LIVING WITH NOISE: INVESTING IN THE FACE OF UNCERTAINTY

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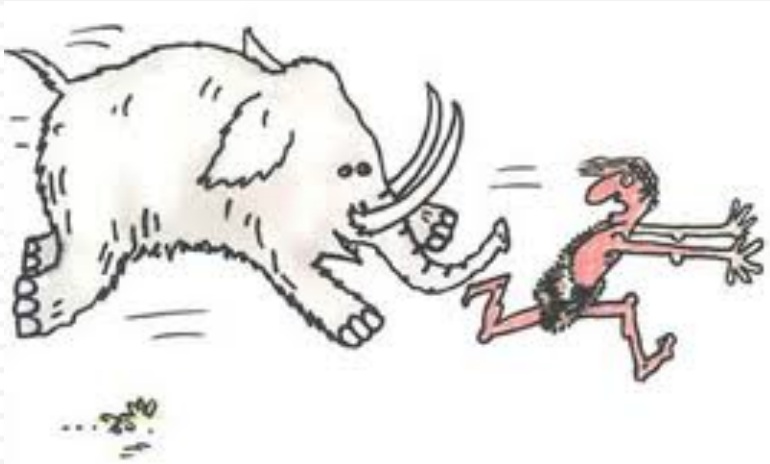
Uncertainty is a feature, not a bug.



And we deal with uncertainty as humans always have…

- 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.

Categorizing and Responding to uncertainty

I. Estimation versus Economic Uncertainty

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

II. Micro versus Macro Uncertainty

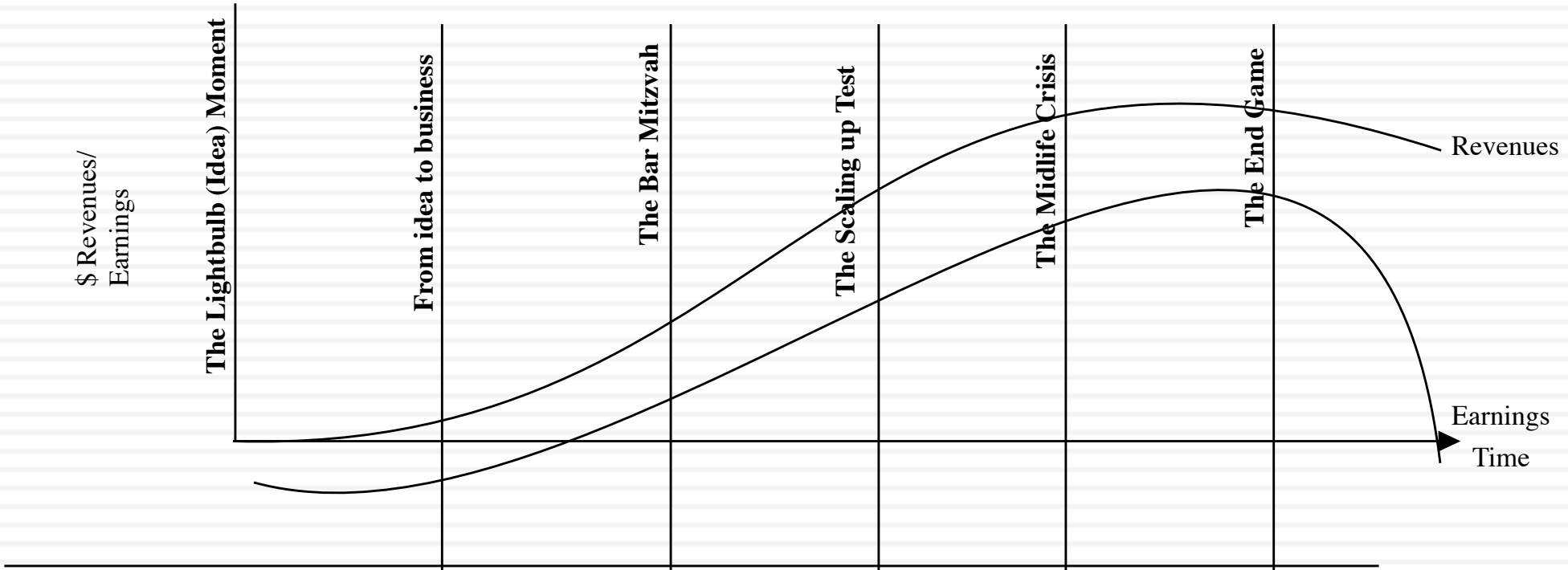
- Micro uncertainty versus Macro uncertainty
  - Micro uncertainty refers to uncertainty about the firm you are valuing and its business model - the potential market or markets for its products, the competition it will face and the quality of its management team.
  - Macro uncertainty reflects the reality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

III. Discrete versus Continuous Uncertainty

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

A Corporate Life Cycle View of Uncertainty with examples

The Evolution of Uncertainty



Growth stage	Stage 1 Start-up	Stage 2 Young Growth	Stage 3: High Growth	Stage 4 Mature Growth	Stage 5 Mature Stable	Stage 6 Decline
Uncertainty about	Does the idea have potential?	Is there a business model for the idea to be commercialized?	Will the business model generate profits?	Can the business be scaled up?	Can the business be defended?	Will management face reality?
Type & Magnitude	*High & company specific*	→	→	→	→	*Low & sector or macro driven*

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…

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Weather changeability for Honolulu, Hawaii

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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°

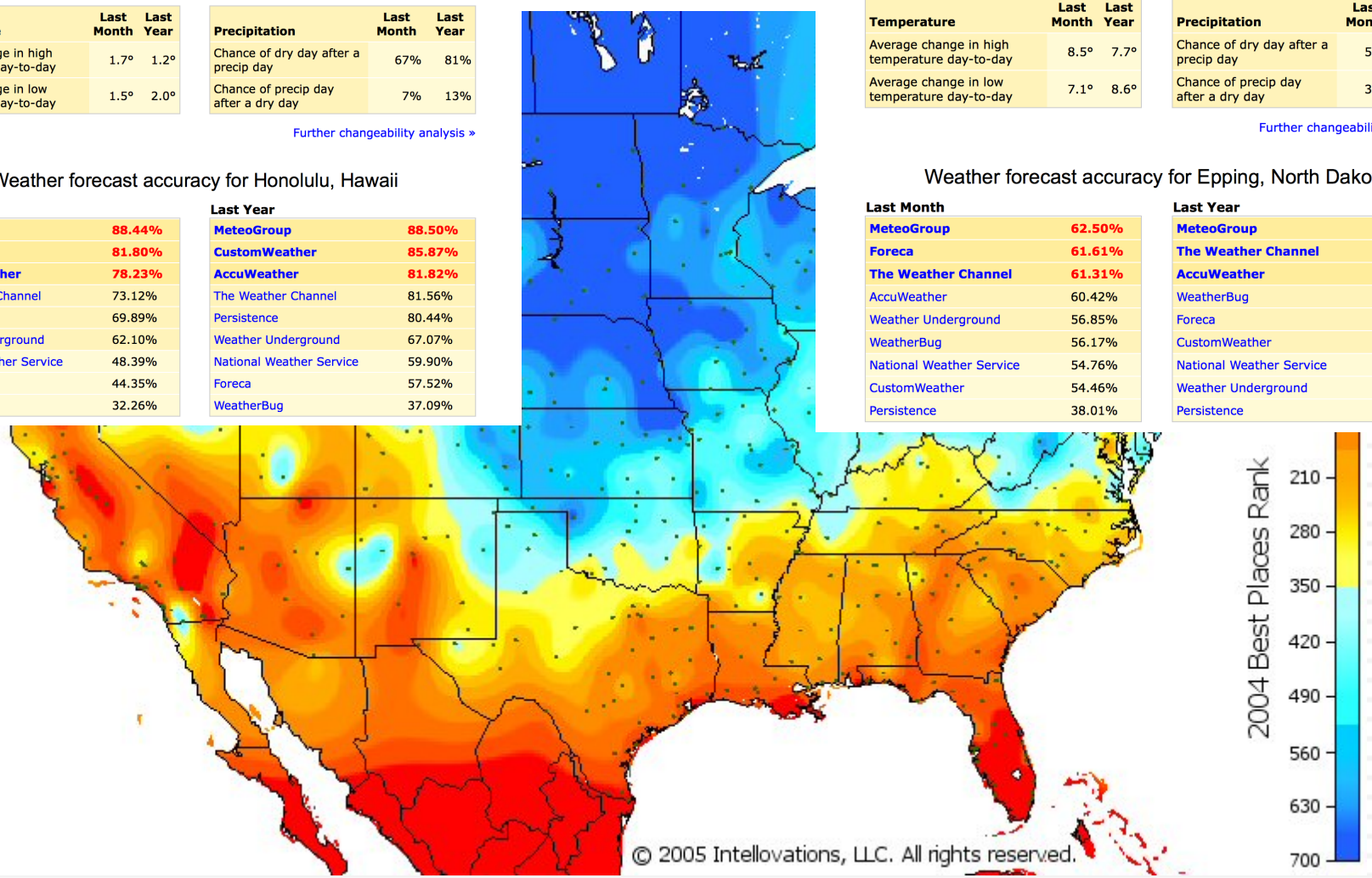
Precipitation	Last Month	Last Year
Chance of dry day after a precip day	50%	65%
Chance of precip day after a dry day	38%	20%

