## NUMBERS AND NARRATIVE: MODELING, STORY TELLING AND INVESTING

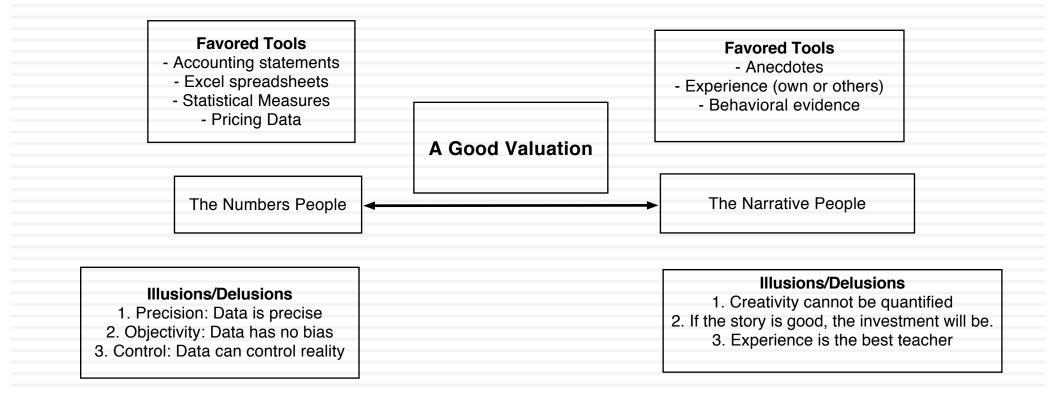
Aswath Damodaran

#### What are you?

 If you were asked to categorize yourself, would you more naturally think of yourself as a

- a) Numbers Person
- b) Story Person
- c) Not sure
- When did you make this decision and how has it affected your educational and career choices?
- As you get older, do you find yourself becoming more of whatever you chose?

#### Bridging the Gap



## FROM NARRATIVE TO NUMBERS: THE MECHANICS

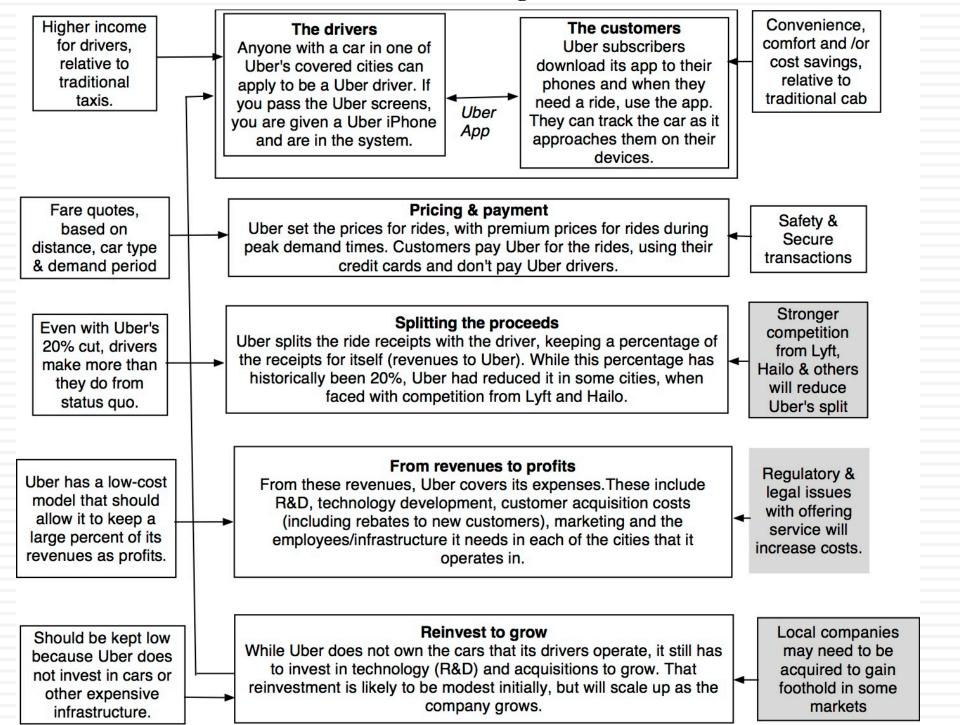
## The Steps

<b>_</b>	Step 1: Develop a narrative for the business that you are valuing In the narrative, you tell your story about how you see the business evolving over time.
	Step 2: Test the narrative to see if it is possible, plausible and probable There are lots of possible narratives, not all of them are plausible and only a few of them are probable.
	Step 3: Convert the narrative into drivers of value Take the narrative apart and look at how you will bring it into valuaton inputs starting with potential market size down to cash flows and risk. By the time you are done, each part of the narrative should have a place in your numbers and each number should be backed up a portion of your story.
	Step 4: Connect the drivers of value to a valuation Create an intrinsic valuation model that connects the inputs to an end-value the business.
	Step 5: Keep the feedback loop open Listen to people who know the business better than you do and use their suggestions to fine tune your narrative and perhaps even alter it. Work out the effects on value of alternative narratives for the company.

