MY VALUATION JOURNEY: HAVE FAITH, YOU MUST!

February 2019
Aswath Damodaran

I. Don't mistake accounting for finance

Valued based upon motive for investment – some marked to market, some recorded at cost and some at quasi-cost

Assets are recorded at original cost, adjusted for depreciation.

The Balance Sheet

Assets		Liabilities	
Long Lived Real Assets	Fixed Assets	Current Liabilties	Short-term liabilities of the firm
Short-lived Assets	Current Assets	Debt	Debt obligations of firm
Investments in securities & assets of other firms	Financial Investments	Other Liabilities	Other long-term obligations
Assets which are not physical, like patents & trademarks	Intangible Assets	Equity	Equity investment in firm

True intangible assets like brand name, patents and customer did not show up. The only intangible asset of any magnitude (goodwill) is a plug variable that is of consequence only if you do an acquisition.

Equity reflects original capital invested and historical retained earnings.

2

The financial balance sheet

Recorded at intrinsic value (based upon cash flows and risk), not at original cost

Assets		Liabilities	
Existing Investments Generate cashflows today Includes long lived (fixed) and short-lived(working capital) assets	Assets in Place	Debt	Fixed Claim on cash flows Little or No role in management *Fixed Maturity* *Tax Deductible*
Expected Value that will be created by future investments	Growth Assets	Equity	Residual Claim on cash flows Significant Role in management *Perpetual Lives*

Value will depend upon magnitude of growth investments and excess returns on these investments

Intrinsic value of equity, reflecting intrinsic value of assets, net of true value of debt outstanding.
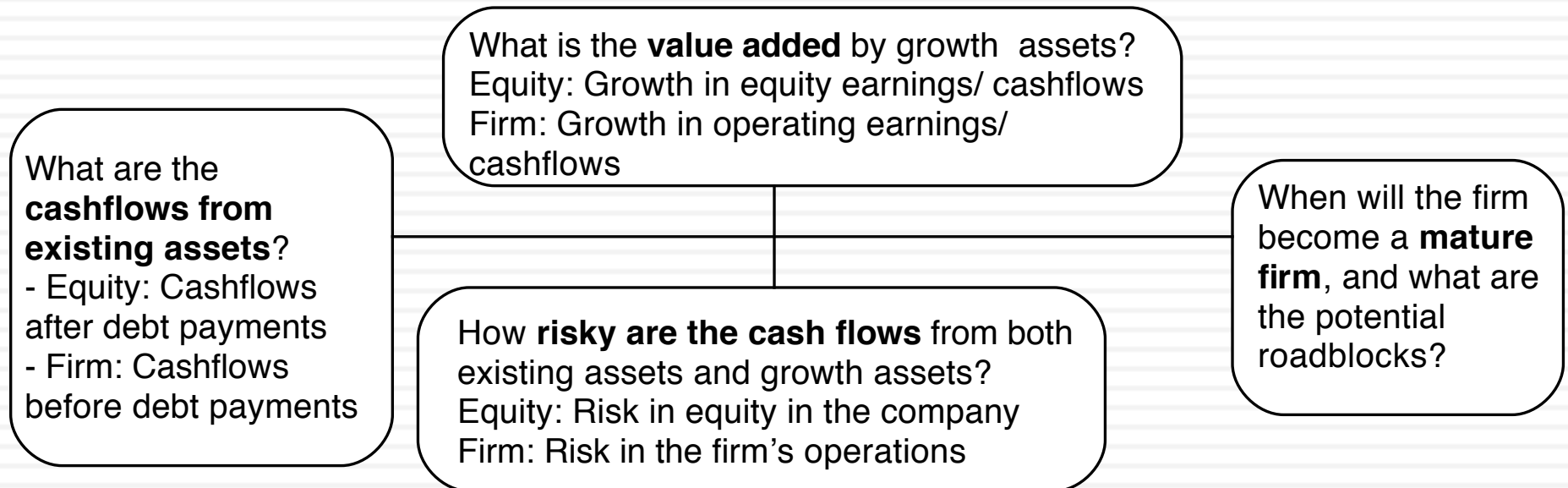
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II. Don't assume that D+CF = DCF

- The value of a risky asset can be estimated by discounting the expected cash flows on the asset over its life at a risk-adjusted discount rate:

$$\text{Value of asset} = \frac{E(CF_1)}{(1+r)} + \frac{E(CF_2)}{(1+r)^2} + \frac{E(CF_3)}{(1+r)^3} \ldots + \frac{E(CF_n)}{(1+r)^n}$$

1. *The IT Proposition*: If "it" does not affect the cash flows or alter risk (thus changing discount rates), "it" cannot affect value.

2. *The DUH Proposition*: For an asset to have value, the expected cash flows have to be positive some time over the life of the asset.

3. *The DON'T FREAK OUT Proposition*: Assets that generate cash flows early in their life will be worth more than assets that generate cash flows later; the latter may however have greater growth and higher cash flows to compensate.

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The drivers of value..