Further changeability analysis »

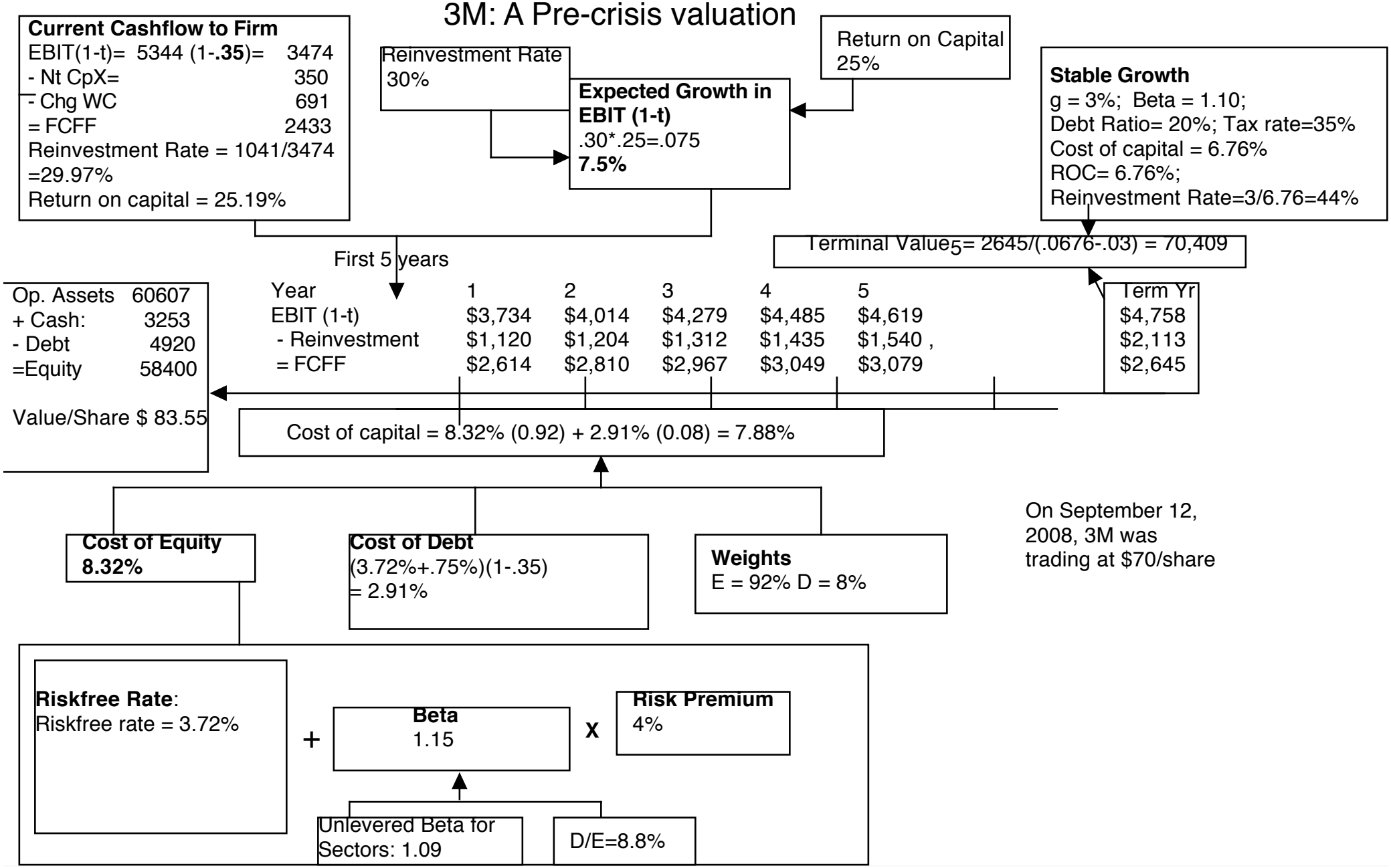
Weather forecast accuracy for Epping, North Dakota

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%



3M: A Pre-crisis valuation



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

Tata Motors: April 2010

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

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%

Reinvestment Rate 70%

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

Return on Capital 17.16%

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

Terminal Value$_5$= 23493/(.1039-.05) = Rs 435,686

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

45278
21785
23493

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

Value/Share Rs 614

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

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

Cost of Equity 14.00%

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

Weights
E = 74.7% D = 25.3%

On April 1, 2010
Tata Motors price = Rs 781

Riskfree Rate:
Rs Riskfree Rate= 5%

+ **Beta** 1.20 X **Mature market premium** 4.5% + **Lambda** 0.80 X Country Equity Risk Premium 4.50%

Unlevered Beta for Sectors: 1.04

Firm's D/E Ratio: 33%

Country Default Spread 3%

X Rel Equity Mkt Vol 1.50

9a. Amazon in January 2000

Current Revenue $ 1,117

Current Margin: -36.71%

EBIT -410m

From previous years

NOL: 500 m

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

Sales Turnover Ratio: 3.00

Competitive Advantages

Revenue Growth: 42%

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

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

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

Forever

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.

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.

Cost of Equity
12.90%

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

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

Weights
Debt= 1.2% -> 15%

Pushed debt ratio to retail industry average of 15%.

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

Riskfree Rate:
T. Bond rate = 6.5%

+ **Beta**
1.60 -> 1.00

X **Risk Premium**
4%

Internet/ Retail

Operating Leverage

Current D/ E: 1.21%

Base Equity Premium

Country Risk Premium

Twitter Pre-IPO Valuation: October 27, 2013

Starting numbers

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

Revenue growth of 51.5% a year for 5 years, tapering down to 2.5% 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 = 2.5%; Beta = 1.00;
Cost of capital = 8%
ROC= **12**%;
Reinvestment Rate=2.5%/12% = 20.83%

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

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

Terminal year (11)
EBIT (1-t) $ 1,852
- Reinvestment $ 386
FCFF $ 1,466

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

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

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

Cost of Equity
11.12%

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

Weights
E = 98.1% D = 1.9%

Riskfree Rate:
Riskfree rate = 2.5%

+

Beta
1.40

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%)

Falabella

The Story

Falabella will continue with the status quo, growing aggressively (a) and its operating margin, which is much higher than industry averages, will decline slight to Falabella's own long term average 9B). Its reinvestment to sustain growth will taper down to reflect industry averages (c), as the company continues to grow. The firm wil maintain its existing debt ratio (d) but excess returns will dwindle to zero over time in a competitive sector.