#### Step 1a: 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.

#### Understanding Uber in 2014



#### Understanding Ferrari in 2015 It is in the Auto Business Low Margins

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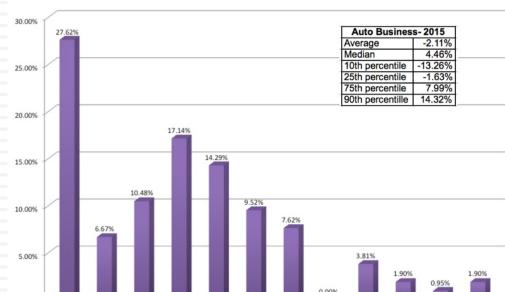
2% - 4%

4% - 6%

6% - 8%

#### Low Growth

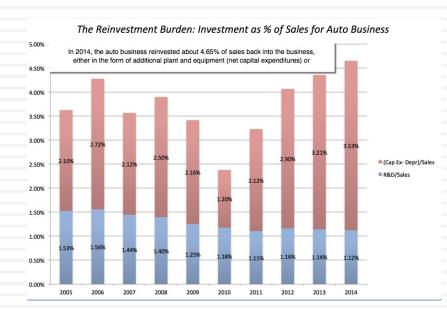
Year 🔻	Revenues (\$) 🔻	% Growth Rate 🔻
2005	1,274,716.60	
2006	1,421,804.20	11.54%
2007	1,854,576.40	30.44%
2008	1,818,533.00	-1.94%
2009	1,572,890.10	-13.51%
2010	1,816,269.40	15.47%
2011	1,962,630.40	8.06%
2012	2,110,572.20	7.54%
2013	2,158,603.00	2.28%
2014	2,086,124.80	-3.36%
ounded Ave	rage =	5.63%



High & Increasing Reinvestment



8% - 10% 10% - 12% 12% - 14% 14% - 16% 16% - 18%



	ROIC	Cost of capital	ROiC - Cost of capital
2004	6.82%	7.93%	-1.11%
2005	10.47%	7.02%	3.45%
2006	4.60%	7.97%	-3.37%
2007	7.62%	8.50%	-0.88%
2008	3.48%	8.03%	-4.55%
2009	-4.97%	8.58%	-13.55%
2010	5.16%	8.03%	-2.87%
2011	7.55%	8.15%	-0.60%
2012	7.80%	8.55%	-0.75%
2013	7.83%	8.47%	-0.64%
2014	6.47%	7.53%	-1.06%

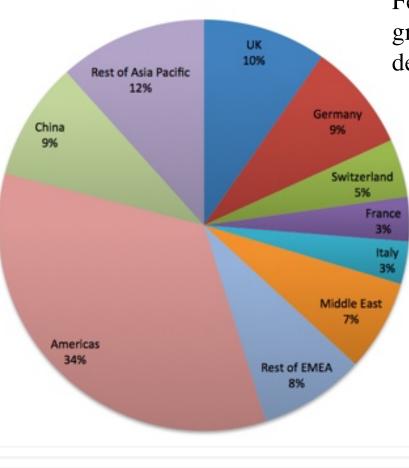
Only once in the last 10 years have auto companies collectively earned more than their cost of capital

The Automobile Business: Pre-tax Operating Margins in 2015

#### But it is not just another auto company..

Ferrari sold only 7,255 cars in all of 2014

Ferrari had a profit margin of 18.2%, in the 95<sup>th</sup> percentile, partly because of its high prices and partly because it spends little on advertising.



Ferrari: Geographical Sales (2014)

Ferrari sales (in units) have grown very little in the last decade & have been stable

Ferrari has not invested in new plants.

#### Step 1b: 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.

# The Uber Narrative: An Urban, Car Service disruptor

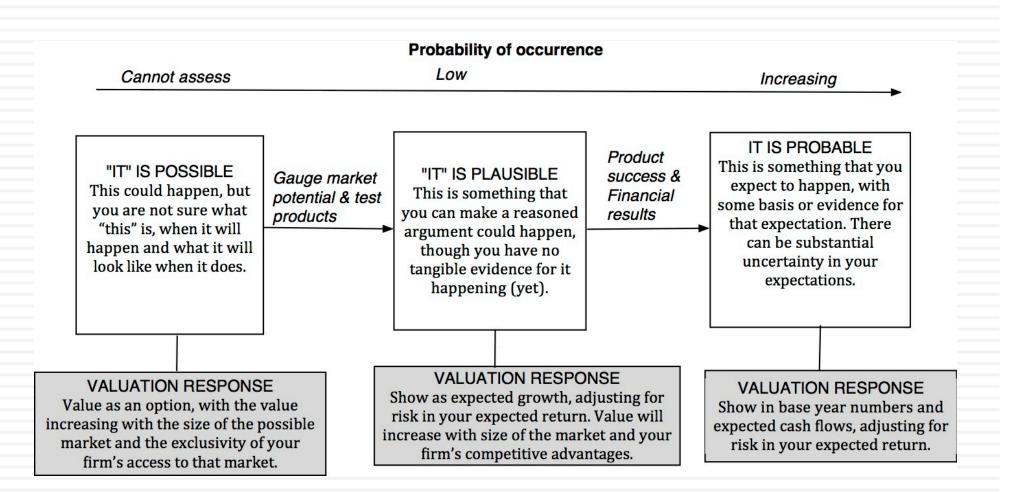
In June 2014, my initial narrative for Uber was that it would be