What is the **value added** by growth assets?
Equity: Growth in equity earnings/ cashflows
Firm: Growth in operating earnings/ cashflows

What are the **cashflows from existing assets**?
- Equity: Cashflows after debt payments
- Firm: Cashflows before debt payments

How **risky are the cash flows** from both existing assets and growth assets?
Equity: Risk in equity in the company
Firm: Risk in the firm's operations

When will the firm become a **mature firm**, and what are the potential roadblocks?

DCF as a tool for intrinsic valuation

Value of growth
The future cash flows will reflect expectations of how quickly earnings will grow in the future (as a positive) and how much the company will have to reinvest to generate that growth (as a negative). The net effect will determine the value of growth.
Expected Cash Flow in year t = E(CF) = Expected Earnings in year t - Reinvestment needed for growth

Cash flows from existing assets
The base earnings will reflect the earnings power of the existing assets of the firm, net of taxes and any reinvestment needed to sustain the base earnings.

$$\text{Value of asset} \ = \ \frac{E(CF_1)}{(1+r)} + \frac{E(CF_2)}{(1+r)^2} + \frac{E(CF_3)}{(1+r)^3} \ ..... + \frac{E(CF_n)}{(1+r)^n}$$

Steady state
The value of growth comes from the capacity to generate excess returns. The length of your growth period comes from the strength & sustainability of your competitive advantages.

Risk in the Cash flows
The risk in the investment is captured in the discount rate as a beta in the cost of equity and the default spread in the cost of debt.

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1. Match your cash flows to your discount rates..

Ten-year Government Bond Rates, net of Default spread (based on sovereign rating)

Legend: Risk free Rate ■ Default Spread based on rating ■

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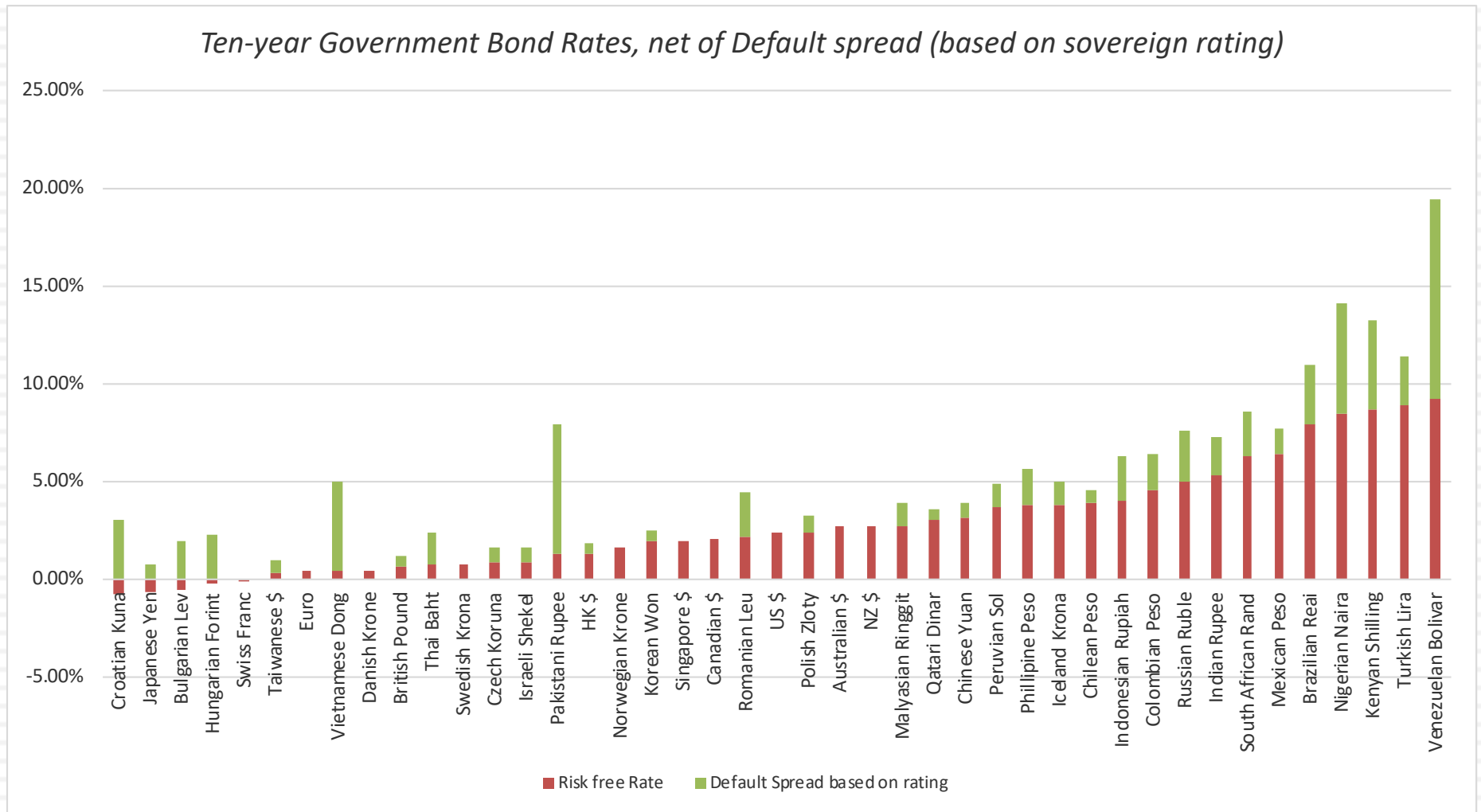
Valuing Infosys in Rupees and Dollars

