4. A Discount for Complexity: An Experiment

	Company A	Company B
Operating Income	$ 1 billion	$ 1 billion
Tax rate	40%	40%
ROIC	10%	10%
Expected Growth	5%	5%
Cost of capital	8%	8%
Business Mix	Single	Multiple
Holdings	Simple	Complex
Accounting	Transparent	Opaque

Which firm would you value more highly?

Aswath Damodaran

Measuring Complexity: Volume of Data in Financial Statements

Company	Number of pages in last 10Q	Number of pages in last 10K
General Electric	65	410
Microsoft	63	218
Wal-mart	38	244
Exxon Mobil	86	332
Pfizer	171	460
Citigroup	252	1026
Intel	69	215
AIG	164	720
Johnson & Johnson	63	218
IBM	85	353

Aswath Damodaran

Measuring Complexity: A Complexity Score

Item	Factors	Follow-up Question	Answer	Weighting factor	Hyundai Heavy Score
Operating Income	1. Multiple Businesses	Number of businesses (with more than 10% of revenues) =	3	2.00	6
	2. One-time income and expenses	Percent of operating income =	5%	10.00	0.5
	3. Income from unspecified sources	Percent of operating income =	15%	10.00	1.5
	4. Items in income statement that are volatile	Percent of operating income =	20%	5.00	1
Tax Rate	1. Income from multiple locales	Percent of revenues from non-domestic locales =	75%	3.00	2.25
	2. Different tax and reporting books	Yes or No	No	Yes=3	0
	3. Headquarters in tax havens	Yes or No	No	Yes=3	0
	4. Volatile effective tax rate	Yes or No	Yes	Yes=2	2
Capital Expenditures	1. Volatile capital expenditures	Yes or No	Yes	Yes=2	2
	2. Frequent and large acquisitions	Yes or No	No	Yes=4	0
	3. Stock payment for acquisitions and investments	Yes or No	No	Yes=4	0
Working capital	1. Unspecified current assets and current liabilities	Yes or No	Yes	Yes=3	3
	2. Volatile working capital items	Yes or No	Yes	Yes=2	2
Expected Growth rate	1. Off-balance sheet assets and liabilities (operating leases and R&D)	Yes or No	No	Yes=3	0
	2. Substantial stock buybacks	Yes or No	No	Yes=3	0
	3. Changing return on capital over time	Is your return on capital volatile?	Yes	Yes=5	5
	4. Unsustainably high return	Is your firm's ROC much higher than industry average?	Yes	Yes=5	5
Cost of capital	1. Multiple businesses	Number of businesses (more than 10% of revenues) =	3	1.00	3
	2. Operations in emerging markets	Percent of revenues=	50%	5.00	2.5
	3. Is the debt market traded?	Yes or No	No	No=2	2
	4. Does the company have a rating?	Yes or No	No	No=2	2
	5. Does the company have off-balance sheet debt?	Yes or No	No	Yes=5	0
No-operating assets	Minority holdings as percent of book assets	Minority holdings as percent of book assets	30%	20.00	6
Firm to Equity value	Consolidation of subsidiaries	Minority interest as percent of book value of equity	20%	20.00	4
Per share value	Shares with different voting rights	Does the firm have shares with different voting rights?	No	Yes = 10	0
	Equity options outstanding	Options outstanding as percent of shares	0%	10.00	0
		Complexity Score =			49.75

Aswath Damodaran

Dealing with Complexity

- In Discounted Cashflow Valuation
  - The Aggressive Analyst: Trust the firm to tell the truth and value the firm based upon the firm's statements about their value.
  - The Conservative Analyst: Don't value what you cannot see.
  - The Compromise: Adjust the value for complexity
    - Adjust cash flows for complexity
    - Adjust the discount rate for complexity
    - Adjust the expected growth rate/ length of growth period
    - Value the firm and then discount value for complexity
- In relative valuation
  - In a relative valuation, you may be able to assess the price that the market is charging for complexity:
  - With the hundred largest market cap firms, for instance:

