



LIVING WITH NOISE: VALUING YOUNG COMPANIES

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Uncertainty comes in many forms...


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- 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.

And unhealthy ways of dealing with it..

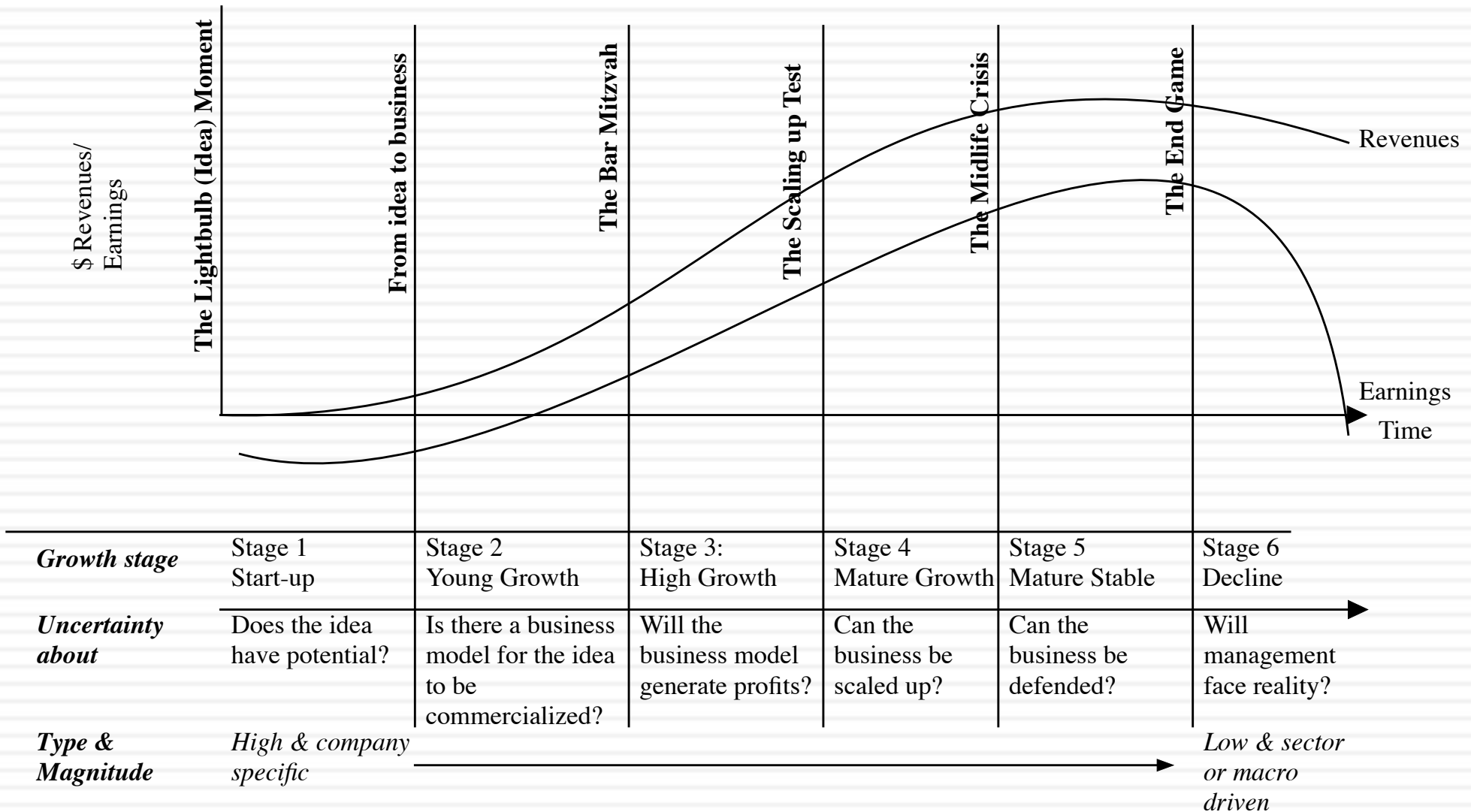
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- Divine Intervention: Praying for intervention from a higher power is the oldest and most practiced risk management system of all.
- Paralysis & Denial: When faced with uncertainty, some of us get paralyzed. Accompanying the paralysis is the hope 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.