- 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 (about 40%</u> over ten years) by bringing in new users.
- 3. With local networking benefits: 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.

#### The Ferrari Narrative: An Exclusive Club

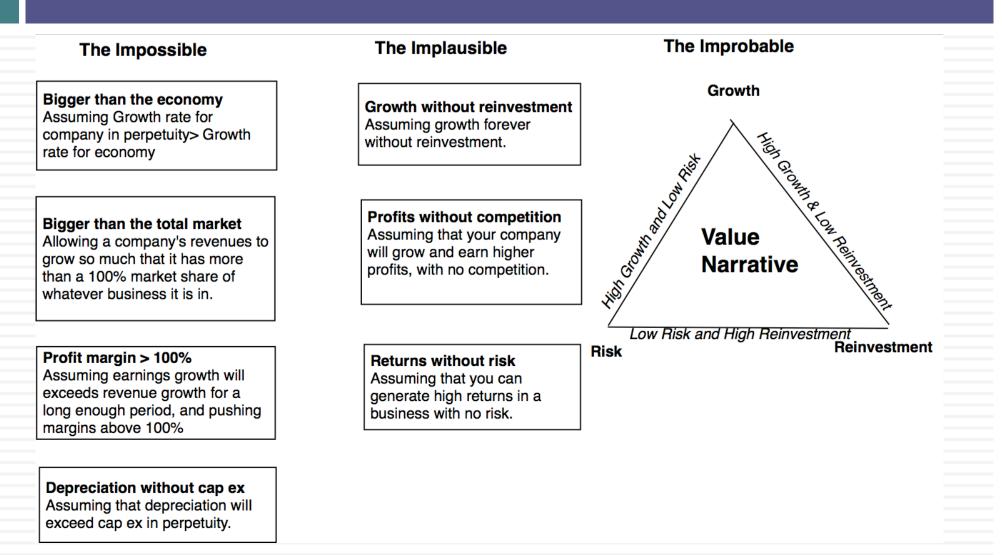
- Ferrari will stay an exclusive auto club, deriving its allure from its scarcity and the fact that only a few own Ferraris.
- By staying exclusive, the company gets three benefits:
  - It can continue to charge nose bleed prices for its cars and sell them with little or no advertising.
  - It does not need to invest in new assembly plants, since it does not plan to ramp up production.
  - It sells only to the super rich, who are unaffected by overall economic conditions or market crises.