The Assumptions

	Base year	Years 1-5	Years 6-10		After year 10	Link to story
Revenues (a)	$ 8,682,996	10.83%	→ 3.42%		3.42%	
Operating margin (b)	11.04%	11.04%	→ 10.53%		10.53%	
Tax rate	22.66%	22.66%	→ 24.00%		24.00%	
Reinvestment (c)		Sales to capital ratio =	2.66	RIR =	43.18%	
Return on capital	8.38%	Marginal ROIC =	26.91%		7.92%	
Cost of capital (d)		8.25%	→ 7.92%		7.92%	

The Cash Flows

	Revenues (CLP)	Operating Margin	EBIT (CLP)	EBIT (1-t) (CLP)	Reinvestment (CLP)	FCFF (CLP)
1	CLP 9,623,364	10.99%	CLP 1,057,249.18	CLP 817,676.52	CLP 354,060.48	CLP 463,616.04
2	CLP 10,665,575	10.94%	CLP 1,166,342.13	CLP 902,049.00	CLP 392,405.23	CLP 509,643.77
3	CLP 11,820,657	10.88%	CLP 1,286,664.25	CLP 995,106.13	CLP 434,902.72	CLP 560,203.42
4	CLP 13,100,834	10.83%	CLP 1,419,368.25	CLP 1,097,739.40	CLP 482,002.68	CLP 615,736.72
5	CLP 14,519,654	10.78%	CLP 1,565,724.78	CLP 1,210,931.55	CLP 534,203.57	CLP 676,727.98
6	CLP 15,876,951	10.73%	CLP 1,704,039.58	CLP 1,313,337.39	CLP 511,039.38	CLP 802,298.01
7	CLP 17,125,832	10.68%	CLP 1,829,397.04	CLP 1,405,050.10	CLP 470,219.30	CLP 934,830.80
8	CLP 18,219,145	10.63%	CLP 1,936,949.16	CLP 1,482,463.41	CLP 411,646.06	CLP 1,070,817.36
9	CLP 19,112,248	10.58%	CLP 2,022,209.06	CLP 1,542,298.40	CLP 336,264.25	CLP 1,206,034.15
10	CLP 19,765,887	10.53%	CLP 2,081,347.87	CLP 1,581,824.38	CLP 246,103.21	CLP 1,335,721.18
Terminal year	CLP 20,441,880	10.53%	CLP 2,152,529.97	CLP 1,635,922.78	CLP 706,421.20	CLP 929,501.58

The Value

Terminal value	CLP 20,655,591			
PV(Terminal value)	CLP 9,434,847			
PV (CF over next 10 years)	CLP 5,019,781			
Value of operating assets =	CLP 14,454,628			
Adjustment for distress	CLP 0		Probability of failure =	0.00%
- Debt & Mnority Interests	CLP 5,818,846			
+ Cash & Other Non-operating assets	CLP 1,497,330			
Value of equity	CLP 10,133,111			
- Value of equity options	CLP 0			
Number of shares	2,434.46			
Value per share	CLP 4,162.37	On July 14, 2017, the stock was trading at =		CLP 5,959.50

Assessing uncertainty…

- Rank the firms in terms of uncertainty (least to most) in your estimate:
  - 3M in 2007
  - Tata Motors in 2010
  - Amazon in 2000
  - Twitter in 2013
  - Falabella in 2017
- 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)			
Falabella (2017)			

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Dealing with uncertainty

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

- 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.

Falabella: Start Easy

Revenue growth rate of 10.83% for next 5 years, based upon Falabella's history

Operating margin of 11.04% declines gradually to Falabella's long term average of 10.53%

Year	Revenues	Operating Margin	EBIT
1	$9,623,364	10.99%	$1,057,249
2	$10,665,575	10.94%	$1,166,342
3	$11,820,657	10.88%	$1,286,664
4	$13,100,834	10.83%	$1,419,368
5	$14,519,654	10.78%	$1,565,725
6	$15,876,951	10.73%	$1,704,040
7	$17,125,832	10.68%	$1,829,397
8	$18,219,145	10.63%	$1,936,949
9	$19,112,248	10.58%	$2,022,209
10	$19,765,887	10.53%	$2,081,348
Terminal year	$20,441,880	10.53%	$2,152,530

The Amazon Forecasts: Ramping it up

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.

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?

Falabella's pathway to steady state

Year	Revenues	Δ Revenue	Sales/Capital	Reinvestment	Capital Invested	EBIT(1-t)	Imputed ROIC	Cost of Capital
Base year	CLP 8,682,996				CLP 8,842,720	CLP 741,180		
1	CLP 9,623,364	CLP 940,368	2.66	CLP 354,060	CLP 9,196,781	CLP 817,677	8.89%	8.25%
2	CLP 10,665,575	CLP 1,042,210	2.66	CLP 392,405	CLP 9,589,186	CLP 902,049	9.41%	8.25%
3	CLP 11,820,657	CLP 1,155,082	2.66	CLP 434,903	CLP 10,024,089	CLP 995,106	9.93%	8.25%
4	CLP 13,100,834	CLP 1,280,177	2.66	CLP 482,003	CLP 10,506,092	CLP 1,097,739	10.45%	8.25%
5	CLP 14,519,654	CLP 1,418,820	2.66	CLP 534,204	CLP 11,040,295	CLP 1,210,932	10.97%	8.25%
6	CLP 15,876,951	CLP 1,357,297	2.66	CLP 511,039	CLP 11,551,335	CLP 1,313,337	11.37%	8.18%
7	CLP 17,125,832	CLP 1,248,881	2.66	CLP 470,219	CLP 12,021,554	CLP 1,405,050	11.69%	8.12%
8	CLP 18,219,145	CLP 1,093,313	2.66	CLP 411,646	CLP 12,433,200	CLP 1,482,463	11.92%	8.05%
9	CLP 19,112,248	CLP 893,103	2.66	CLP 336,264	CLP 12,769,464	CLP 1,542,298	12.08%	7.99%
10	CLP 19,765,887	CLP 653,639	2.66	CLP 246,103	CLP 13,015,567	CLP 1,581,824	12.15%	7.92%
Terminal Year	CLP 20,441,880	CLP 675,993			Assumed to be =		7.92%	7.92%

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

Falabella: In Chilean Pesos and US dollars

	Chilean Pesos	US Dollars
Risk Free Rate	3.42%	2.16%
Cost of capital	8.25%	6.93%
Cost of capital (stable growth)	7.92%	6.60%
Expected growth rate (next 5 years)	10.83%	9.48%
Expected growth rate (stable growth)	3.42%	2.16%
Return on capital (today)	8.28%	8.28%
Return on capital (year 10)	12.15%	11.43%
Return on capital (forever)	7.92%	6.60%
Value per share	CLP 4,162.37	$6.53
In CLP terms	CLP 4,162.37	CLP 4,162.37

1.0825*(1.025/1.0125)-1 =1.0693

Equity versus Firm

- Dividends versus FCFE: Dividend discount models can give you different values from FCFE models, especially if companies pay dividends that don't reflect FCFE.
- FCFE versus FCFF: If you make consistent assumptions about debt ratios, you should get the same values from both models:
  - In FCFF models, the assumptions about debt ratios are embedded in your cost of capital.
  - In FCFE models, the assumptions about debt ratios are in your cash flows (as debt issuances or debt repayments).