A Corporate Life Cycle View of Uncertainty with examples

The Evolution of Uncertainty



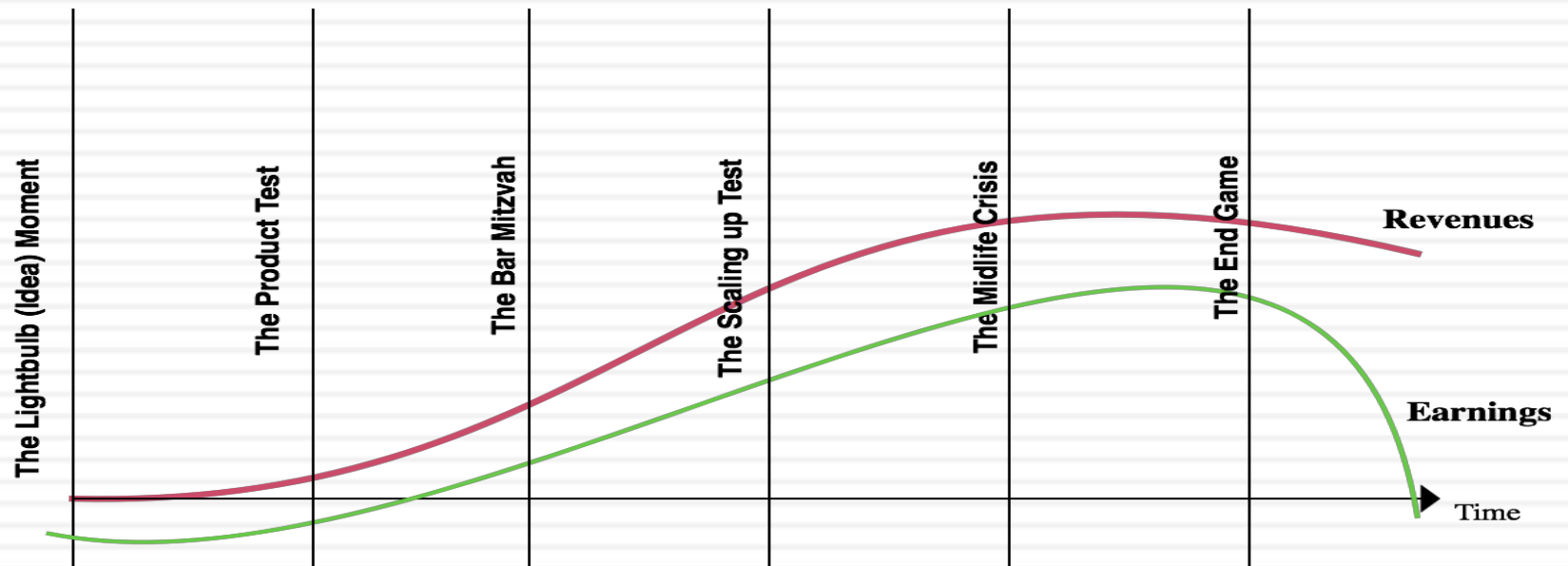
Uncertainty and the Pricing Imperative

- As investors/analysts face more uncertainty about the future, they become less willing to grapple with it and make estimates for the future, a requirement for valuation.
- Instead, they choose to price companies/assets, thus anchoring what they are willing to pay to what others are paying for similar assets.
- Note that while this reaction is understandable, the uncertainty still remains.
 - You are in denial. Hiding from uncertainty does not make it go away.
 - You are letting the crowd, just as uncertain as you are, determine what you should pay.

In pricing, the scaling metric changes over time...

<i>Growth stage</i>	<i>Stage 1 Start-up</i>	<i>Stage 2 Young Growth</i>	<i>Stage 3: High Growth</i>	<i>Stage 4 & 5 Mature Stable</i>	<i>Stage 6 Decline</i>
<i>Key Questions</i>	Is there a market for the product or service? How big is that market? Will you survive?	Do people use your product or service? How much do they like it?	Will people pay for the product or service? Can you scale up, i.e., grow as you get bigger?	Can you make money of the product and service and sustain profitability in the face of competition?	What will you get if you sell your assets? How do you plan to return cash flows to your investors?
<i>Pricing Metrics & Measures</i>	Market size, Cash on hand, Access to capital	Number of users, User intensity (EV/User)	User engagement with model, Revenues (EV/Sales)	Earnings levels and growth (PE, EV/EBIT)	Cash flows, Payout & Debt servicing (PBV, EV/EBITDA)
<i>Narrative vs Numbers</i>	Mostly or all narrative	More narrative than numbers	Mix of narrative & numbers	More numbers than narrative	Mostly or all numbers
<i>Value Drivers</i>	Total market size, Market Share & Target Margin	Revenue Growth (and its drivers)	Revenue Growth & Reinvestment	Operating margins and Return on capital	Dividends/Cash Returns & Debt ratios
<i>Dangers</i>	<i>Macro delusions</i> , where companies are collectively overpriced, given market size.	<i>Value distractions</i> , with focus on wrong revenue drivers.	<i>Growth illusions</i> , with failure to factor in the cost of growth.	<i>Disruption Denial</i> , with failure to see threats to sustainable profits.	<i>Liquidation leakage</i> , with unrealistic assumptions about what others will pay for liquidated assets.
	<i>Transitions</i>	<i>Potential to Product</i>	<i>Product to Revenues</i>	<i>Revenues to Profits</i>	<i>Profits to Cash flows</i>

In value, the emphasis shifts as well, from narrative to numbers...