# Step 2: Check the narrative against history, economic first principles & common sense



Aswath Damodaran

# The Impossible, The Implausible and the Improbable



#### The Improbable: Willy Wonkitis

#### Tesla: Summary 15-year DCF Analysis (DCF valuation as of mid-year 2013)

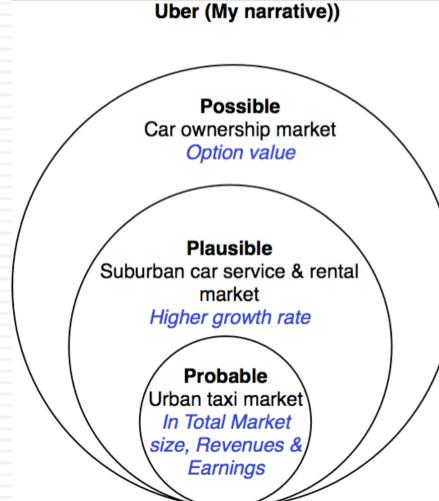
,	/		,	<b>`</b>						/						
	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 20
Unit Volume	24,298	36,883	64,684	86,713	149,869	214,841	291,861	384,747	466,559	550,398	643,850	726,655	820,645	922,481	1,034,215	1,137,7
6 Growth		52%	75%	34%	73%	43%	36%	32%	21%	18%	17%	13%	13%	12%	12%	1
automotive Revenue Per Unit (\$)	93,403	85,342	83,432	78,932	65,465	58,258	56,407	55,553	55,991	56,586	56,969	57,540	58,138	58,603	59,002	59,
6 Growth		-9%	-2%	-5%	-17%	-11%	-3%	-2%	1%	1%	1%	1%	1%	1%	1%	
Automotive Sales	2,462	3,321	5,613	7,051	10,025	12,720	16,685	21,595	26,347	31,357	36,897	42,022	47,949	54,283	61,221	67,9
Development Service Sales	16	40	42	44	46	49	51	54	56	59	62	65	68	72	75	_
Total Sales	2,478	3,361	5,655	7,095	10,072	12,768	16,736	21,648	26,403	31,416	36,959	42,087	48,017	54,355	61,296	68,0
6 Growth		36%	68%	25%	42%	27%	31%	29%	22%	19%	18%	14%	14%	13%	13%	
EBITDA	148	417	920	1,042	1,586	2,150	3,138	4,066	4,857	5,723	6,328	7,182	8,144	9,688	10,874	12,0
6 Margin	6.0%	12.4%	16.3%	14.7%	15.7%	16.8%	18.7%	18.8%	18.4%	18.2%	17,1%	17.1%	17.0%	17.8%	17.7%	17
8A	103	158	172	203	301	353	389	537	606	696	811	938	1,088	1,260	1,451	1,
6 of Capex	41%	79%	55%	65%	62%	69%	78%	86%	79%	77%	75%	76%	76%	76%	76%	
BIT	45	259	748	839	1,285	1,796	2,749	3,529	4,252	5,027	5,517	6,244	7,056	8,429	9,423	10,4
6 Margin	1.8%	7.7%	13.2%	11.8%	12.8%	14,1%	16.4%	16.3%	16.1%	16.0%	14.9%	14.8%	14.7%	15.5%	15.4%	1
let Interest Income (Expense)	(27)	(1)	9	33	47	90	108	155	199	278	358	445	542	651	784	1
Other Income	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
retax Income	46	258	758	872	1,332	1,886	2,857	3,684	4,451	5,305	5,875	6,688	7,598	9,080	10,207	11,2
ncome Taxes	3	2	14	34	86	262	462	641	807	1,003	1,134	1,317	1,470	1,761	2,028	2;
6 Effective Rate	6%	1%	2%	4%	6%	14%	16%	17%	18%	19%	19%	20%	19%	19%	20%	
let Income	44	256	744	839	1,246	1,624	2,395	3,043	3,644	4,303	4,741	5,372	6,128	7,319	8,179	9,0
Plus																
After-tax Interest Expense (Income)	27	1	(9)	(33)	(47)	(90)	(108)	(154)	(199)	(278)	(357)	(444)	(541)	(650)	(782)	(9
Depreciation of PP&E	103	158	172	203	301	353	389	537	606	696	811	938	1,088	1,260	1,451	1,6
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
055																
hange in Working Capital	(155)	(14)	(157)	(167)	(172)	(325)	(163)	(81)	(28)	(299)	(356)	(328)	(219)	(329)	(365)	6
6 of Change in Sales		-2%	-7%	-12%	-6%	-12%	-4%	-2%	-1%	-6%	-6%	-6%	-4%	-5%	-5%	
apital Expenditures	250	200	312	312	486	510	497	623	765	906	1,078	1,236	1,437	1,660	1,898	2,
of Sales	10%	6%	6%	4%	5%	4%	3%	3%	3%	3%	3%	3%	3%	3%	3%	_
Ither	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
inlevered Free Cash Flow	78	229	750	863	1,186	1,702	2,343	2,884	3,314	4,113	4,472	4,959	5,456	6,597	7,315	8,
					1,100		2,010	2,004	0,014	4,110	4,478			0,000	1,010	
													EBITDA			12,
													Sales			68,
													Net Debt (Cas			(
													Tesla Diluted	Shares		
xit EBITDA High							12.0 >	(	Exit PPG Hid	h	5.0%		Exit P/Sales H	lich	180%	
Exit EBITDA Low							8.0 3		Exit PPG Low		3.0%		Exit P/Sales L		130%	
													and a second		10010	

Discount R Discount R		FY Month of Valuation Month of FY End	1.0 (Beginning of this Month) 12.0 (End of this Month)	
Discontro	reage cow a.u.w	Monar of FT Eng	rate (cha or ans monar)	

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### Uber: Possible, Plausible and Probable

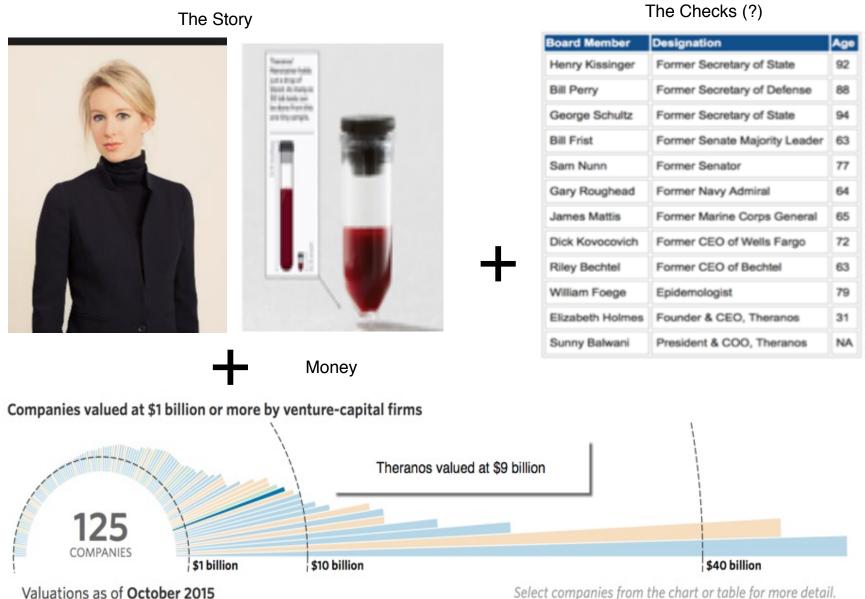
The larger & more ambitious your story, the more onus there is on you to show that it is possible, plausible & probable.