  PBV = 0.65 + 15.31 ROE – 0.55 Beta + 3.04 Expected growth rate – 0.003 # Pages in 10K

5. Be circumspect about defining debt for cost of capital purposes...

- General Rule: Debt generally has the following characteristics:
  - Commitment to make fixed payments in the future
  - The fixed payments are tax deductible
  - Failure to make the payments can lead to either default or loss of control of the firm to the party to whom payments are due.
- Defined as such, debt should include
  - All interest bearing liabilities, short term as well as long term
  - All leases, operating as well as capital
- Debt should not include
  - Accounts payable or supplier credit
- Be wary of your conservative impulses which will tell you to count everything as debt. That will push up the debt ratio and lead you to understate your cost of capital.

Aswath Damodaran

Book Value or Market Value

- ☐ You are valuing a distressed telecom company and have arrived at an estimate of $ 1 billion for the enterprise value (using a discounted cash flow valuation). The company has $ 1 billion in face value of debt outstanding but the debt is trading at 50% of face value (because of the distress). What is the value of the equity to you as an investor?

    a. The equity is worth nothing (EV minus Face Value of Debt)

    b. The equity is worth $ 500 million (EV minus Market Value of Debt)

- ☐ Would your answer be different if you were told that the liquidation value of the assets of the firm today is $1.2 billion and that you were planning to liquidate the firm today?

But you should consider other potential liabilities when getting to equity value

- If you have under funded pension fund or health care plans, you should consider the under funding at this stage in getting to the value of equity.
  - If you do so, you should not double count by also including a cash flow line item reflecting cash you would need to set aside to meet the unfunded obligation.
  - You should not be counting these items as debt in your cost of capital calculations….
- If you have contingent liabilities - for example, a potential liability from a lawsuit that has not been decided - you should consider the expected value of these contingent liabilities
  - Value of contingent liability = Probability that the liability will occur * Expected value of liability

Aswath Damodaran

6. Equity to Employees: Effect on Value

- In recent years, firms have turned to giving employees (and especially top managers) equity option or restricted stock packages as part of compensation. If they are options, they usually are long term and on volatile stocks. If restricted stock, the restrictions are usually on trading.

- These equity compensation packages are clearly valuable and the question becomes how best to deal with them in valuation.

- Two key issues with employee options:
  - How do options or restricted stock granted in the past affect equity value per share today?
  - How do expected grants of either in the future affect equity value today?

The Easier Problem: Restricted Stock Grants

- When employee compensation takes the form of restricted stock grants, the solution is relatively simple.

- To account for restricted stock grants in the past, make sure that you count the restricted stock that have already been granted in shares outstanding today. That will reduce your value per share.

- To account for expected stock grants in the future, estimate the value of these grants as a percent of revenue and forecast that as expense as part of compensation expenses. That will reduce future income and cash flows.

The Bigger Challenge: Employee Options

- It is true that options can increase the number of shares outstanding but dilution per se is not the problem.

- Options affect equity value at exercise because

  - Shares are issued at below the prevailing market price. Options get exercised only when they are in the money.

  - Alternatively, the company can use cashflows that would have been available to equity investors to buy back shares which are then used to meet option exercise. The lower cashflows reduce equity value.

- Options affect equity value before exercise because we have to build in the expectation that there is a probability of and a cost to exercise.

Aswath Damodaran

A simple example...

- XYZ company has $ 100 million in free cashflows to the firm, growing 3% a year in perpetuity and a cost of capital of 8%. It has 100 million shares outstanding and $ 1 billion in debt. Its value can be written as follows:

Value of firm = 100 / (.08-.03)	= 2000
Debt	= 1000
= Equity	= 1000
Value per share	= 1000/100 = $10

- XYZ decides to give 10 million options at the money (with a strike price of $10) to its CEO. What effect will this have on the value of equity per share?

  a. None. The options are not in-the-money.

  b. Decrease by 10%, since the number of shares could increase by 10 million

  c. Decrease by less than 10%. The options will bring in cash into the firm but they have time value.