<i>Lifecycle stage</i>	Start-up	Young Growth	High Growth	Mature Growth	Mature Stable	Decline
<i>Narrative versus Numbers</i>	All Narrative	Mostly narrative	Narrative + Numbers	Numbers + Narrative	Mostly Numbers	All Numbers
<i>Narrative Drivers</i>	How big is the narrative?	How plausible is narrative?	How profitable is narrative?	How scalable is narrative?	How sustainable is narrative?	How happy is the ending?
<i>Narrative Differences</i>	Unconstrained & Large differences	<i>Constraints mount as numbers build up</i>				Constrained & Narrow differences
		<i>Differences across investors narrow, as history deepens</i>				

Narrative to Numbers for companies

- With a young company, narrative is central, divergent and volatile.
 - ▣ It is central because it is the only thing that you are offering investors, since you have no history.
 - ▣ It is divergent because you can still offer widely different narratives, since it is early in the game.
 - ▣ It is volatile, because the real world will deliver surprises that will require you to adjust your narrative.
- As companies age, their narratives get narrower as their histories, size and culture start to become binding. The numbers often drive the narrative, rather than the other way around.

Amazon in January 2000

Drivers of Cash Flow (Business Model)

Stable Growth

Revenue Growth: 6%

Operating Margin: 10.00%

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

Current Revenue: \$ 1,117

Current Margin: -36.71%

From previous year

NOL: 500 m

EBIT: -410m

Growth potential: Revenue Growth: 42%

Profit potential: Expected Margin: > 10.00%

Investment efficiency: Sales to Capital: 3.00

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

Value of Op Assets \$ 15,170
+ Cash \$ 26
= Value of Firm \$ 15,196
- Value of Debt \$ 349
= Value of Equity \$ 14,847
- Equity Options \$ 2,892
Value per share \$ 35.08

	Base	1	2	3	4	5	6	7	8	9	10	Terminal Year
Revenue Growth Rate		150.00%	100.00%	75.00%	50.00%	30.00%	25.20%	20.40%	15.60%	10.80%	6.00%	6%
Revenues	\$ 1,117	\$ 2,793	\$ 5,585	\$ 9,774	\$ 14,661	\$ 19,059	\$ 23,862	\$ 28,729	\$ 33,211	\$ 36,798	\$ 39,006	\$ 41,346
Operating Margin	-36.71%	-13.35%	-1.68%	4.16%	7.08%	8.54%	9.27%	9.64%	9.82%	9.91%	9.95%	10.00%
EBIT	-\$410	-\$373	-\$94	\$407	\$1,038	\$1,628	\$2,212	\$2,768	\$3,261	\$3,646	\$3,883	\$4,135
Taxes	\$0	\$0	\$0	\$0	\$167	\$570	\$774	\$969	\$1,141	\$1,276	\$1,359	\$1,447
EBIT(1-t)	-\$410	-\$373	-\$94	\$407	\$871	\$1,058	\$1,438	\$1,799	\$2,119	\$2,370	\$2,524	\$2,688
- Reinvestment	\$133	\$559	\$931	\$1,396	\$1,629	\$1,466	\$1,601	\$1,623	\$1,494	\$1,196	\$736	\$806
FCFF	-\$543	-\$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%	

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

Amazon was trading at \$84 in January 2000.

Cost of Equity: 12.90%

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

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

Weights: Debt = 1.2% -> 15%

Pushed debt ratio to retail industry average of 15%.

Riskfree Rate: T. Bond rate = 6.5%

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

Beta: 1.60 -> 1.00

Risk Premium: 4%

Internet/Retail

Operating Leverage

Current D/E: 1.21%

Base Equity Premium

Country Risk Premium

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Dealing with uncertainty

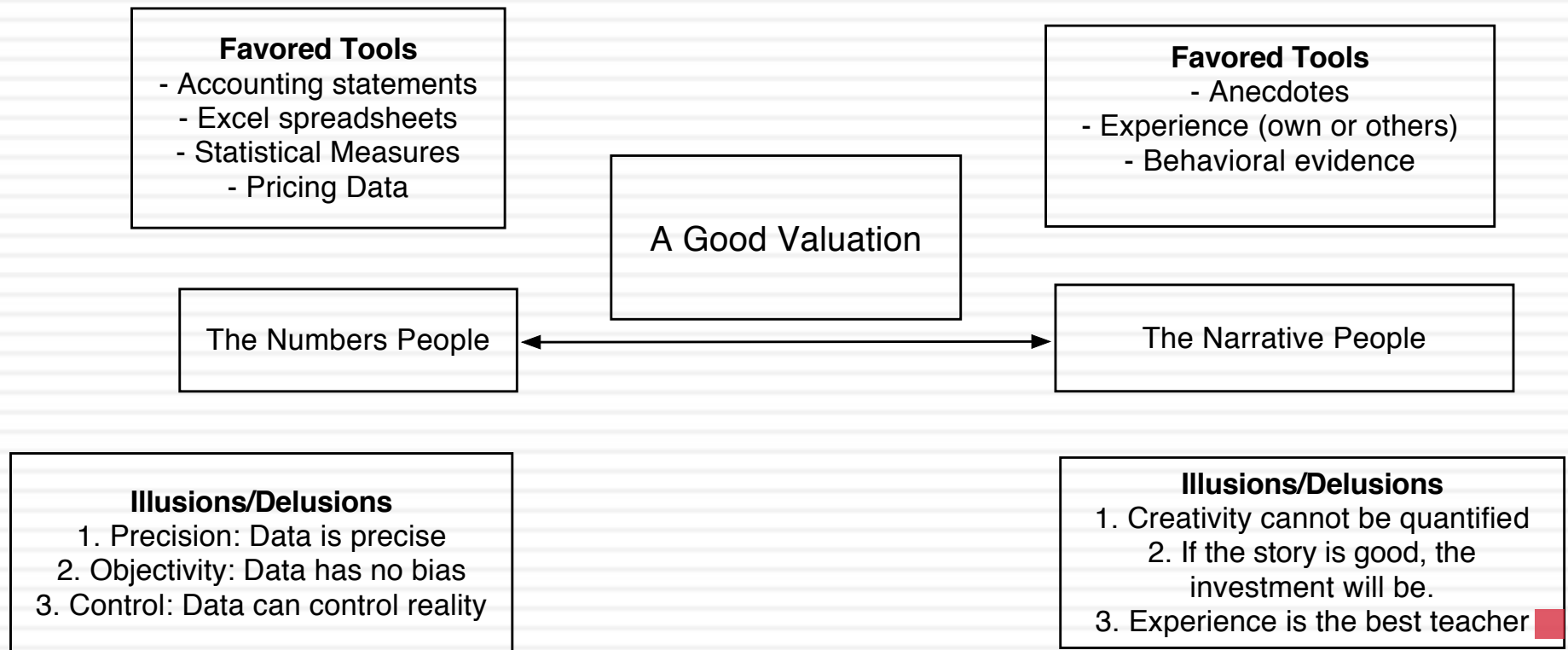
Ten suggestions for dealing with uncertainty...