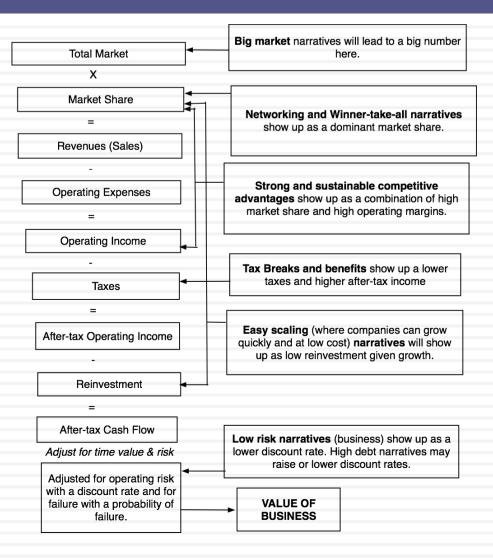
The Runaway Story: When you want a story to be true...

- 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.
  - <u>Telling a story about disrupting a much business, where you</u> <u>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.

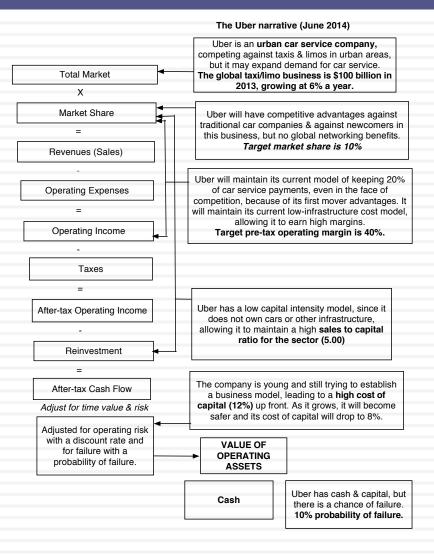
#### The Impossible: The Runaway Story



# Step 4a: Connect your narrative to key drivers of value



#### The Uber Link

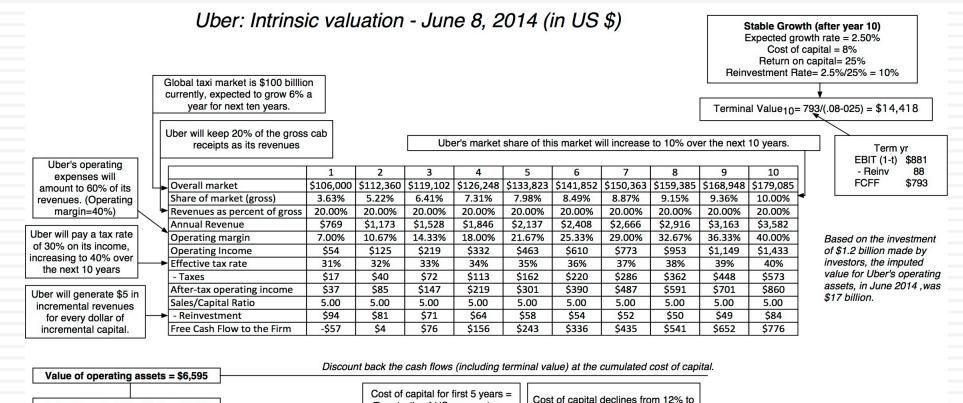


### Ferrari: From story to numbers

Valuation Input	The Story	Valuation Inputs
Revenues	Keep it scarce	Revenue growth of 4% (in Euro terms) a year for next 5 years, scaling down to
Operating Margin & Taxes		0.7% in year 10. Translates into an increase in production of about 25% in next 10 years
Operating Income	And pricey	Ferrari's pre-tax operating margin stays at 18.2%, in the 95th percentile of auto business.
Reinvestment	Little need for capacity expansion	Sales/Invested Capital stays at 1.42, i.e. every euro invested generates 1.42 euros in sales
Cash Flow		
Discount Rate (Risk)	Super-rich clients are recession-proof	Cost of capital of 6.96% in Euros and no chance of default.
V		

#### Step 4b: Value the company (Uber)





	Cost of capital for first 5 years =	
Adust for probability of failure (10%) Expected value = \$6,595 (.9) = \$5,895	Top decile of US companies = 12%	Cost of capital declines from 12 8% from years 6 to 10.