	In Rupees	In Dollars
Risk free Rate	5.38%	2.85%
Expected growth rate	10.00% for next 5 years, scaling down to 5.38% in year 10 (and forever)	7.37% for next 5 years, scaling down to 2.85% in year 10 (and forever)
Return on Capital	Marginal ROIC of 39.70%, scaling down to 15% forever	Marginal ROIC of 37.68%, scaling down to 12.36% forever.
Cost of capital	11.02% for next 5 years, scaling down to 9.88% in year 10 (and beyond)	8.36% for next 5 years, scaling down to 7.23% in year 10 (and beyond)
Value per share	Rs 1072.22 per share about 7% below stock price of Rs 1,150/share	$16.86 per share about 7% below stock price of $18.02/share

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2. Risk is not in the past..

	Arithmetic Average		Geometric Average	
	Stocks - T. Bills	Stocks - T. Bonds	Stocks - T. Bills	Stocks - T. Bonds
1928-2017	8.09%	6.38%	6.26%	4.77%
Std Error	2.10%	2.24%		
1968-2017	6.58%	4.24%	5.28%	3.29%
Std Error	2.39%	2.70%		
2008-2017	9.85%	5.98%	8.01%	4.56%
Std Error	6.12%	8.70%		

- If you are going to use a historical risk premium, make it
  - Long term (because of the standard error)
  - Consistent with your risk free rate
  - A "compounded" average
- No matter which estimate you use, recognize that it is backward looking, is noisy and may reflect selection bias.

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But in the future..

Base year cash flow (last 12 mths)
Dividends (TTM):   52.25
+ Buybacks (TTM):   84.40
= Cash to investors (TTM): **136.65**

Expected cashflow growth in next 5 years
Cash flow growth = Top down analyst estimate of earnings growth for S&P 500 = 4.12%

	Last 12 months	1	2	3	4	5	Terminal Year
Expected Earnings	148.34	154.46	160.83	167.46	174.37	181.56	186.43
Expected Dividends + Buybacks =	136.65	$142.28	$148.15	$154.26	$160.62	$167.25	171.73

Earnings and Cash flows grow @2.68% (set equal to risk free rate) a year forever.

S&P 500 on 1/1/19= **2506.85**

$$2506.85 = \frac{142.28}{(1+r)} + \frac{148.15}{(1+r)^2} + \frac{154.26}{(1+r)^3} + \frac{160.62}{(1+r)^4} + \frac{167.25}{(1+r)^5} + \frac{167.25\,(1.0268)}{(r-.0268)(1+r)^5}$$

The last term in this equation is the expected index level at the end of year 5 (capturing price appreciaiton)

Solve for r

r = Implied Expected Return on Stocks = 8.64%

Minus

Risk free rate = T.Bond rate on 1/1/19= 2.68%

Equals

Implied Equity Risk Premium (1/1/19) = 8.64% - 2.68% = **5.96%**

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3. Globalization is not a buzz word

□ As companies get globalized, the valuations that we do have to reflect that globalization. In particular, we need to be wary of

  ◻ Currency mismatches: Multinationals derive their revenues in many currencies but you have to be currency-consistent.

  ◻ Beta gaming: When a company is listed in many markets, you can get very different betas, depending on how you set up and run a beta regression

  ◻ Equity Risk Premiums: The standard practice of estimating equity risk premiums based on your country of incorporation will lead to skewed valuations.

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ERP : Jan 2019

Western Europe

Country	Total ERP	CRP	Country	Total ERP	CRP
Andorra	8.60%	2.64%	Italy	9.02%	3.06%
Austria	6.51%	0.55%	Jersey (States of)	6.80%	0.84%
Belgium	6.80%	0.84%	Liechtenstein	5.96%	0.00%
Cyprus	10.13%	4.17%	Luxembourg	5.96%	0.00%
Denmark	5.96%	0.00%	Malta	7.63%	1.67%
Finland	6.51%	0.55%	Netherlands	5.96%	0.00%
France	6.65%	0.69%	Norway	5.96%	0.00%
Germany	5.96%	0.00%	Portugal	9.02%	3.06%
Greece	14.99%	9.03%	Spain	8.18%	2.22%
Guernsey (States of)	6.80%	0.84%	Sweden	5.96%	0.00%
Iceland	7.63%	1.67%	Switzerland	5.96%	0.00%
Ireland	7.14%	1.18%	Turkey	10.96%	5.00%
Isle of Man	6.65%	0.69%	United Kingdom	6.65%	0.69%
			Western Europe	**7.11%**	**1.15%**

North America

	Total ERP	CRP
Canada	5.96%	0.00%
United States	5.96%	0.00%
North America	**5.96%**	**0.00%**