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1. Start with a story that you tie to numbers
2. Less is more (the rule on detail....) (Revenue & margin forecasts) and 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. Tell a story

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My Amazon Story in 2000: A Field of Dreams, General Retail Company

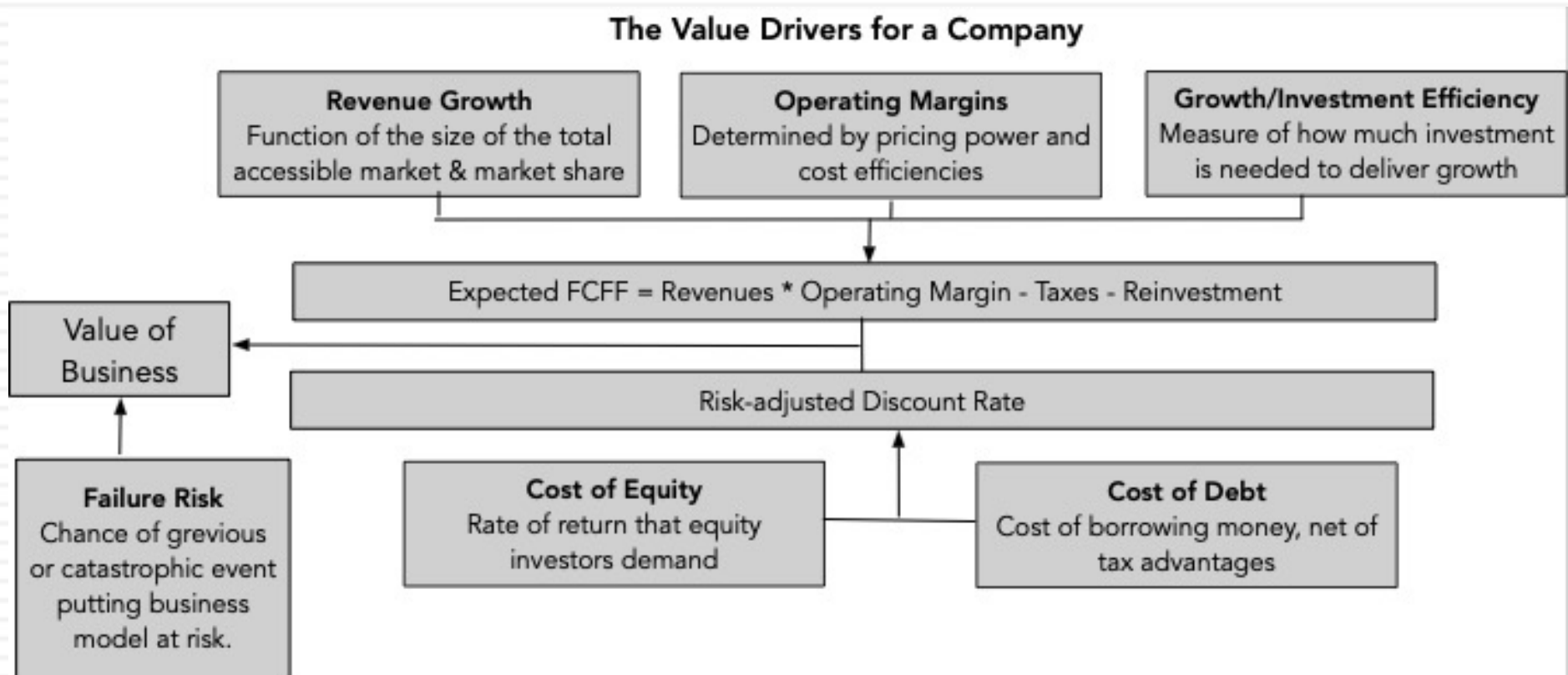
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- A Field of Dreams Company: Amazon would build revenues first, before going for profits -> High revenue growth + Low margins in early years.
- In retail: Amazon would grow its presence across retail, but would not venture into the discount retail space.
- With no failure risk: Amazon would be able to raise capital from markets to cover its cash flow needs, as it grew. (It was the peak of the dot com boom).
- And superb management: That would let it navigate its way from tiny retailer to global presence.