### Ferrari: The "Exclusive Club" Value

									Sta	ay Su	iper	Excl	usiv	/e: R	eve	enue ș	gro	wth is	s lov	N					ſ	High Prices + No selling
	Ba	se year		1		2		3		4		5		6		7		8		9		10	Terr	ninal year		cost =
Revenue growth rate			4.	.00%	4	.00%	4.	00%	4	.00%	4	.00%	3.	34%	2.	.68%	2.	.02%	1.	36%	0.	.70%		0.70%		Preserve
Revenues	€	2,763	€	2,874	€	2,988	€ :	3,108	€	3,232	€	3,362	€	3,474	€	3,567	€	3,639	€ 3	3,689	€	3,714	€	3,740		current operating
EBIT (Operating) margin		18.20%	18	.20%	18	8.20%	18	.20%	1	8.20%	18	8.20%	18	.20%	18	.20%	18	.20%	18	.20%	18	.20%	1	8.20%		margin
EBIT (Operating income)	€	503	€	523	€	544	€	566	€	588	€	612	€	632	€	649	€	662	€	671	€	676	€	681	ļĻ	
Tax rate		33.54%	33	.54%	33	3.54%	33	.54%	3	3.54%	33	8.54%	33	.54%	33	.54%	33	.54%	33.	.54%	33	.54%	3	33.54%		Minimal
EBIT(1-t)	€	334	€	348	€	361	€	376	(€	391	€	407	€	420	€	431	€	440	€	446	€	449	€	452		Reinvestment
- Reinvestment			€	78	€	81	€	84	€	87	€	91	€	79	€	66	€	51	€	35	€	18	€	22		due to low
FCFF			€	270	€	281	€	292	€	303	€	316	€	341	€	366	€	389	€	411	€	431	€	431		growth
Cost of capital			6.	.96%	6	.96%	6.	96%	6	6.96%	6	.96%	6.	96%	6.	.97%	6.	.98%	6.	99%	7.	.00%		7.00%		
PV(FCFF)			€	252	€	245	€	238	€	232	€	225	€	228	€	228	€	227	€	224	€	220				The super
																										rich are not
Terminal value	€	6,835																								sensitive to
PV(Terminal value)	€	3,485																								economic
PV (CF over next 10 years)	€	2,321																								downturns
Value of operating assets =	€	5,806																								
- Debt	€	623																								
- Minority interests	€	13																								
+ Cash	€	1,141																								
Value of equity	€	6,311																								

#### Step 5: Keep the feedback loop open

- When you tell a story about a company (either explicitly or implicitly), it is natural to feel attached to that story and to defend it against all attacks. Nothing can destroy an investor more than hubris.
- Being open to other views about a company is not easy, but here are some suggestions that may help:
  - **□** Face up to the uncertainty in your own estimates of value.
  - Present the valuation to people who don't think like you do.
  - Create a process where people who disagree with you the most have a say.
  - Provide a structure where the criticisms can be specific and pointed, rather than general.

#### The Uber Feedback Loop: Bill Gurley

- 25
- <u>Not just car service company.</u>: Uber is a car company, not just a car service company, and there may be a day when consumers will subscribe to a Uber service, rather than own their own cars. It could also expand into logistics, i.e., moving and transportation businesses.
- <u>Not just urban</u>: Uber can create new demands for car service in parts of the country where taxis are not used (suburbia, small towns).
- 3. <u>Global networking benefits</u>: By linking with technology and credit card companies, Uber can have global networking benefits.

### Valuing Bill Gurley's Uber narrative

	Uber (Gurley)	Uber (Gurley Mod)	Uber (Damodaran)
Narrative	Uber will expand the car service	Uber will expand the car service	Uber will expand the car service
	market substantially, bringing in	market substantially, bringing in	market moderately, primarily in
	mass transit users & non-users	mass transit users & non-users from	urban environments, and use its
	from the suburbs into the market,	the suburbs into the market, and use	<u>competitive advantages</u> to get a
	and use its <u>networking advantage</u>	its <u>networking advantage</u> to gain a	significant but not dominant
	to gain a dominant market share,	dominant market share, while	market share and maintain its
	while maintaining its revenue slice	cutting prices and margins (to 10%).	revenue slice at 20%.
	at 20%.		
Total	\$300 billion, growing at 3% a year	\$300 billion, growing at 3% a year	\$100 billion, growing at 6% a year
Market			
Market	40%	40%	10%
Share			
Uber's	20%	10%	20%
revenue			
slice			
Value for	\$53.4 billion + Option value of	\$28.7 billion + Option value of	\$5.9 billion + Option value of
Uber	entering car ownership market	entering car ownership market (\$6	entering car ownership market (\$2-
	(\$10 billion+)	billion+)	3 billion)