	Total ERP	CRP
Caribbean	**13.61%**	**7.65%**

Central and South America

	Total ERP	CRP
Argentina	13.60%	7.64%
Belize	14.99%	9.03%
Bolivia	10.96%	5.00%
Brazil	10.13%	4.17%
Chile	6.94%	0.98%
Colombia	8.60%	2.64%
Costa Rica	12.21%	6.25%
Ecuador	14.99%	9.03%
El Salvador	16.37%	10.41%
Guatemala	9.43%	3.47%
Honduras	12.21%	6.25%
Mexico	7.63%	1.67%
Nicaragua	13.60%	7.64%
Panama	8.60%	2.64%
Paraguay	9.43%	3.47%
Peru	7.63%	1.67%
Suriname	13.60%	7.64%
Uruguay	8.60%	2.64%
Venezuela	28.10%	22.14%
Central and South America	**10.61%**	**4.65%**

Africa

	Total ERP	CRP
Angola	14.99%	9.03%
Benin	12.21%	6.25%
Botswana	7.14%	1.18%
Burkina Faso	13.60%	7.64%
Cameroon	13.60%	7.64%
Cape Verde	13.60%	7.64%
Congo (DR)	14.99%	9.03%
Congo (Rep)	18.46%	12.50%
Côte d'Ivoire	10.96%	5.00%
Egypt	14.99%	9.03%
Ethiopia	12.21%	6.25%
Gabon	16.37%	10.41%
Ghana	14.99%	9.03%
Kenya	13.60%	7.64%
Morocco	9.43%	3.47%
Mozambique	19.83%	13.87%
Namibia	9.43%	3.47%
Nigeria	13.60%	7.64%
Rwanda	13.60%	7.64%
Senegal	10.96%	5.00%
South Africa	9.02%	3.06%
Swaziland	13.60%	7.64%
Tanzania	12.21%	6.25%
Tunisia	13.60%	7.64%
Uganda	13.60%	7.64%
Zambia	16.37%	10.41%
Africa	**12.63%**	**6.67%**

Eastern Europe & Russia

	Total ERP	CRP
Albania	12.21%	6.25%
Armenia	12.21%	6.25%
Azerbaijan	10.13%	4.17%
Belarus	14.99%	9.03%
Bosnia and Herzegovina	14.99%	9.03%
Bulgaria	8.60%	2.64%
Croatia	10.13%	4.17%
Czech Republic	6.94%	0.98%
Estonia	6.94%	0.98%
Georgia	10.13%	4.17%
Hungary	9.02%	3.06%
Kazakhstan	9.02%	3.06%
Kyrgyzstan	13.60%	7.64%
Latvia	7.63%	1.67%
Lithuania	7.63%	1.67%
Macedonia	10.96%	5.00%
Moldova	14.99%	9.03%
Montenegro	12.21%	6.25%
Poland	7.14%	1.18%
Romania	9.02%	3.06%
Russia	9.43%	3.47%
Serbia	10.96%	5.00%
Slovakia	7.14%	1.18%
Slovenia	8.18%	2.22%
Tajikistan	9.43%	3.47%
Ukraine	18.46%	12.50%
Eastern Europe & Russia	**9.24%**	**3.28%**

Middle East

	Total ERP	CRP
Abu Dhabi	6.65%	0.69%
Bahrain	13.60%	7.64%
Iraq	16.37%	10.41%
Israel	6.94%	0.98%
Jordan	12.21%	6.25%
Kuwait	6.65%	0.69%
Lebanon	14.99%	9.03%
Oman	9.02%	3.06%
Qatar	6.80%	0.84%
Ras Al Khaimah (Emirate of)	7.14%	1.18%
Saudi Arabia	6.94%	0.98%
Sharjah	7.63%	1.67%
United Arab Emirates	6.65%	0.69%
Middle East	**7.96%**	**2.00%**

Africa (PRS table)

Country	PRS	ERP	CRP	Country	PRS	ERP	CRP
Algeria	65	13.60%	7.64%	Malawi	61	16.37%	10.41%
Brunei	80.5	6.94%	0.98%	Mali	61.3	16.37%	10.41%
Gambia	63.3	14.99%	9.03%	Myanmar	62	16.37%	10.41%
Guinea	54.3	22.61%	16.65%	Niger	54.5	22.61%	16.65%
Guinea-Bissau	62	16.37%	10.41%	Sierra Leone	54.8	22.61%	16.65%
Guyana	66.5	12.21%	6.25%	Somalia	53.5	22.61%	16.65%
Haiti	60	18.46%	12.50%	Sudan	38.8	28.10%	22.14%
Iran	69.3	10.13%	4.17%	Syria	51.8	22.61%	16.65%
Korea, D.P.R.	53	22.61%	16.65%	Togo	61	16.37%	10.41%
Liberia	53.5	22.61%	16.65%	Yemen, Republic	48	28.10%	22.14%
Libya	66.5	12.21%	6.25%	Zimbabwe	59.3	18.46%	12.50%
Madagascar	64	14.99%	9.03%				