Aswath Damodaran

I. The Diluted Share Count Approach

☐ The simplest way of dealing with options is to try to adjust the denominator for shares that will become outstanding if the options get exercised. In the example cited, this would imply the following:

Value of firm = 100 / (.08-.03) = 2000

Debt = 1000

= Equity = 1000

Number of diluted shares = 110

Value per share = 1000/110 = $9.09

☐ The diluted approach <u>fails to consider that exercising options will bring in cash into the firm</u>. Consequently, they will overestimate the impact of options and understate the value of equity per share.

II. The Treasury Stock Approach

- □ The treasury stock approach adds the proceeds from the exercise of options to the value of the equity before dividing by the diluted number of shares outstanding.

- □ In the example cited, this would imply the following:

Value of firm = 100 / (.08-.03)	= 2000
Debt	= 1000
= Equity	= 1000
Number of diluted shares	= 110
Proceeds from option exercise	= 10 * 10 = 100
Value per share	= (1000+ 100)/110 = $ 10

- □ The treasury stock approach fails to consider the time premium on the options. The treasury stock approach also has problems with out-of-the-money options. If considered, they can increase the value of equity per share. If ignored, they are treated as non-existent.

Aswath Damodaran

III. Option Value Drag

- Step 1: Value the firm, using discounted cash flow or other valuation models.

- Step 2: Subtract out the value of the outstanding debt to arrive at the value of equity. Alternatively, skip step 1 and estimate the of equity directly.

- Step 3:Subtract out the market value (or estimated market value) of other equity claims:
  - Value of Warrants = Market Price per Warrant * Number of Warrants
      : Alternatively estimate the value using option pricing model
  - Value of Conversion Option = Market Value of Convertible Bonds - Value of Straight Debt Portion of Convertible Bonds
  - Value of employee Options: Value using the average exercise price and maturity.

- Step 4:Divide the remaining value of equity by the number of shares outstanding to get value per share.

Aswath Damodaran

Valuing Equity Options issued by firms... The Dilution Problem

- Option pricing models can be used to value employee options with four caveats –
  - Employee options are long term, making the assumptions about constant variance and constant dividend yields much shakier,
  - Employee options result in stock dilution, and
  - Employee options are often exercised before expiration, making it dangerous to use European option pricing models.
  - Employee options cannot be exercised until the employee is vested.
- These problems can be partially alleviated by using an option pricing model, allowing for shifts in variance and early exercise, and factoring in the dilution effect. The resulting value can be adjusted for the probability that the employee will not be vested.

Aswath Damodaran

Valuing Employee Options

□ To value employee options, you need the following inputs into the option valuation model:

 ◻ Stock Price = $ 10, Adjusted for dilution = $9.58
 ◻ Strike Price = $ 10
 ◻ Maturity = 10 years (Can reduce to reflect early exercise)
 ◻ Standard deviation in stock price = 40%
 ◻ Riskless Rate = 4%

□ Using a dilution-adjusted Black Scholes model, we arrive at the following inputs:

 ◻ N (d1) = 0.8199
 ◻ N (d2) = 0.3624
 ◻ Value per call = $ 9.58 (0.8199) - $10 e $^{-(0.04)\,(10)}$(0.3624) = $5.42

Aswath Damodaran

Value of Equity to Value of Equity per share

□ Using the value per call of $5.42, we can now estimate the value of equity per share after the option grant:

Value of firm = 100 / (.08-.03)	= 2000
Debt	= 1000
= Equity	= 1000
Value of options granted	= $ 54.2
= Value of Equity in stock	= $945.8
/ Number of shares outstanding	/ 100
= Value per share	= $ 9.46

□ Note that this approach yields a higher value than the diluted share count approach (which ignores exercise proceeds) and a lower value than the treasury stock approach (which ignores the time premium on the options)

Aswath Damodaran

To tax adjust or not to tax adjust...

