for pricing*
- Multiples and comparables
 - Charting and technical indicators
 - Pseudo DCF

Value of cashflows,
adjusted for time
and risk

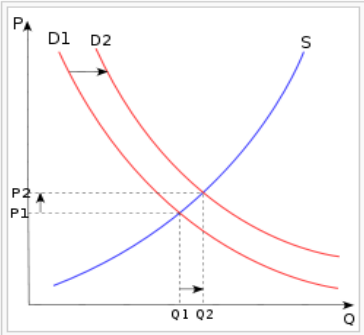
INTRINSIC
VALUE



THE GAP
Is there one?
Will it close?



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

Three views of “the gap”

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

The “pricers” dilemma..

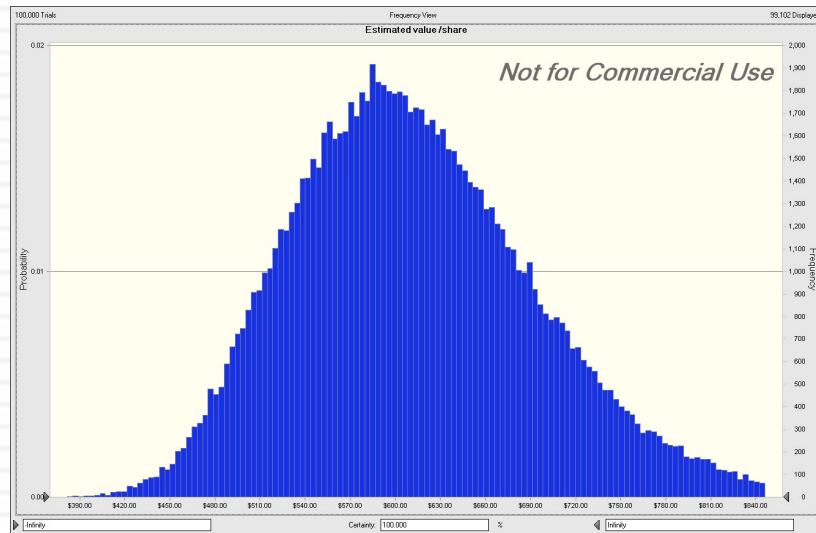
- No anchor: If you do not believe in intrinsic value and make no attempt to estimate it, you have no moorings when you invest. You will therefore be pushed back and forth as the price moves from high to low. In other words, everything becomes relative and you can lose perspective.
- Reactive: Without a core measure of value, your investment strategy will often be reactive rather than proactive.
- Crowds are fickle and tough to get a read on: The key to being successful as a pricer is to be able to read the crowd mood and to detect shifts in that mood early in the process. By their nature, crowds are tough to read and almost impossible to model systematically.

The valuer's dilemma ...

- Uncertainty about the magnitude of the gap:
 - Margin of safety: Many value investors swear by the notion of the “margin of safety” as protection against risk/uncertainty.
 - Collect more information: Collecting more information about the company is viewed as one way to make your investment less risky.
 - Ask what if questions: Doing scenario analysis or what if analysis gives you a sense of whether you should invest.
- Uncertainty about gap closing: This is tougher and you can reduce your exposure to it by
 - Lengthening your time horizon
 - Providing or looking for a catalyst that will cause the gap to close.

And here is how it plays out...

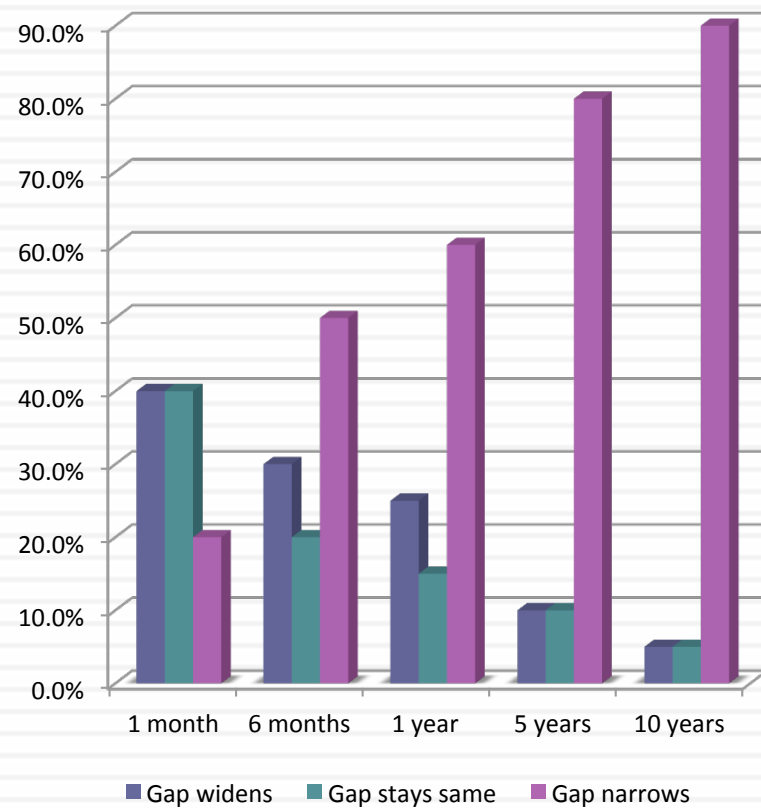
The value process My valuation of Apple in January 2013



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

Aswath Damodaran

The Pricing Process: Apple



Why the “margin of safety” is not a buffer against uncertainty...

- The margin of safety (MOS) is a buffer that you build into your investment decisions to protect yourself from investment mistakes. Thus, if your margin of safety is 30%, you will buy a stock only if the price is more than 30% below its “intrinsic” value.
- While value investors use the “margin of safety” as a shield against risk, keep in mind that:
 - ▣ MOS comes into play at the end of the investment process, not at the beginning.
 - ▣ MOS does not substitute for risk assessment and intrinsic valuation, but augments them.
 - ▣ The MOS cannot and should not be a fixed number, but should be reflective of the uncertainty in the assessment of intrinsic value.
 - ▣ Being too conservative can be damaging to your long term investment prospects. Too high a MOS can hurt you as an investor.

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

- The “karmic” approach: In this one, you buy (sell short) under (over) valued companies and sit back and wait for the gap to close. You are implicitly assuming that given time, the market will see the error of its ways and fix that error.
- The catalyst approach: For the gap to close, the price has to converge on value. For that convergence to occur, there usually has to be a catalyst.
 - If you are an activist investor, you may be the catalyst yourself. In fact, your act of buying the stock may be a sufficient signal for the market to reassess the price.
 - If you are not, you have to look for other catalysts. Here are some to watch for: a new CEO or management team, a “blockbuster” new product or an acquisition bid where the firm is targeted.