### Different narratives, Different Numbers

Total Market	Growth Effect	Network Effect	Competitive Advantages	Value of Uber
A4. Mobility Services	B4. Double market size	C5. Strong global network effects	D4. Strong & Sustainable	\$90,457
A3. Logistics	B4. Double market size	C5. Strong global network effects	D4. Strong & Sustainable	\$65,158
A4. Mobility Services	B3. Increase market by 50%	C3. Strong local network effects	D3. Semi-strong	\$52,346
A2. All car service	B4. Double market size	C5. Strong global network effects	D4. Strong & Sustainable	\$47,764
A1. Urban car service	B4. Double market size	C5. Strong global network effects	D4. Strong & Sustainable	\$31,952
A3. Logistics	B3. Increase market by 50%	C3. Strong local network effects	D3. Semi-strong	\$14,321
A1. Urban car service	B3. Increase market by 50%	C3. Strong local network effects	D3. Semi-strong	\$7,127
A2. All car service	B3. Increase market by 50%	C3. Strong local network effects	D3. Semi-strong	\$4,764
A4. Mobility Services	B1. None	C1. No network effects	D1. None	\$1,888
A3. Logistics	B1. None	C1. No network effects	D1. None	\$1,417
A2. All car service	B1. None	C1. No network effects	D1. None	\$1,094
A1. Urban car service	B1. None	C1. No network effects	D1. None	\$799

#### The Ferrari Counter Narrative

	Ferrari: The	Rev-it-up Option
Valuation Input	The Story	Valuation Inputs
Revenues Operating Margin & Taxes	Sales Push	Revenue growth of 12% (in Euro terms) a year for next 5 years, scaling down to 0.7% in year 10. Translates into an increase in production of about 100% in next 10 years
▼ Operating Income	With lower priced models & selling costs	Ferrari's pre-tax operating margin drops to 14.32%, in the 90th percentile of auto business.
Reinvestment	With investments in additional capacity	Sales/Invested Capital stays at 1.42, but higher sales create more reinvestment
Cash Flow		
Discount Rate (Risk)	Very rich are more sensitive to economic	Cost of capital of 8% in Euros and no chance of default
▼ Value	conditions	

## Ferrari: The "Rev-it-up" Alternative

						Ge	t le	ss ex	clu	sive:	Do	ouble	nui	mber	of	cars	so	ld ove	er r	next c	leca	de			Lower
	Ba	se year		1		2		3		4		5		6		7		8		9	1	0	Terr	ninal year	Prices + Some selling
Revenue growth rate			12	.00%	12	.00%	12	.00%	12	.00%	12	2.00%	9.	74%	7.	48%	5.	.22%	2	.96%	0.7	0%	(	0.70%	 cost = Lower
Revenues	€	2,763	€	3,095	€	3,466	€	3,882	€	4,348	€	4,869	€ :	5,344	€	5,743	€	6,043	€	6,222	€ 6	,266	€	6,309	operating
EBIT (Operating) margin		18.20%	17	.81%	17	.42%	17	.04%	16	.65%	16	5.26%	15	.87%	15	.48%	15	.10%	14	.71%	14.	32%	1	4.32%	margin
EBIT (Operating income)	€	503	€	551	€	604	€	661	€	724	€	792	€	848	€	889	€	912	€	915	€	897	€	904	
Tax rate		33.54%	33	.54%	33	.54%	33	.54%	33	.54%	33	8.54%	33	.54%	33	.54%	33	.54%	33	8.54%	33.	54%	3	3.54%	
EBIT(1-t)	€	334	€	366	€	401	€	439	€	481	€	526	€	564	€	591	€	606	€	608	€	596	€	600	Reinvestment
- Reinvestment			€	233	€	261	€	293	€	328	€	367	€	334	€	281	€	211	€	126	€	31	€	35	reflects
FCFF			€	133	€	140	€	147	€	153	€	159	€	230	€	310	€	395	€	482	€	566	€	565	higher sales
Cost of capital			8.	00%	8.	00%	8.	.00%	8.	00%	8	.00%	7.	90%	7.	80%	7.	.70%	7	.60%	7.5	0%	,	7.50%	
PV(FCFF)			€	123	€	120	€	117	€	113	€	108	€	145	€	181	€	215	€	244	€	266			The very
																									rich are
Terminal value	€	8,315																							more sensitive to
PV(Terminal value)	€	3,906																							economic
PV (CF over next 10 years)	€	1,631																							conditions
Value of operating assets =	€	5,537																							
- Debt	€	623																							
- Minority interests	€	13																							
+ Cash	€	1,141																							
Value of equity	€	6,042																							