4. Draw on economic first principles and mathematical limits…

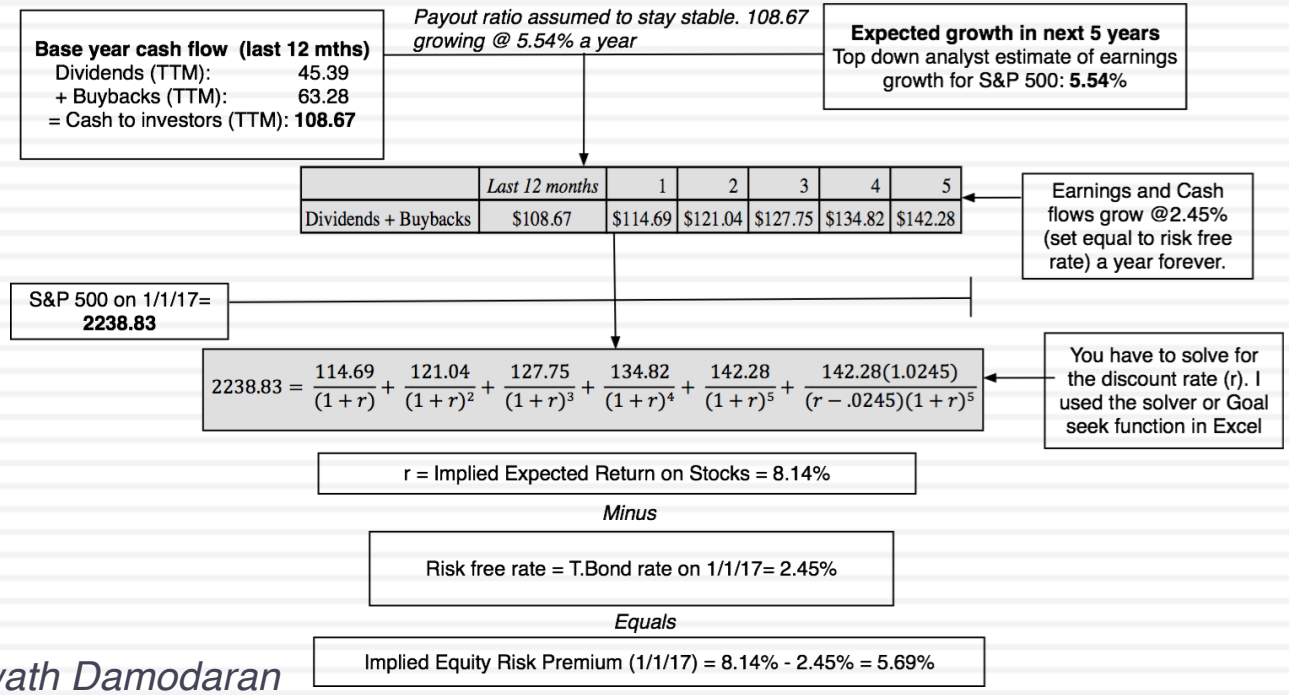
- When doing valuation, you are free to make assumptions about how your company will evolve over time in the market that it operates, but you are not free to violate first principles in economics and mathematics.
- Put differently, there are assumptions in valuation that are either mathematically impossible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

And the "excess return" effect…

Stable growth rate	*3M*	*Tata Motors*	*Amazon*	*Twitter*	*Falabella*
0%	$70,409	435,686₹	$26,390	$23,111	20,656 CLP
1%	$70,409	435,686₹	$28,263	$24,212	20,656 CLP
2%	$70,409	435,686₹	$30,595	$25,679	20,656 CLP
3%	$70,409	435,686₹	$33,594		20,656 CLP
4%		435,686₹	$37,618		
5%		435,686₹	$43,334		
			$52,148		
Riskfree rate	3.72%	5%	6.60%	2.70%	3.42%
ROIC	6.76%	10.39%	20%	12.00%	7.92%
Cost of capital	6.76%	10.39%	9.61%	8.00%	7.92%

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
1928-2016	7.96%	6.24%	6.11%	4.62%
Std Error	2.13%	2.28%		
1967-2016	6.57%	4.37%	5.26%	3.42%
Std Error	2.42%	2.74%		
2007-2016	7.91%	3.62%	6.15%	2.30%
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 5.69%.
- 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 Spread$_{Country}$ * ($\sigma_{Country\ Equity}$ / $\sigma_{Country\ Bond}$)
  - Standard Deviation in Chilean Stock Market Select = 18%
  - Standard Deviation in Chilean government bond= 14%
  - Default spread for Chile= 0.70%
  - Additional risk premium for Chile = 0.70% (18/14) = 0.90%
  - Equity Risk Premium for Chile = 5.69% + 0.90% = 6.59%

ERP : Jan 2017

Andorra	8.81%	3.12%	Jersey	6.26%	0.57%
Austria	6.26%	0.57%	Liechtenstein	5.69%	0.00%
Belgium	6.55%	0.86%	Luxembourg	5.69%	0.00%
Cyprus	12.09%	6.40%	Malta	7.40%	1.71%
Denmark	5.69%	0.00%	Netherlands	5.69%	0.00%
Finland	6.26%	0.57%	Norway	5.69%	0.00%
France	6.39%	0.70%	Portugal	9.24%	3.55%
Germany	5.69%	0.00%	Spain	8.40%	2.71%
Greece	19.89%	14.20%	Sweden	5.69%	0.00%
Guernsey	6.26%	0.57%	Switzerland	5.69%	0.00%
Iceland	7.40%	1.71%	Turkey	9.24%	3.55%
Ireland	7.40%	1.71%	UK	6.26%	0.57%
Isle of Man	6.26%	0.57%	**W.Europe**	**6.81%**	**1.12%**
Italy	8.40%	2.71%			

Albania	12.09%	6.40%
Armenia	12.09%	6.40%
Azerbaijan	9.24%	3.55%
Belarus	16.34%	10.65%
Bosnia and Her	14.93%	9.24%
Bulgaria	8.40%	2.71%
Croatia	9.96%	4.27%
Czech Republic	6.69%	1.00%
Estonia	6.69%	1.00%
Georgia	10.81%	5.12%
Hungary	8.81%	3.12%
Kazakhstan	8.81%	3.12%
Kyrgyzstan	13.51%	7.82%
Latvia	7.40%	1.71%
Lithuania	7.40%	1.71%
Macedonia	10.81%	5.12%
Moldova	14.93%	9.24%
Montenegro	12.09%	6.40%
Poland	6.90%	1.21%
Romania	8.81%	3.12%
Russia	9.24%	3.55%
Serbia	12.09%	6.40%
Slovakia	6.90%	1.21%
Slovenia	8.81%	3.12%
Ukraine	19.89%	14.20%
E.Europe	**9.09%**	**3.40%**

Country	ERP	CRP	Country	ERP	CRP
Algeria	13.72%	7.47%	Malawi	17.24%	10.99%
Brunei	9.75%	3.50%	Mali	13.90%	7.65%
Gambia	13.72%	7.47%	Myanmar	13.72%	7.47%
Guinea	20.00%	13.75%	Niger	17.24%	10.99%
Guinea-Bissau	12.48%	6.23%	Sierra Leone	16.61%	10.36%
Guyana	12.48%	6.23%	Somalia	20.00%	13.75%
Haiti	16.61%	10.36%	Sudan	20.00%	13.75%
Iran	11.22%	4.97%	Syria	20.00%	13.75%
Korea, D.P.R.	17.24%	10.99%	Tanzania	13.90%	7.65%
Liberia	17.24%	10.99%	Togo	13.72%	7.47%
Libya	20.00%	13.75%	Yemen, Republic	17.24%	10.99%
Madagascar	12.48%	6.23%	Zimbabwe	17.24%	10.99%

Canada	5.69%	0.00%
USA	5.69%	0.00%
North America	**5.69%**	**0.00%**

Caribbean	**13.81%**	**8.12%**

Argentina	14.93%	9.24%
Belize	18.48%	12.79%
Bolivia	10.81%	5.12%
Brazil	9.96%	4.27%
Chile	6.55%	0.86%
Colombia	8.40%	2.71%
Costa Rica	9.24%	3.55%
Ecuador	14.93%	9.24%
El Salvador	14.93%	9.24%
Guatemala	9.24%	3.55%
Honduras	13.51%	7.82%
Mexico	7.40%	1.71%
Nicaragua	13.51%	7.82%
Panama	8.40%	2.71%
Paraguay	9.24%	3.55%
Peru	7.40%	1.71%
Suriname	12.09%	6.40%
Uruguay	8.40%	2.71%
Venezuela	19.89%	14.20%
Latin America	**10.11%**	**4.42%**

Angola	12.09%	6.40%
Botswana	6.90%	1.21%
Burkina Faso	14.93%	9.24%
Cameroon	13.51%	7.82%
Cape Verde	13.51%	7.82%
Congo (DR)	14.93%	9.24%
Congo (Rep)	14.93%	9.24%
Côte d'Ivoire	10.81%	5.12%
Egypt	14.93%	9.24%
Ethiopia	12.09%	6.40%
Gabon	12.09%	6.40%
Ghana	14.93%	9.24%
Kenya	12.09%	6.40%
Morocco	9.24%	3.55%
Mozambique	19.89%	14.20%
Namibia	8.81%	3.12%
Nigeria	12.09%	6.40%
Rwanda	13.51%	7.82%
Senegal	12.09%	6.40%
South Africa	8.40%	2.71%
Tunisia	10.81%	5.12%
Uganda	13.51%	7.82%
Zambia	14.93%	9.24%
Africa	**11.98%**	**6.29%**