Asia

	Total ERP	CRP
Bangladesh	10.96%	5.00%
Cambodia	13.60%	7.64%
China	6.94%	0.98%
Fiji	10.96%	5.00%
Hong Kong	6.65%	0.69%
India	8.60%	2.64%
Indonesia	8.60%	2.64%
Japan	6.94%	0.98%
Korea	6.65%	0.69%
Macao	6.80%	0.84%
Malaysia	7.63%	1.67%
Maldives	13.60%	7.64%
Mauritius	8.18%	2.22%
Mongolia	14.99%	9.03%
Pakistan	14.99%	9.03%
Papua New Guinea	13.60%	7.64%
Philippines	8.60%	2.64%
Singapore	5.96%	0.00%
Solomon Islands	14.99%	9.03%
Sri Lanka	12.21%	6.25%
Taiwan	8.18%	2.22%
Thailand	8.18%	2.22%
Vietnam	10.96%	5.00%
Asia	**7.43%**	**1.47%**

Australia & New Zealand

	Total ERP	CRP
Australia	5.96%	0.00%
Cook Islands	12.21%	6.25%
New Zealand	5.96%	0.00%
Australia & New Zealand	**5.96%**	**0.00%**

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

And your country risk exposure comes from where you operate, not where you incorporate!

Region	Revenues	ERP	Weight	Weighted ERP
North America	₹ 42,408	5.08%	62.01%	3.1499%
Europe	₹ 15,302	6.01%	22.37%	1.3437%
Rest of the World	₹ 8,504	6.21%	12.43%	0.7721%
India	₹ 2,180	7.27%	3.19%	0.2317%
Total	₹ 68,394		100.00%	5.4974%

1. By focusing on revenues, are we misestimating country risk exposure?
2. As the company looks to grow in Latin America and Asia, how do you see this premium evolving?
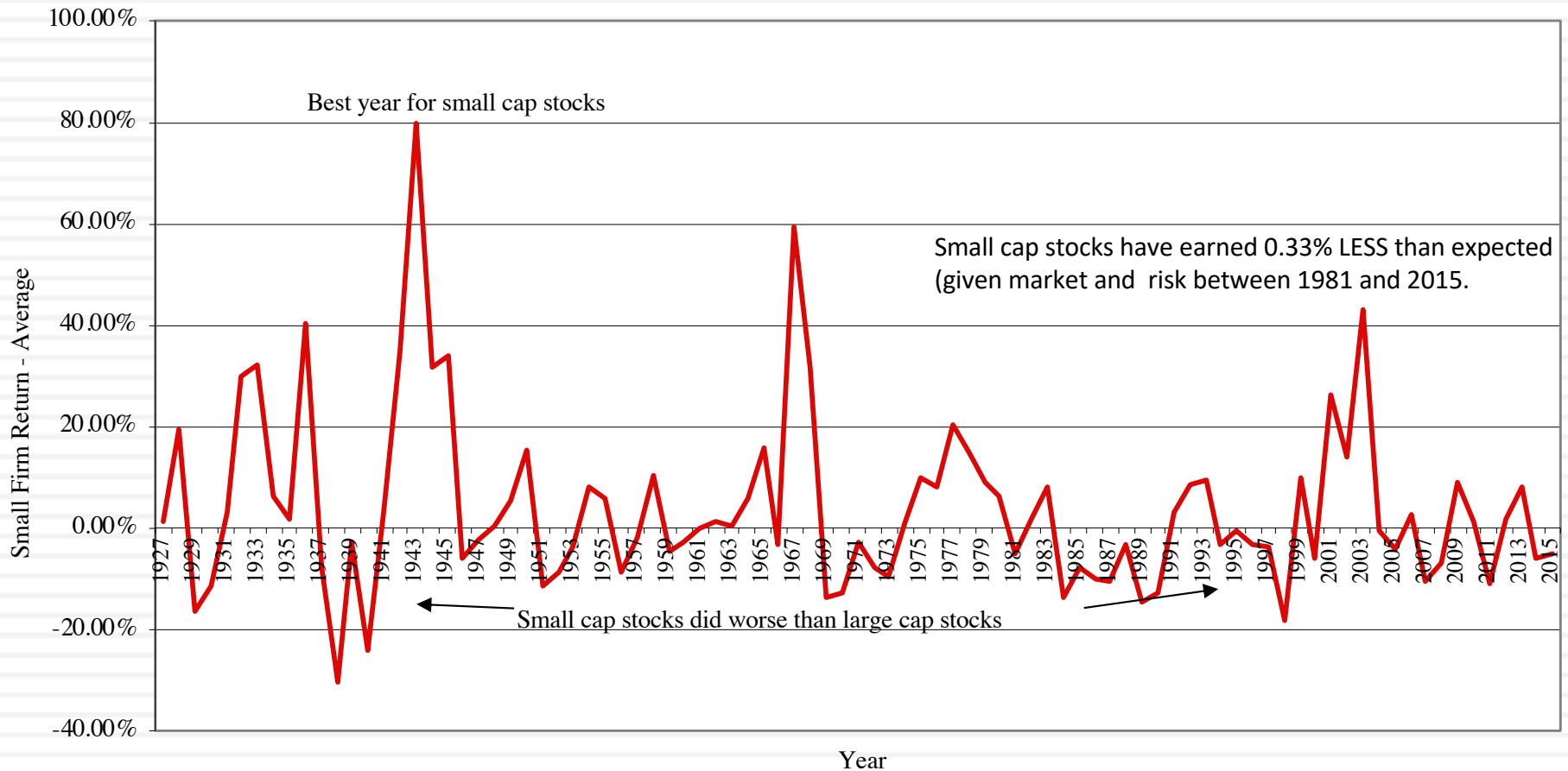
Shell: Equity Risk Premium- March 2016