2. 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.

Parsimony in models...



And in forecasts...

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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

Use “auto pilot” approaches to estimate future years

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

And 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?

3. Consistency is key in the numbers...

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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

And in your stories...

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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.

Especially when it comes to terminal value

Myth 5.1: The only way to estimate terminal value is to use the perpetual growth model.

Myth 5.2: The perpetual growth model can give you an infinite value.

Myth 5.3: The growth rate is your biggest driver of terminal value.

Myth 5.4: Your growth rate cannot be negative in a perpetual growth model.

Myth 5.5: If your terminal value is a high proportion of your DCF value, it is flawed.

$$\text{Value of an asset with life } > n \text{ years} = \frac{E(CF_1)}{(1+r)^1} + \frac{E(CF_2)}{(1+r)^2} + \dots + \frac{E(CF_n)}{(1+r)^n} + \frac{\text{Terminal Value}_n}{(1+r)^n}$$

Truth 5.1: The terminal value can be based on annuities or a liquidation value.

Truth 5.2: Not if growth forever is capped at the growth rate of the economy.

Truth 5.3: Growth is not free & increasing growth can add or destroy value.

Truth 5.4: Growth can be negative forever & is often more reflective of reality.

Truth 5.5: The terminal value should be a high percent of value today.

And extending to other macro assumptions..

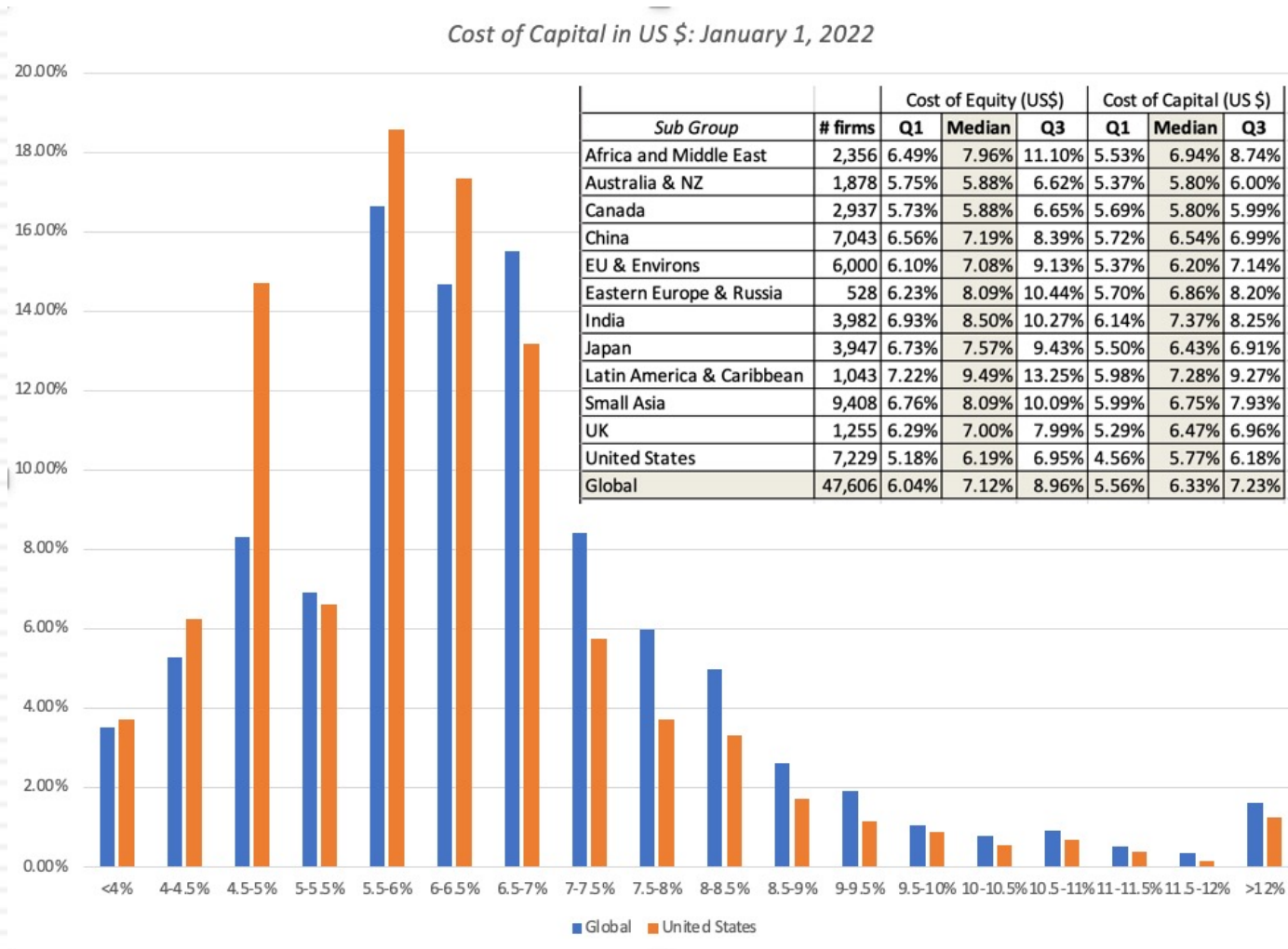
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- The best (though not easiest) thing to do is to separate your macro views from your micro views. Use current market based numbers for your valuation, but then provide a separate assessment of what you think about those market numbers.
- With interest rates, inflation and exchange rates, you are often tempted to use your own forecasts or worse still, the forecasts of so-called experts on how they will evolve. With cyclical and commodity companies, it is undeniable that the value you arrive at will be affected by your views on the economy or the price of the commodity.
 - The first problem with doing this is that these experts are horrifically bad at forecasting the future.
 - The second problem is that your valuation then become a joint product of your views on macro variables and your views on the company, and it is difficult to separate the two.