## And the world is full of feedback.. My Ferrari afterthought!

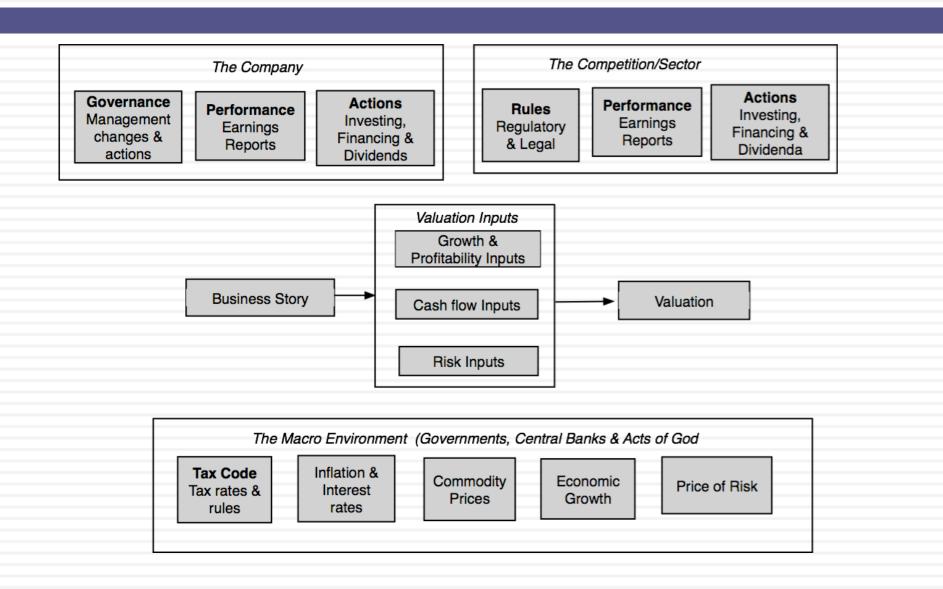


### Narrative breaks, shifts & changes

"When my information changes, I alter my conclusions. What do you do, sir?"

Lord Keynes

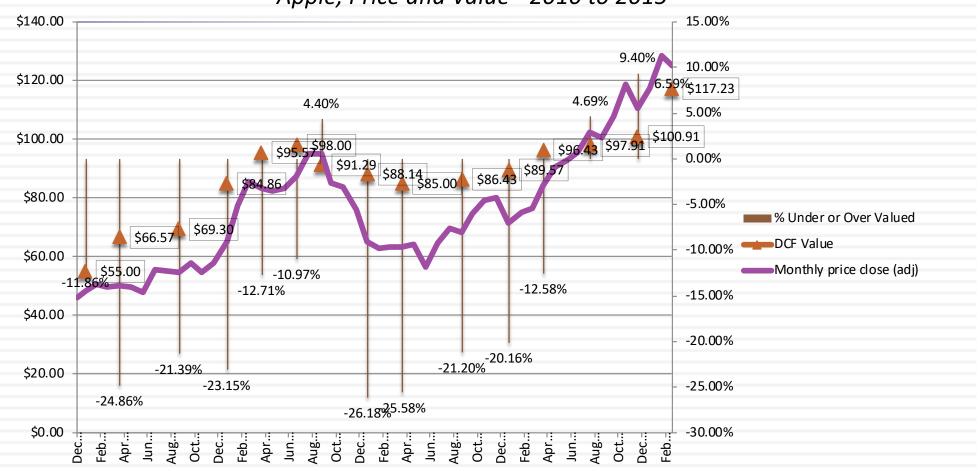
### Why narratives change



### How narratives change

Narrative Break/End	Narrative Shift	Narrative Change (Expansion or Contraction)
Events, external (legal, political or economic) or internal (management, competitive, default), that can cause the narrative to break or end.	Improvement or deterioration in initial business model, changing market size, market share and/or profitability.	Unexpected entry/success in a new market or unexpected exit/failure in an existing market.
Your valuation estimates (cash flows, risk, growth & value) are no longer operative	Your valuation estimates will have to be modified to reflect the new data about the company.	Valuation estimates have to be redone with new overall market potential and characteristics.
Estimate a probability that it will occur & consequences	Monte Carlo simulations or scenario analysis	Real Options

#### Sometimes your story does not change...



Apple, Price and Value - 2010 to 2015

# And sometimes it does.. Facebook's Evolution

Report Date	Active Users	Mobile Active Users	% of revenue from Mobile	Net Income	Capital	T12m Sales/Capital
7/26/12	955	543	NR	(\$157)	\$3,515	1.23
10/23/12	1010	604	NR	(\$59)	\$4,252	1.09
1/30/13	1060	680	23.00%	\$64	\$4,120	1.24
5/1/13	1100	751	30.00%	\$219	\$4,272	1.28
7/24/13	1150	819	41.00%	(\$152)	\$3,948	1.55
10/30/13	1190	874	49.00%	\$425	\$4,007	1.71
1/29/14	1230	945	53.00%	\$523	\$4,258	1.85
4/23/14	1280	1010	59.00%	\$642	\$4,299	2.07
7/23/14	1320	1070	62.00%	\$791	\$4,543	2.20

## The End

"There is no real ending. It's just the place where you stop the story."