Country	Oil & Gas Production	% of Total	ERP
Denmark	17396	3.83%	6.20%
Italy	11179	2.46%	9.14%
Norway	14337	3.16%	6.20%
UK	20762	4.57%	6.81%
Rest of Europe	*874*	*0.19%*	*7.40%*
Brunei	823	0.18%	9.04%
Iraq	20009	4.40%	11.37%
Malaysia	22980	5.06%	8.05%
Oman	78404	17.26%	7.29%
Russia	22016	4.85%	10.06%
Rest of Asia & ME	*24480*	*5.39%*	*7.74%*
Oceania	*7858*	*1.73%*	*6.20%*
Gabon	12472	2.75%	11.76%
Nigeria	67832	14.93%	11.76%
Rest of Africa	6159	1.36%	12.17%
USA	104263	22.95%	6.20%
Canada	8599	1.89%	6.20%
Brazil	13307	2.93%	9.60%
Rest of Latin America	*576*	*0.13%*	*10.78%*
Royal Dutch Shell	**454326**	**100.00%**	**8.26%**

4. Everyone may do it, but that does not make it right.. The small cap premium

Figure 4: Small Firm Premium over time- 1927 -2015

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5. Don't let your inputs be at war with each other..

Growth

Is your risk reflective of how much, how & where you are growing?

Are you reinvesting enough, given your growth rate?

Value

Risk

Reinvestment

Is your risk consistent with your reinvestment strategy?

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

	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 2028
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	1,137,780
% Growth		52%	75%	34%	73%	43%	36%	32%	21%	18%	17%	13%	13%	12%	12%	10%
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	59,554
% Growth		-9%	-2%	-5%	-17%	-11%	-3%	-2%	1%	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	67,980
Development Service Sales	16	40	42	44	46	49	51	54	56	59	62	65	68	72	75	79
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**	**68,059**
% Growth		36%	68%	25%	42%	27%	31%	29%	22%	19%	18%	14%	14%	13%	13%	11%
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	12,099
% 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%	17.8%
D&A	103	158	172	203	301	353	389	537	606	696	811	938	1,088	1,260	1,451	1,661
% of Capex	41%	79%	55%	65%	62%	69%	78%	86%	79%	77%	75%	76%	76%	76%	76%	77%
EBIT	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	10,439
% 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%	15.3%
Net Interest Income (Expense)	(27)	(1)	9	33	47	90	108	155	199	278	358	445	542	651	784	934
Other Income	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pretax 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	11,373
Income Taxes	3	2	14	34	86	262	462	641	807	1,003	1,134	1,317	1,470	1,761	2,028	2,323
% Effective Rate	6%	1%	2%	4%	6%	14%	16%	17%	18%	19%	19%	20%	19%	19%	20%	20%
Net 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	9,050
Plus																
After-tax Interest Expense (Income)	27	1	(9)	(33)	(47)	(90)	(108)	(154)	(199)	(278)	(357)	(444)	(541)	(650)	(782)	(932)
Depreciation of PP&E	103	158	172	203	301	353	389	537	606	696	811	938	1,088	1,260	1,451	1,661
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Less																
Change in Working Capital	(155)	(14)	(157)	(167)	(172)	(325)	(163)	(81)	(28)	(299)	(356)	(328)	(219)	(329)	(365)	(376)
% of Change in Sales		-2%	-7%	-12%	-6%	-12%	-4%	-2%	-1%	-6%	-6%	-6%	-4%	-5%	-5%	-6%
Capital Expenditures	250	200	312	312	486	510	497	623	765	906	1,078	1,236	1,437	1,660	1,898	2,149
% of Sales	10%	6%	6%	4%	5%	4%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unlevered 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**	**8,005**

EBITDA	12,099
Sales	68,059
Net Debt (Cash)	(260)
Tesla Diluted Shares	142

Exit EBITDA High	12.0 x	Exit PPG High	5.0%	Exit P/Sales High	180%
Exit EBITDA Low	8.0 x	Exit PPG Low	3.0%	Exit P/Sales Low	130%

Discount Rate High	13.0%	FY Month of Valuation	1.0 (Beginning of this Month)
Discount Rage Low	9.0%	Month of FY End	12.0 (End of this Month)

And consider the trade offs..