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.

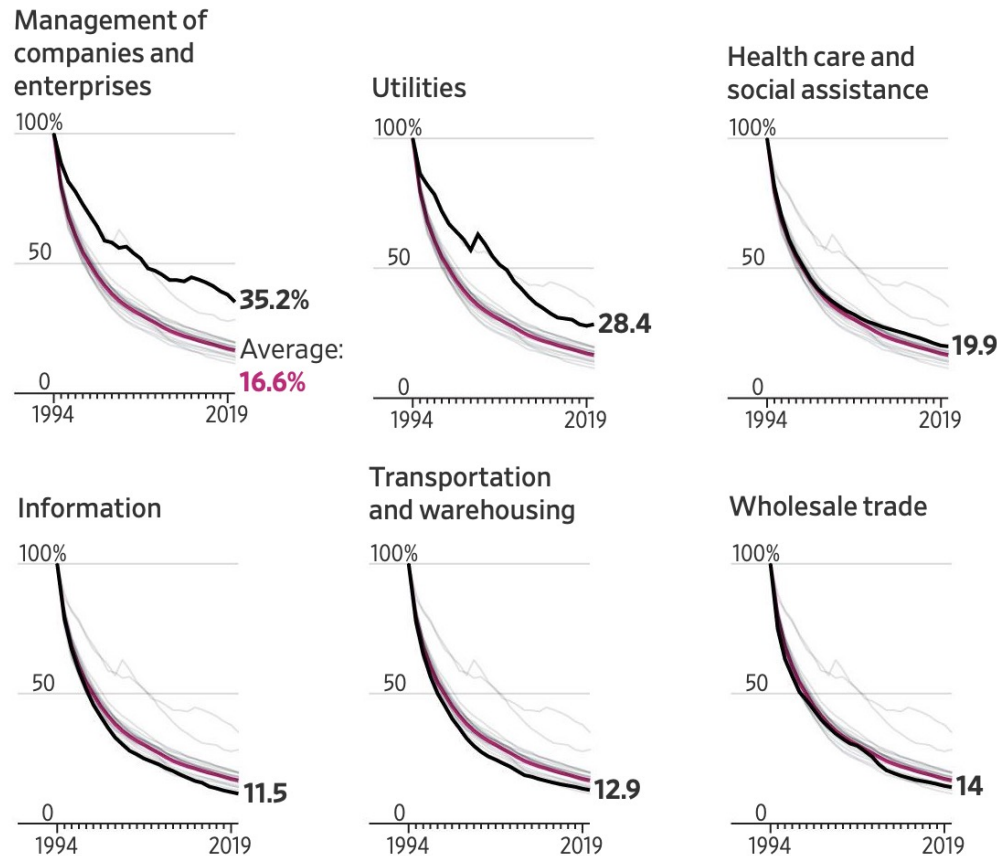
And play some Moneyball...



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

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Sectors with highest and lowest annual survival rate, compared to all sectors



Source: Bureau of Labor Statistics, Business Employment Dynamics data

Contrasting ways of dealing with survival risk...

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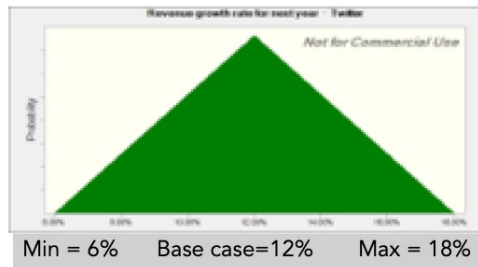
- The Venture Capital approach: In the venture capital approach, you hike the “discount rate” well above what would be appropriate for a going concern and then use this “target” rate to discount your “exit value” (which is estimated using a multiple and forward earnings).
 - Value = (Forward Earnings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