- In the example above, we have assumed that the options do not provide any tax advantages. To the extent that the exercise of the options creates tax advantages, the actual cost of the options will be lower by the tax savings.

- One simple adjustment is to multiply the value of the options by (1- tax rate) to get an after-tax option cost.

Aswath Damodaran

Option grants in the future…

- Assume now that this firm intends to continue granting options each year to its top management as part of compensation. These expected option grants will also affect value.

- The simplest mechanism for bringing in future option grants into the analysis is to do the following:

  - Estimate the value of options granted each year over the last few years as a percent of revenues.

  - Forecast out the value of option grants as a percent of revenues into future years, allowing for the fact that as revenues get larger, option grants as a percent of revenues will become smaller.

  - Consider this line item as part of operating expenses each year. This will reduce the operating margin and cashflow each year.

When options affect equity value per share the most…

- Option grants affect value more
  - The lower the strike price is set relative to the stock price
  - The longer the term to maturity of the option
  - The more volatile the stock price
- The effect on value will be magnified if companies are allowed to revisit option grants and reset the exercise price if the stock price moves down.

Aswath Damodaran

NARRATIVE AND NUMBERS: VALUATION AS A BRIDGE

Tell me a story..

Valuation as a bridge

Number Crunchers

Story Tellers

Favored Tools
- Accounting statements
- Excel spreadsheets
- Statistical Measures
- Pricing Data

A Good Valuation

Favored Tools
- Anecdotes
- Experience (own or others)
- Behavioral evidence

The Numbers People ⟷ The Narrative People

Illusions/Delusions
1. Precision: Data is precise
2. Objectivity: Data has no bias
3. Control: Data can control reality

Illusions/Delusions
1. Creativity cannot be quantified
2. If the story is good, the investment will be.
3. Experience is the best teacher

Step 1: Survey the landscape

- Every valuation starts with a narrative, a story that you see unfolding for your company in the future.
- In developing this narrative, you will be making assessments of
  - Your company (its products, its management and its history.
  - The market or markets that you see it growing in.
  - The competition it faces and will face.
  - The macro environment in which it operates.

Higher income for drivers, relative to traditional taxis.	**The drivers** Anyone with a car in one of Uber's covered cities can apply to be a Uber driver. If you pass the Uber screens, you are given a Uber iPhone and are in the system. → *Uber App* →	**The customers** Uber subscribers download its app to their phones and when they need a ride, use the app. They can track the car as it approaches them on their devices.	**Convenience, comfort and /or cost savings, relative to traditional cab**

Fare quotes, based on distance, car type & demand period

Pricing & payment
Uber set the prices for rides, with premium prices for rides during peak demand times. Customers pay Uber for the rides, using their credit cards and don't pay Uber drivers.

Safety & Secure transactions

Even with Uber's 20% cut, drivers make more than they do from status quo.

Splitting the proceeds
Uber splits the ride receipts with the driver, keeping a percentage of the receipts for itself (revenues to Uber). While this percentage has historically been 20%, Uber had reduced it in some cities, when faced with competition from Lyft and Hailo.

Stronger competition from Lyft, Hailo & others will reduce Uber's split

Uber has a low-cost model that should allow it to keep a large percent of its revenues as profits.

From revenues to profits
From these revenues, Uber covers its expenses. These include R&D, technology development, customer acquisition costs (including rebates to new customers), marketing and the employees/infrastructure it needs in each of the cities that it operates in.

Regulatory & legal issues with offering service will increase costs.

Should be kept low because Uber does not invest in cars or other expensive infrastructure.

Reinvest to grow
While Uber does not own the cars that its drivers operate, it still has to invest in technology (R&D) and acquisitions to grow. That reinvestment is likely to be modest initially, but will scale up as the company grows.

Local companies may need to be acquired to gain foothold in some markets

Step 2: Create a narrative for the future

□ Every valuation starts with a narrative, a story that you see unfolding for your company in the future.

□ In developing this narrative, you will be making assessments of your company (its products, its management), the market or markets that you see it growing in, the competition it faces and will face and the macro environment in which it operates.