Excess Returns (ROIC - Cost of Capital) Globally - January 2019 update

Region	ROIC < WACC	ROIC=WACC	ROIC > WACC
Africa and Middle East	58.83%	13.09%	28.08%
Australia & NZ	66.89%	8.26%	24.85%
Canada	80.35%	6.36%	13.29%
China	51.13%	14.96%	33.91%
Eastern Europe & Russia	60.57%	14.25%	25.18%
EU & Environs	53.27%	12.73%	34.00%
India	55.94%	11.44%	32.62%
Japan	46.18%	19.35%	34.47%
Latin America & Caribbean	53.43%	17.59%	28.98%
Small Asia	69.39%	9.99%	20.62%
UK	49.31%	11.20%	39.50%
United States	57.73%	10.47%	31.80%
Grand Total	58.79%	12.30%	28.91%

Aswath Damodaran

6. Don't sweat the small stuff

Cost of Capital Distribution- January 2019

Broad Group	1st Decile	1st Quartile	Median	3rd Quartile	9th Decile
Aus, NZ and Canada	6.11%	8.14%	9.59%	10.06%	10.45%
Developed Europe	6.07%	7.16%	9.01%	10.53%	12.01%
Emerging Markets	6.85%	8.27%	10.23%	12.24%	14.43%
Japan	6.47%	7.20%	8.87%	10.26%	11.31%
United States	5.25%	6.58%	8.84%	9.97%	10.86%
Global	6.23%	7.79%	9.53%	10.93%	13.23%

Aswath Damodaran

7. Don't let your terminal value run away with your valuation

- In the terminal value equation, the growth seems to be the magic input, the key driver of value.

$$Terminal\ Value_n = \frac{Free\ Cash\ Flow_{n+1}}{(r - g)}$$

- Since that growth rate has to be maintained in perpetuity, it cannot exceed the growth rate of the economy in which you operate:
  - If your valuation is in nominal terms, it is the nominal growth rate of the economy. If it is is real terms, it is the real growth rate.
  - If your company is purely domestic, it is the growth rate of the domestic economy. If it is global, it is the global economy.

Aswath Damodaran

My Simple Proxy: The Risk free Rate

- I use a <u>simpler and more easily observable number as a cap on stable growth: the risk free rate that I have used in the valuation</u>. This take into account the currency automatically (since higher inflation currencies have higher risk free rates) and it is not unreasonable to argue that it is a good proxy for the nominal growth rate in the economy.

- There are three reasons I do it:

    - The best predictor nominal growth in the US economy at the start of every decade has been the US treasury bond rate at the time.

    - It preserves consistency. If you believe, as many have, that the risk free rate is too low in US $ or Euros, it compensates for the resulting too-low cost of capital by also capping the growth rate at the same number (at least in terminal value).

    - It puts a control on my biases.

A Consistent Version of Terminal Value

- The terminal value equation can be restated:

$$\text{Terminal Value in year n} = \frac{\text{EBIT}_{n+1} \ (1-t)(1-\frac{g}{\text{ROC}})}{(\text{Cost of Capital} - g)}$$

Terminal Value for a firm with $100 million in after-tax operating income & cost of capital = 10% (for different g and ROIC)

		Return on capital in perpetuity				
		6%	8%	10%	12%	14%
Growth rate forever	0.00%	$1,000	$1,000	$1,000	$1,000	$1,000
	0.50%	$965	$987	$1,000	$1,009	$1,015
	1.00%	$926	$972	$1,000	$1,019	$1,032
	1.50%	$882	$956	$1,000	$1,029	$1,050
	2.00%	$833	$938	$1,000	$1,042	$1,071
	2.50%	$778	$917	$1,000	$1,056	$1,095
	3.00%	$714	$893	$1,000	$1,071	$1,122

8. Don't let your macro views drown out your micro views..

- When you are asked to value a company, you should keep your focus on what drives that value. If you bring in your specific macro views into the valuation, the value that you obtain for a company will be a joint result of what you think about the company and your macro views.

- **Bottom line**: If you have macro views, provide them separately. You should be as macro-neutral as you can be, in your company valuations.

- **Follow up**: If you find macro risk dominating your thoughts, deal with it frontally.

Aswath Damodaran

The biggest driver for Shell (and no surprise) is..