Bahrain	9.96%	4.27%
Iraq	14.94%	9.25%
Israel	6.69%	1.00%
Jordan	12.09%	6.40%
Kuwait	6.40%	0.71%
Lebanon	13.51%	7.82%
Oman	7.96%	2.27%
Qatar	6.40%	0.71%
Ras Al Khaimah	6.90%	1.21%
Saudi Arabia	6.69%	1.00%
Sharjah	7.40%	1.71%
United Arab Emirates	6.40%	0.71%
Middle East	**7.50%**	**1.81%**

Bangladesh	10.81%	5.12%
Cambodia	13.51%	7.82%
China	6.55%	0.86%
Fiji	12.09%	6.40%
Hong Kong	6.26%	0.57%
India	8.81%	3.12%
Indonesia	8.81%	3.12%
Japan	6.69%	1.00%
Korea	6.39%	0.70%
Macao	6.55%	0.86%
Malaysia	7.40%	1.71%
Mauritius	7.95%	2.26%
Mongolia	16.34%	10.65%
Pakistan	14.93%	9.24%
Papua New Guinea	13.51%	7.82%
Philippines	8.40%	2.71%
Singapore	5.69%	0.00%
Sri Lanka	12.09%	6.40%
Taiwan	6.55%	0.86%
Thailand	7.95%	2.26%
Vietnam	12.09%	6.40%
Asia	**7.12%**	**1.43%**

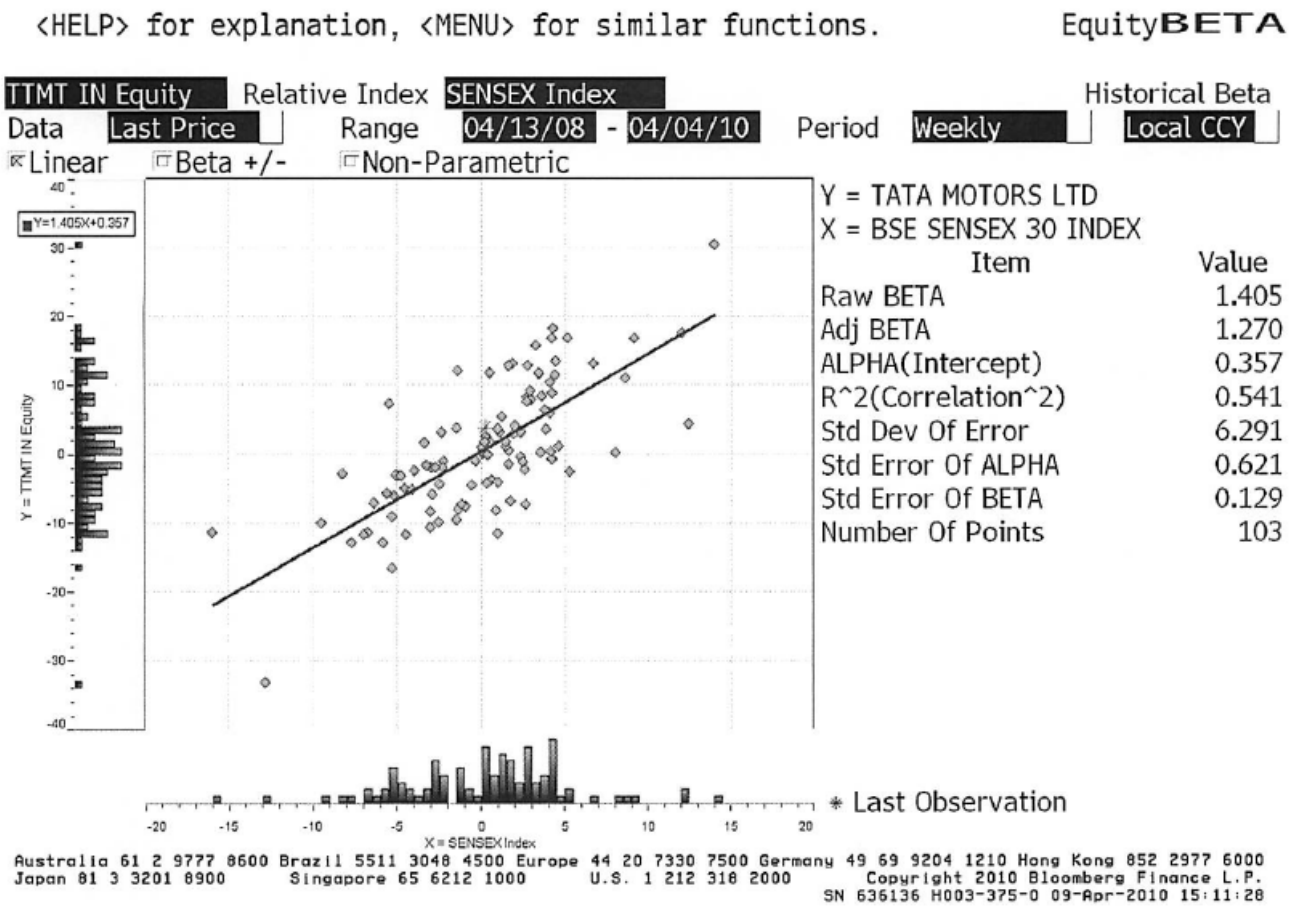
Australia	5.69%	0.00%
Cook Islands	12.09%	6.40%
New Zealand	5.69%	0.00%
Australia & NZ	**5.70%**	**0.01%**

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…



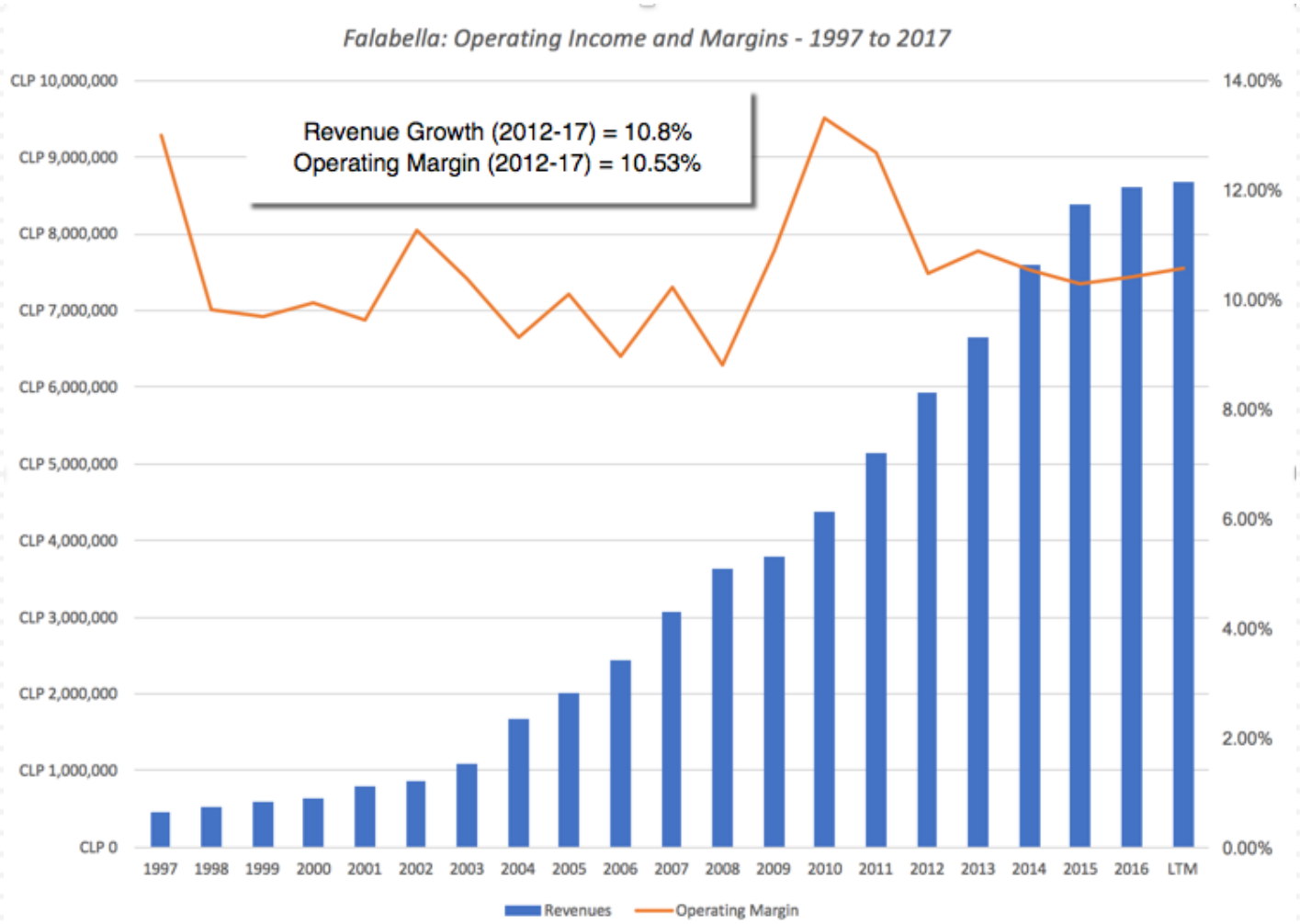
But an average beta across companies is not…