 ■ Rule 1: Keep it simple.

 ■ Rule 2: Keep it focused.
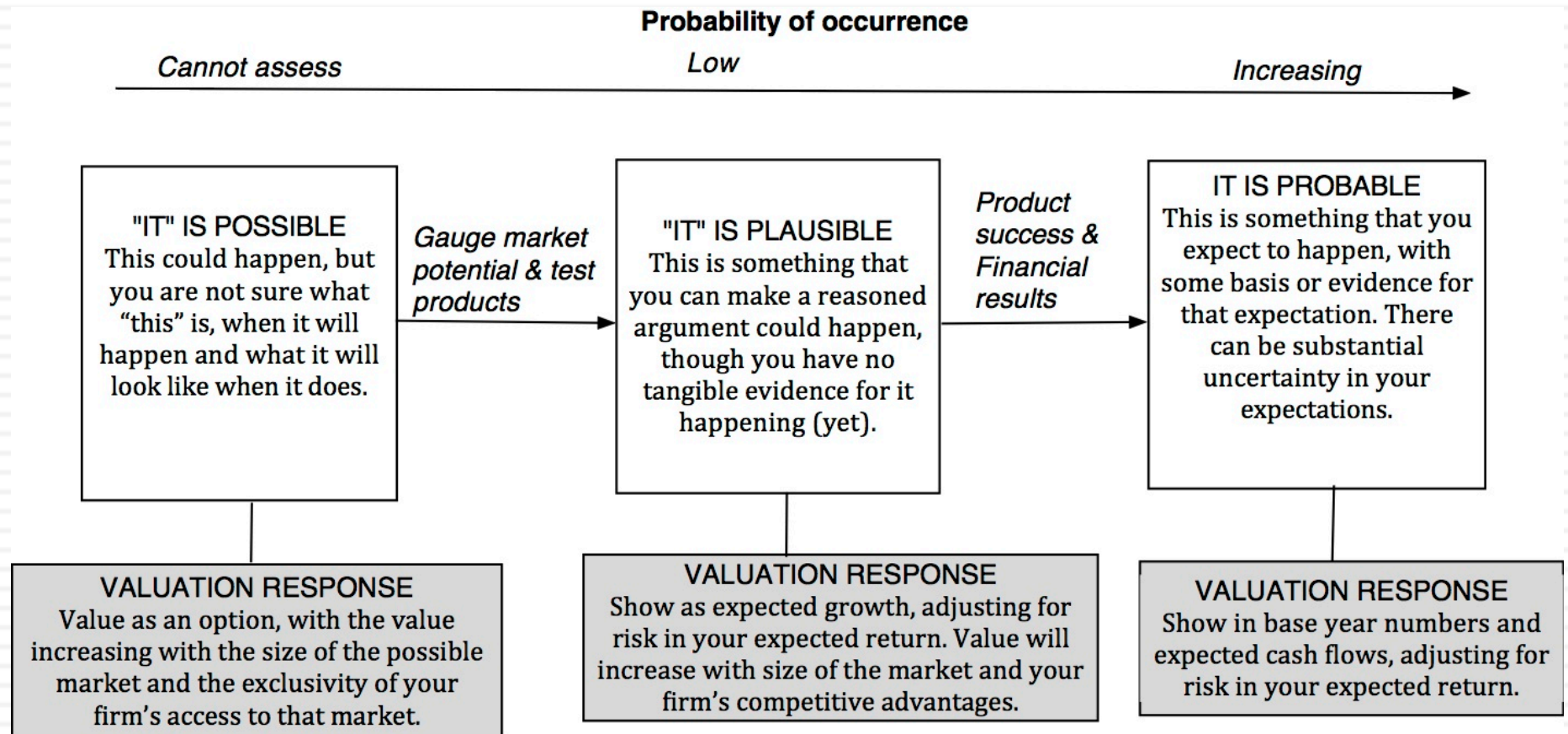
 ■ Rule 3: Stay grounded in reality.