8. Confront uncertainty, if you can...

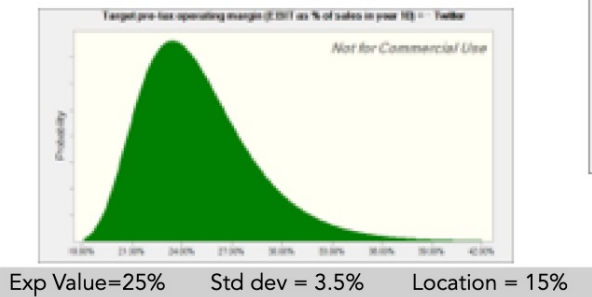
- In standard valuation, you are forced to make point estimates for inputs where you are uncertain about values. In statistical terms, you are being asked to compress a probability distribution about a variable into an expected value. You then obtain a single estimate of value, based upon your base case 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.

With the consequences for equity value...

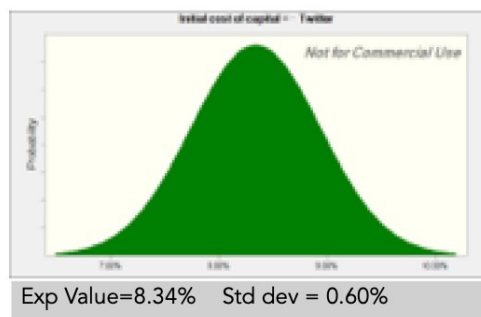
Revenue Growth Rate - Years 1- 5



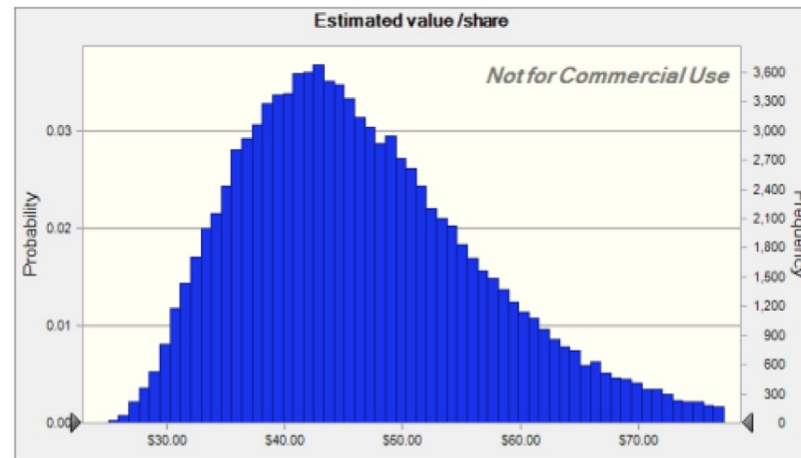
Target Operating Margin



Cost of Capital



Twitter Valuation in April 2022: Simulation



Percentile	Value per share
0%	\$ 24.14
10%	\$ 34.42
20%	\$ 37.61
30%	\$ 40.27
40%	\$ 42.69
50%	\$ 45.17
60%	\$ 47.95
70%	\$ 51.08
80%	\$ 55.15
90%	\$ 61.32
100%	\$ 138.18

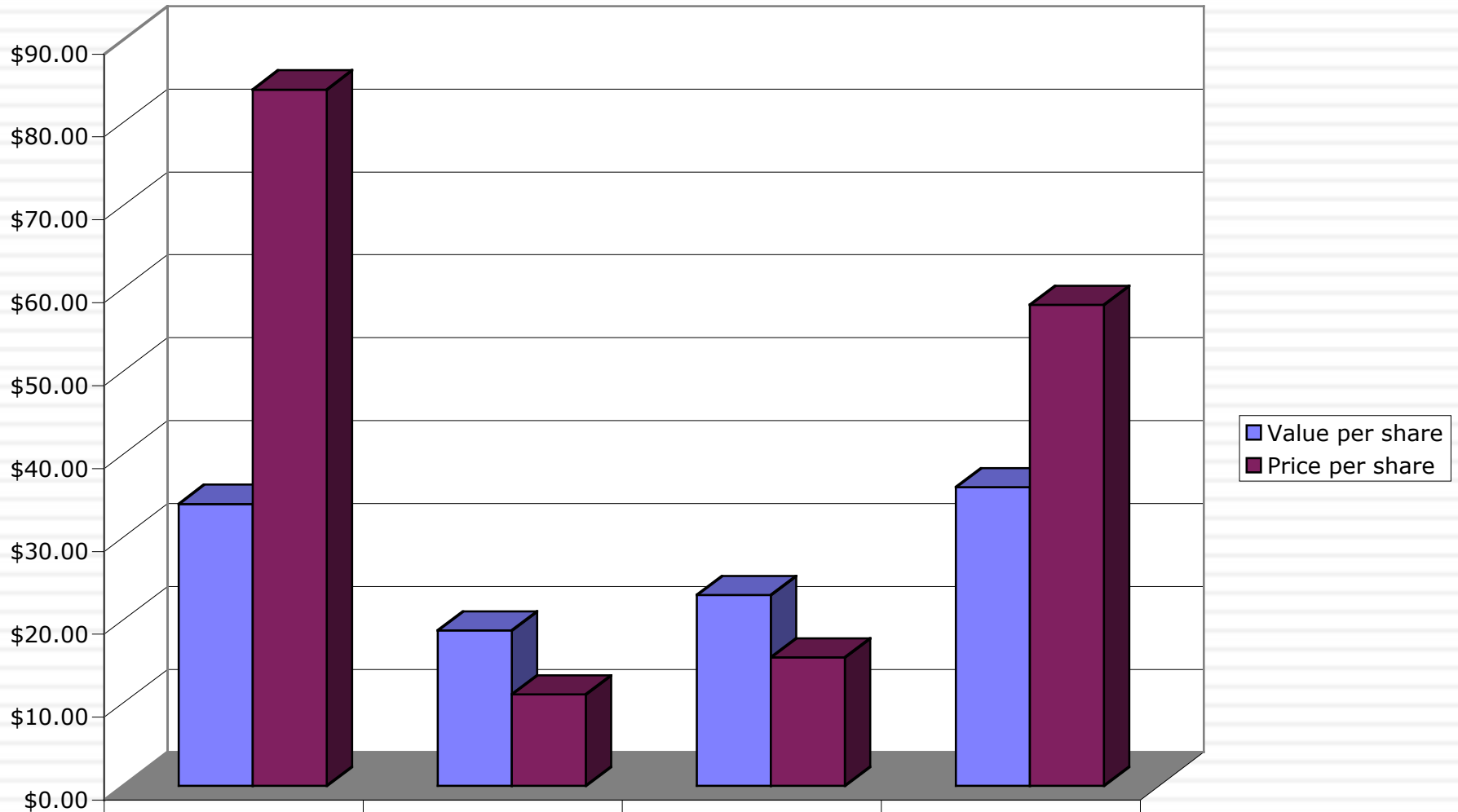
9. Don't look for precision..