- 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/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

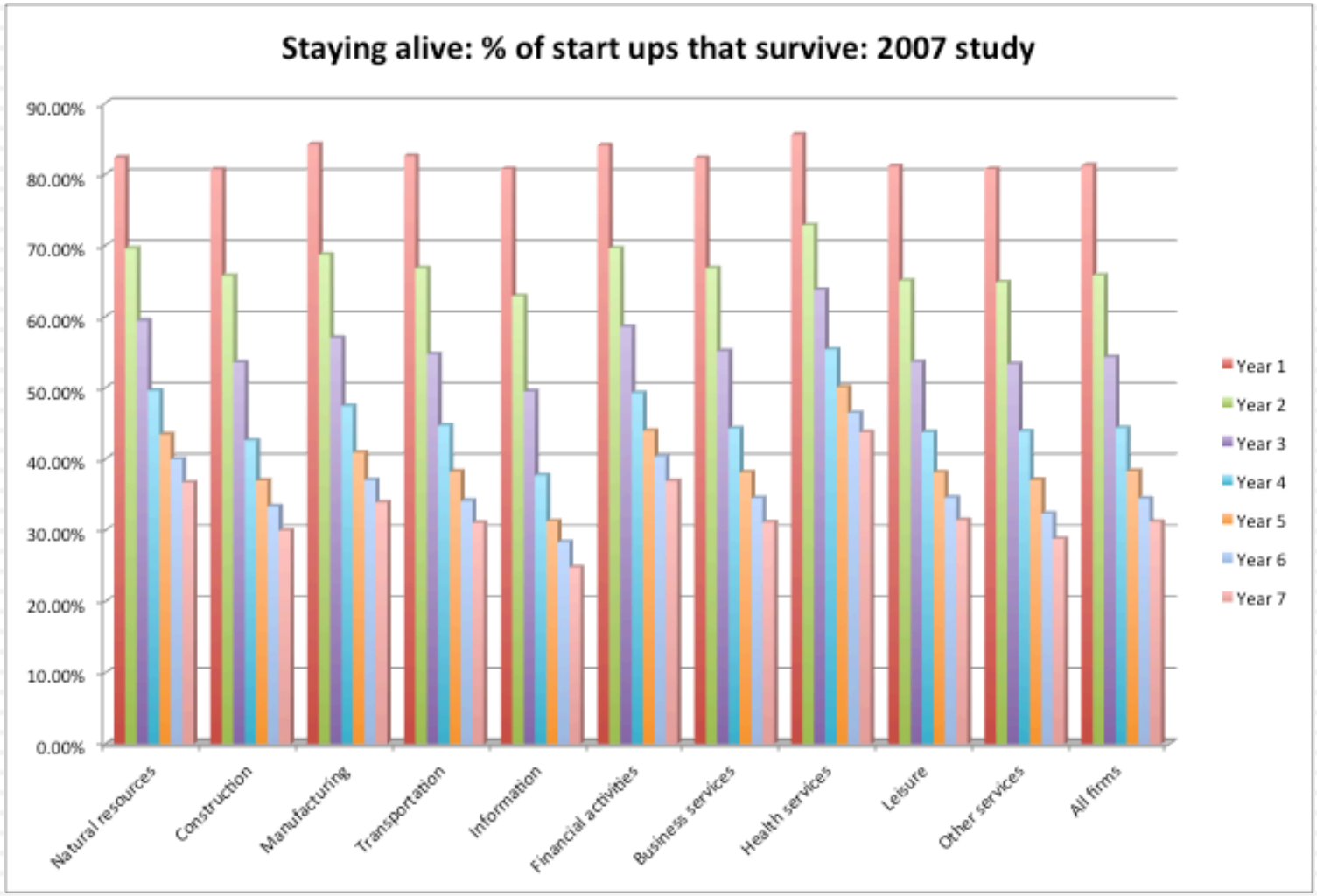
Estimating Bottom Up Betas: Falabella

Business	*Revenues*	*EV/Sales*	*Estimated Value*	*Weight*	*Unlevered Beta*
Retail (General)	$2,886.00	0.7399	$2,135.37	23.24%	0.8148
Retail (Grocery and Food)	$2,001.00	0.6488	$1,298.32	14.13%	0.5678
Retail (Building Supply)	$1,372.00	1.4657	$2,010.92	21.88%	0.7273
Real Estate (General/Diversified)	$332.00	3.4183	$1,134.88	12.35%	0.6751
Banking	$497.00	5.2507	$2,609.58	28.40%	0.4490
Falbella	**$7,088.00**		**$9,189.07**		**0.6396**

Another illustration: Normalizing margins for Falabella



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)

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.

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.

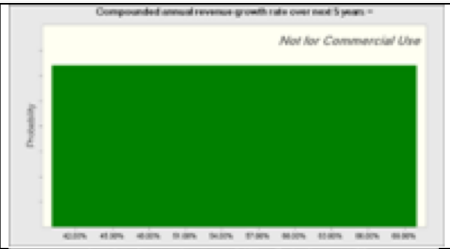
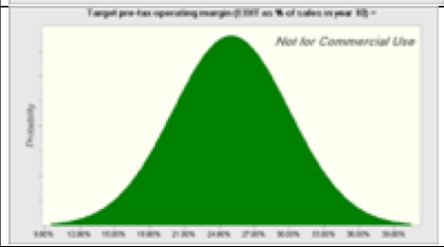
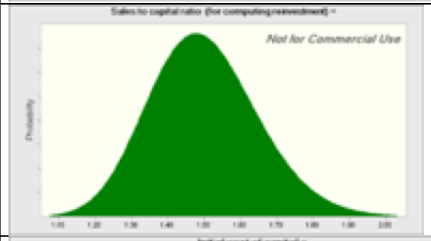
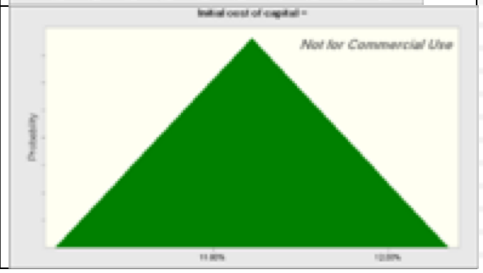
Risk of default (7)
The high debt ratio makes default a very real probability. Given the company's rating (BB), history suggests a 28.25% probability of default within 10 years.