The Uber Narrative

In June 2014, my initial narrative for Uber was that it would be

1. <u>An urban car service business</u>: I saw Uber primarily as a force in urban areas and only in the car service business.

2. Which <u>would expand the business moderately</u> (about 40% over ten years) by bringing in new users.

3. <u>With local networking benefits</u>: If Uber becomes large enough in any city, it will quickly become larger, but that will be of little help when it enters a new city.

4. Maintain its revenue sharing (20%) system due to strong <u>competitive advantages</u> (from being a first mover).

5. And <u>its existing low-capital business model</u>, with drivers as contractors and very little investment in infrastructure.

Step 3: Check the narrative against history, economic first principles & common sense

Probability of occurrence

Cannot assess — *Low* — *Increasing*

"IT" IS POSSIBLE
This could happen, but you are not sure what "this" is, when it will happen and what it will look like when it does.

Gauge market potential & test products

"IT" IS PLAUSIBLE
This is something that you can make a reasoned argument could happen, though you have no tangible evidence for it happening (yet).

Product success & Financial results

IT IS PROBABLE
This is something that you expect to happen, with some basis or evidence for that expectation. There can be substantial uncertainty in your expectations.

VALUATION RESPONSE
Value as an option, with the value increasing with the size of the possible market and the exclusivity of your firm's access to that market.

VALUATION RESPONSE
Show as expected growth, adjusting for risk in your expected return. Value will increase with size of the market and your firm's competitive advantages.

VALUATION RESPONSE
Show in base year numbers and expected cash flows, adjusting for risk in your expected return.

Aswath Damodaran

The Impossible, The Implausible and the Improbable

The Impossible

Bigger than the economy
Assuming Growth rate for company in perpetuity> Growth rate for economy

Bigger than the total market
Allowing a company's revenues to grow so much that it has more than a 100% market share of whatever business it is in.

Profit margin > 100%
Assuming earnings growth will exceeds revenue growth for a long enough period, and pushing margins above 100%

Depreciation without cap ex
Assuming that depreciation will exceed cap ex in perpetuity.

The Implausible

Growth without reinvestment
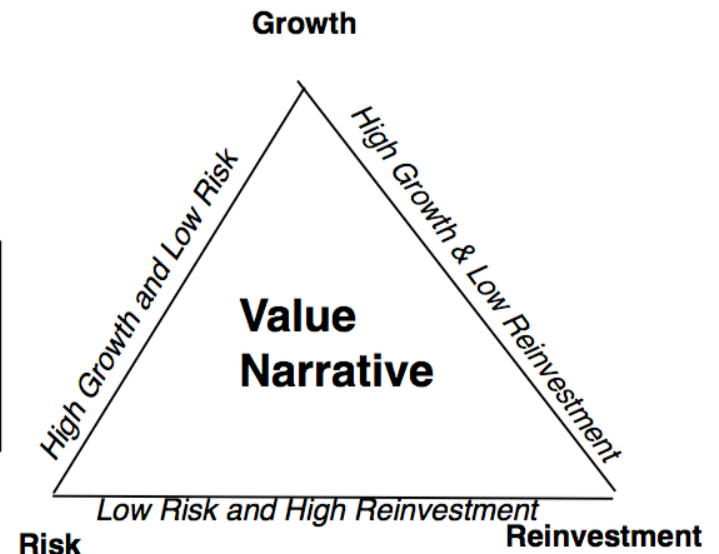Assuming growth forever without reinvestment.