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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.

To illustrate: Your mistakes versus market mistakes..

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The Disruption Platform Rolls on

Amazon continues on its transformation from online retailer to disruption platform, willing to enter any business that it perceives as inefficiently run, and changing it. Along the way, it will invest large amounts of capital and wait for long periods to attain profitability. In 2020 and 2021, Amazon benefited from the COVID shut down to increase growth and improve its profitability, making its dominant position even more dominant.

The Assumptions

	Base year	Next year	Years 2-5	Years 6-10	After year 10	Link to story
Revenues (a)	\$469,822.00	15.0%	15.00%	3.00%	3.00%	Disruption platform in multiple businesses
Operating margin (b)	9.60%	10.0%	10.00%	12.50%	12.50%	Margins improve, aided by cloud business & continued economies of scale.
Tax rate	12.60%		12.60%	25.00%	25.00%	Global/US marginal tax rate over time
Reinvestment (c)		1.69	1.69	1.69	25.00%	Maintined at Amazon's current level
Return on capital	14.17%	Marginal ROIC =	23.66%		12.00%	Stronge competitive edges
Cost of capital (d)			6.47%	6.11%	6.11%	Cost of capital close to median company

The Cash Flows

	Revenues	Operating Margin	EBIT	EBIT (1-t)	Reinvestment	FCFF
1	\$540,295.30	10.00%	\$54,029.53	\$47,221.81	\$41,723.60	\$5,498.21
2	\$621,339.60	10.50%	\$65,240.66	\$57,020.33	\$47,982.14	\$9,038.19
3	\$714,540.53	10.75%	\$76,813.11	\$67,134.66	\$55,179.46	\$11,955.19
4	\$821,721.61	11.00%	\$90,389.38	\$79,000.32	\$63,456.38	\$15,543.94
5	\$944,979.86	11.25%	\$106,310.23	\$92,915.14	\$72,974.84	\$19,940.31
6	\$1,064,047.32	11.34%	\$120,655.80	\$102,460.90	\$70,493.69	\$31,967.21
7	\$1,172,580.14	11.63%	\$136,365.15	\$112,419.43	\$64,256.68	\$48,162.75
8	\$1,264,041.40	11.92%	\$150,669.48	\$120,475.31	\$54,149.48	\$66,325.83
9	\$1,332,299.63	12.21%	\$162,671.54	\$126,037.91	\$40,412.17	\$85,625.74
10	\$1,372,268.62	12.50%	\$171,533.58	\$128,650.18	\$23,663.57	\$104,986.61
Terminal year	\$1,413,436.68	12.50%	\$176,679.58	\$132,509.69	\$33,127.42	\$99,382.27

The Value

Terminal value	\$3,195,571.27			
PV(Terminal value)	\$1,725,022.81			
PV (CF over next 10 years)	\$248,868.32			
Value of operating assets =	\$1,973,891.13			
Adjustment for distress	\$0.00		Probability of failure =	0.00%
- Debt & Minority Interests	\$139,439.00			
+ Cash & Other Non-operating assets	\$96,049.00			
Value of equity	\$1,930,501.13			
- Value of equity options	\$0.00			
Number of shares	506.00			
Value per share	\$3,815.22		Stock was trading at =	\$3,068.57

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.*

The Bermuda Triangle of Valuation