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

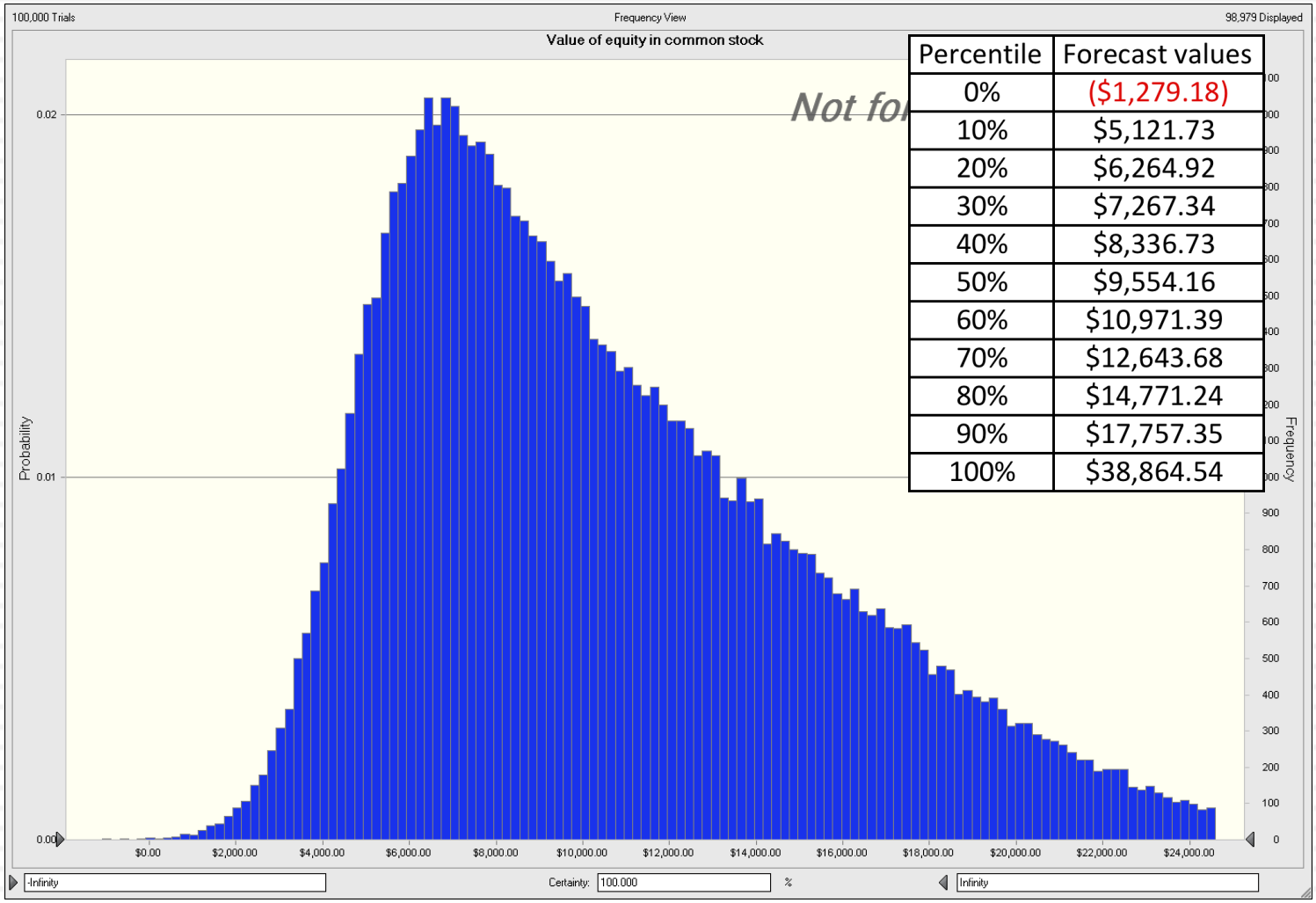
8. Confront uncertainty, if you can…

- 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.

Revisiting the Twitter valuation

Revenue Growth Rate Distribution: Uniform Expected Value = 55% Minimum Value: 40% Maximum Value: 70%	
Target Operating Margin Distribution: Normal Expected Value = 25% Standard Deviation = 5%	
Sales to Capital Ratio Distribution: Lognormal Expected value: 1.50 Standard deviation: 0.15	
Cost of Capital Distribution: Triangular Expected value: 11.22% Minimum value: 10.02% Maximum value: 12.22%	

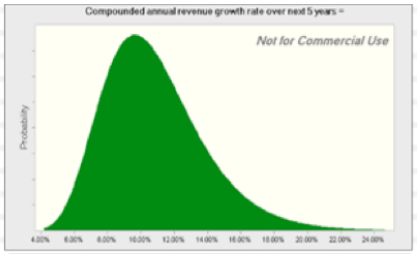
With the consequences for equity value…



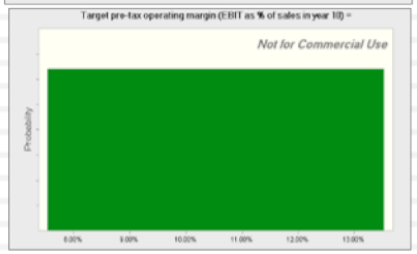
Percentile	Forecast values
0%	($1,279.18)
10%	$5,121.73
20%	$6,264.92
30%	$7,267.34
40%	$8,336.73
50%	$9,554.16
60%	$10,971.39
70%	$12,643.68
80%	$14,771.24
90%	$17,757.35
100%	$38,864.54

And the Falabella Valuation

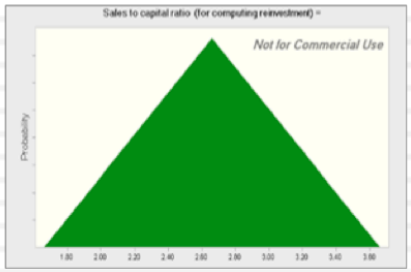
Revenue Growth
Dist'n = Lognormal
E(Value) = 10.83%
Std dev = 3.08%



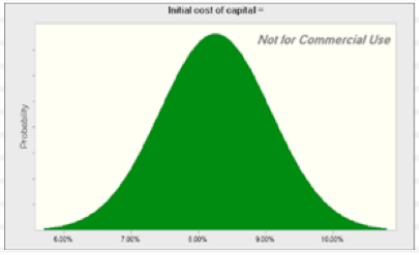
Operating Margin
Dist'n = Uniform
E(Value) = 10.53%
Minimum = 7.53%
Maximum =13.53%