Profits without competition
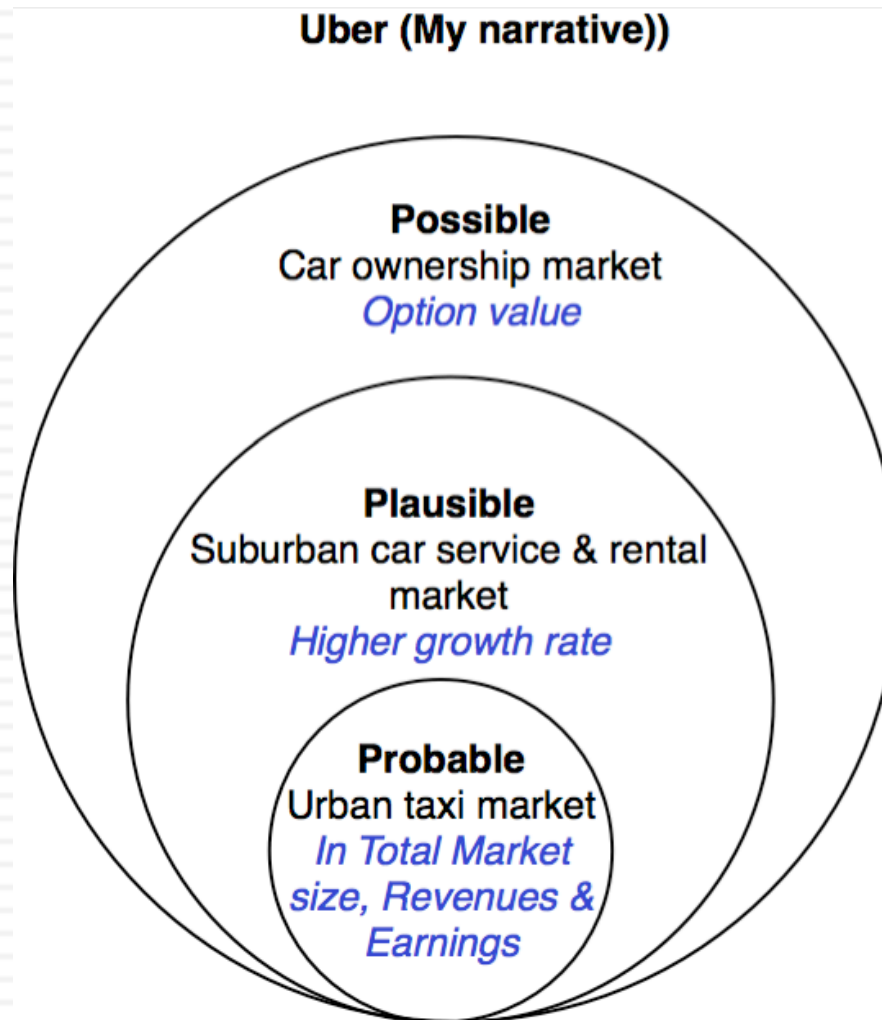Assuming that your company will grow and earn higher profits, with no competition.

Returns without risk
Assuming that you can generate high returns in a business with no risk.

The Improbable

Growth

High Growth and Low Risk

High Growth & Low Reinvestment

Value Narrative

Low Risk and High Reinvestment

Risk

Reinvestment

Aswath Damodaran

Uber: Possible, Plausible and Probable

Uber (My narrative))

Possible
Car ownership market
Option value

Plausible
Suburban car service & rental market
Higher growth rate

Probable
Urban taxi market
*In Total Market size, Revenues & Earnings*

The Runaway Story: When you want a story to be true…

- With a runaway business story, you usually have three ingredients:

  1. <u>Charismatic, likeable Narrator</u>: The narrator of the business story is someone that you want to see succeed, either because you like the narrator or because he/she will be a good role model.

  2. <u>Telling a story about disrupting a much business, where you dislike the status quo</u>: The status quo in the business that the story is disrupting is dissatisfying (to everyone involved)>

  3. <u>With a societal benefit as bonus</u>: And if the story holds, society and humanity will benefit.

- Since you want this story to work out, you stop asking questions, because the answers may put the story at risk.
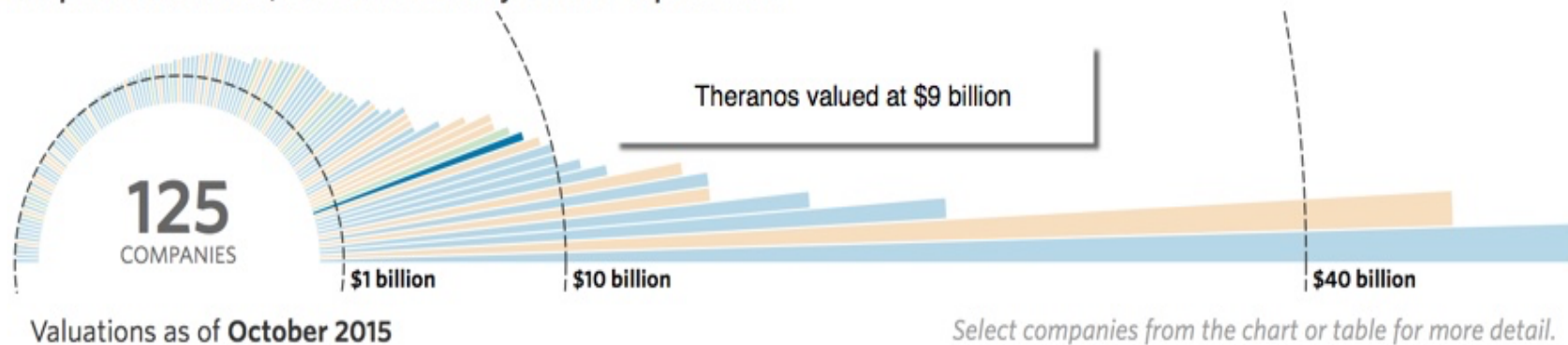
The Impossible: The Runaway Story

The Story
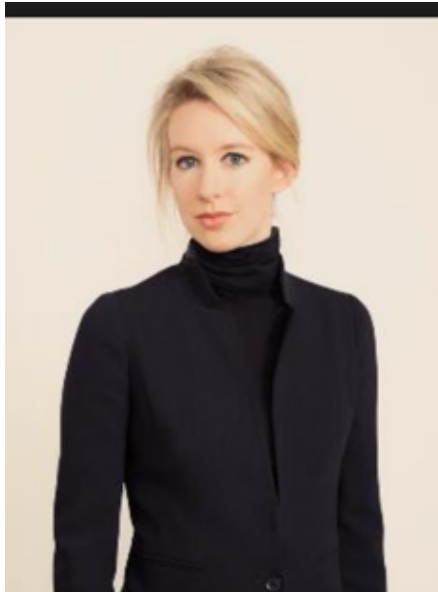
The Checks (?)

Board Member	Designation	Age
Henry Kissinger	Former Secretary of State	92
Bill Perry	Former Secretary of Defense	88
George Schultz	Former Secretary of State	94
Bill Frist	Former Senate Majority Leader	63
Sam Nunn	Former Senator	77
Gary Roughead	Former Navy Admiral	64
James Mattis	Former Marine Corps General	65
Dick Kovocovich	Former CEO of Wells Fargo	72
Riley Bechtel	Former CEO of Bechtel	63
William Foege	Epidemologist	79
Elizabeth Holmes	Founder & CEO, Theranos	31
Sunny Balwani	President & COO, Theranos	NA

\+

\+ **Money**

Companies valued at $1 billion or more by venture-capital firms

Theranos valued at $9 billion

125 COMPANIES

$1 billion $10 billion $40 billion

Valuations as of **October 2015**

Select companies from the chart or table for more detail.

When runaway stories melt down..

The Meltdown Story

Untrustworthy Storyteller
A narrator, who through his/her words or actions has become untrustworthy.

+

Story at war with numbers
The company's narrative conflicts with its own actions and/or with the actual results/numbers reported by the company.

+

Bad Business Model
The business model has a fundamental flaw that can affect either future profitability or survival, but the management is either in denial about the flaw or opaque in how it plans to deal with it.

=

Meltdown Story
Investors, lenders and observers question story, unwilling to accept the company's spin on number, pushing pricing down.

Aswath Damodaran