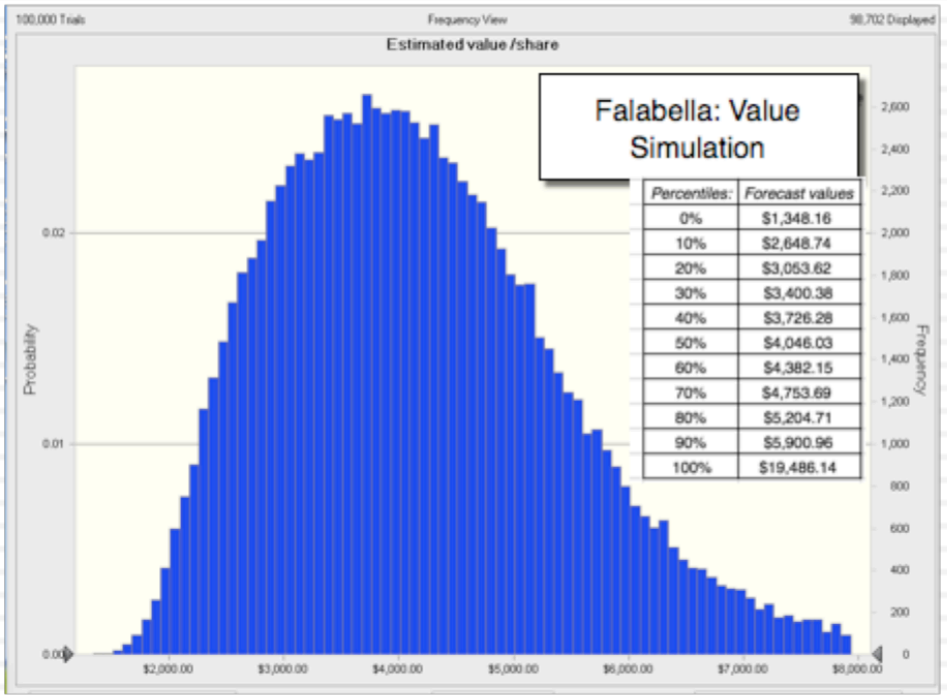


Sales to Capital
Dist'n = Triangular
E(Value) = 2.66
Low= 1.66
Maximum =3.66



Cost of Capital
Dist'n = Normal
E(Value) = 8.25%
Std dev = 0.83%



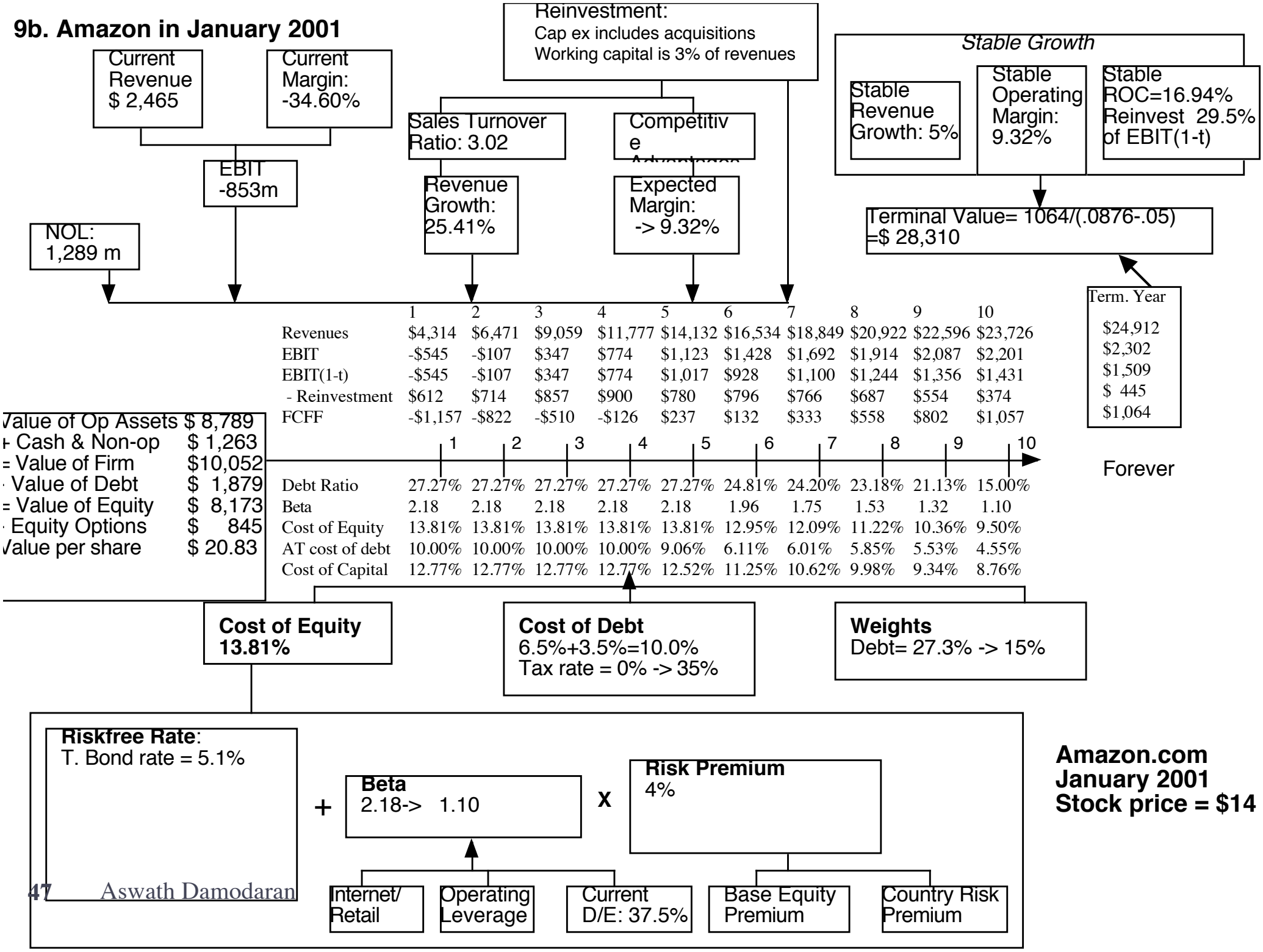


Percentiles:	Forecast values
0%	$1,348.16
10%	$2,648.74
20%	$3,053.62
30%	$3,400.38
40%	$3,726.28
50%	$4,046.03
60%	$4,382.15
70%	$4,753.69
80%	$5,204.71
90%	$5,900.96
100%	$19,486.14

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

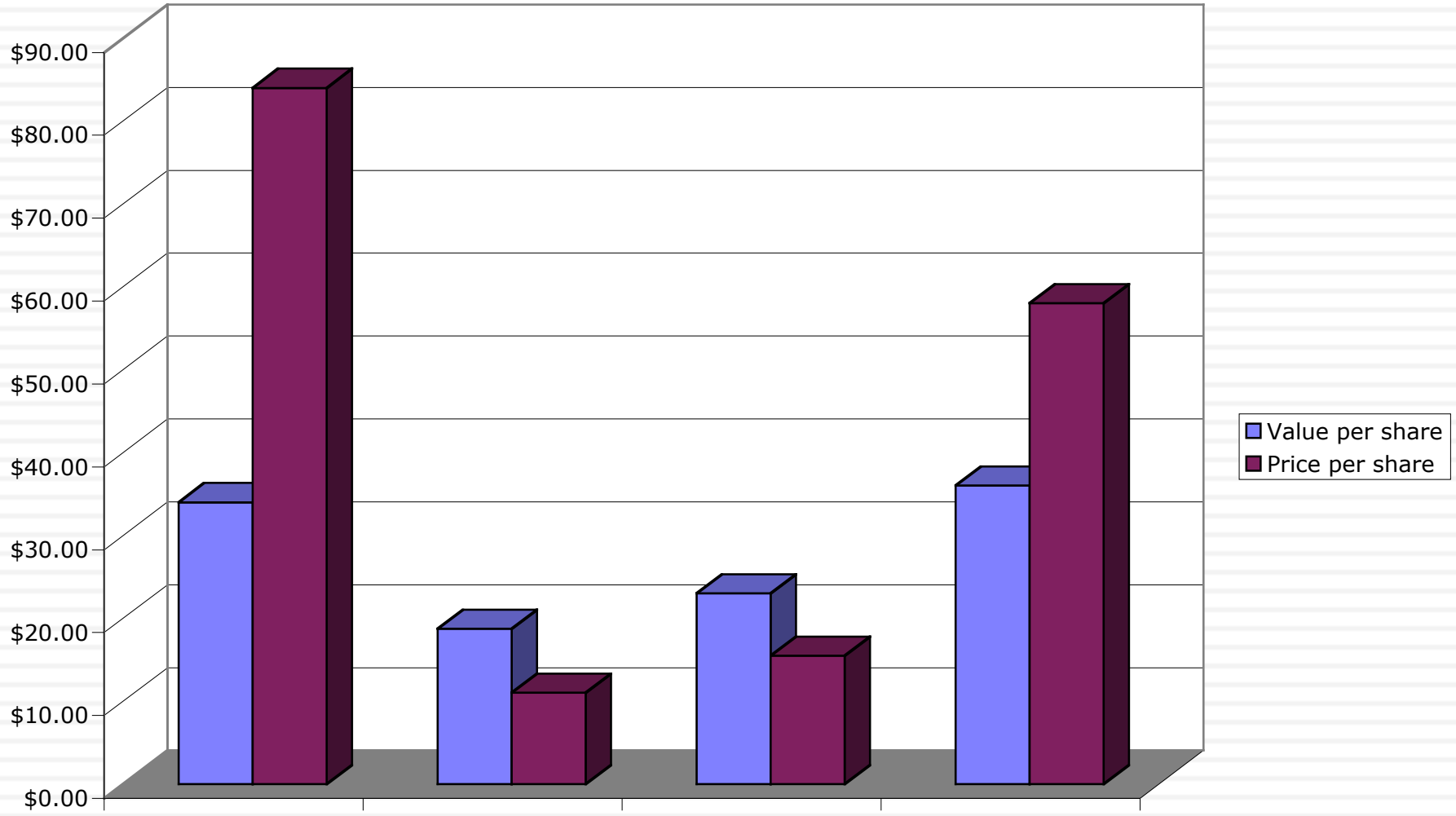


	1	2	3	4	5	6	7	8	9	10
Revenues	$4,314	$6,471	$9,059	$11,777	$14,132	$16,534	$18,849	$20,922	$22,596	$23,726
EBIT	-$545	-$107	$347	$774	$1,123	$1,428	$1,692	$1,914	$2,087	$2,201
EBIT(1-t)	-$545	-$107	$347	$774	$1,017	$928	$1,100	$1,244	$1,356	$1,431
- Reinvestment	$612	$714	$857	$900	$780	$796	$766	$687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