Shell: Revenues vs Oil Price

Revenues = 39,992.77 + 4,039.39 * Average Oil Price
R squared = 96.44%
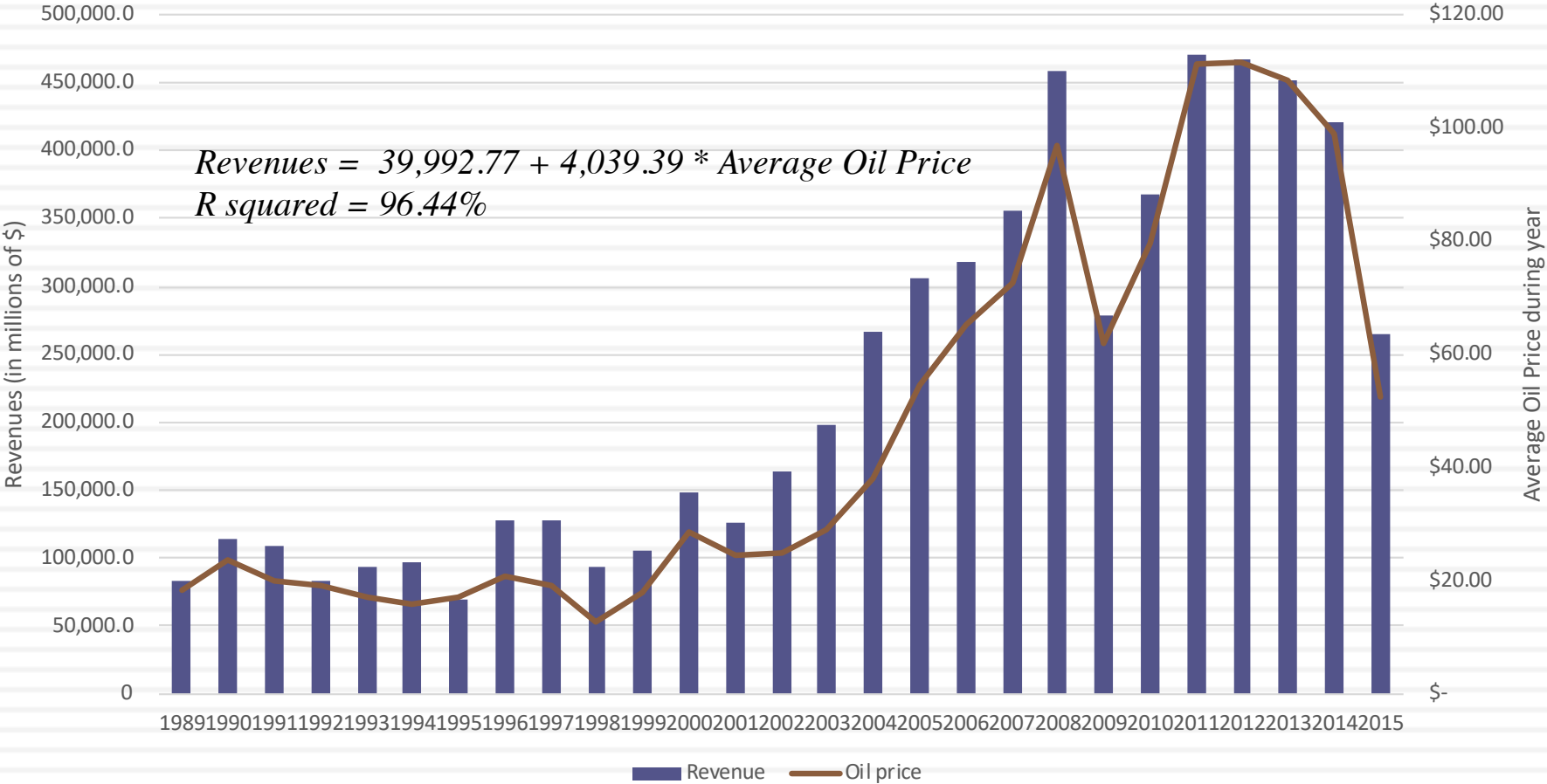
Valuing Shell at April 2016 oil price ($40)

Revenue calculated from prevailing oil price of $40/barrel in March 2016
Revenue = 39992.77+4039.40*$40
= $201,569

Compounded revenue growth of 3.91% a year, based on Shell's historical revenue growth rate from 2000 to 2015

	Base Year	1	2	3	4	5	Terminal Year
Revenues	$ 201,569	$ 209,450	$ 217,639	$ 226,149	$ 234,991	$ 244,180	$ 249,063
Operating Margin	3.01%	6.18%	7.76%	8.56%	8.95%	9.35%	9.35%
Operating Income	$ 6,065.00	$ 12,942.85	$ 16,899.10	$ 19,352.39	$ 21,040.39	$ 22,830.80	$ 23,287.41
Effective tax rate	30.00%	30.00%	30.00%	30.00%	30.00%	30.00%	30.00%
AT Operating Income	$ 4,245.50	$ 9,060.00	$ 11,829.37	$ 13,546.68	$ 14,728.27	$ 15,981.56	$ 16,301.19
+ Depreciation	$ 26,714.00	$ 27,759	$ 28,844	$ 29,972	$ 31,144	$ 32,361	
- Cap Ex	$ 31,854.00	$ 33,099	$ 34,394	$ 35,738	$ 37,136	$ 38,588	
- Chg in WC		$ 472.88	$ 491.37	$ 510.58	$ 530.55	$ 551.29	
FCFF		$ 3,246.14	$ 5,788.19	$ 7,269.29	$ 8,205.44	$ 9,203.68	$ 13,011.34
Terminal Value						$ 216,855.71	
Return on capital							12.37%
Cost of Capital		9.91%	9.91%	9.91%	9.91%	9.91%	8.00%
Cumulated Discount Factor		1.0991	1.2080	1.3277	1.4593	1.6039	
Present Value		$ 2,953.45	$ 4,791.47	$ 5,474.95	$ 5,622.81	$ 140,940.73	
Value of Operating Assets	$ 159,783.41						
+ Cash	$ 31,752.00						
+ Cross Holdings	$ 33,566.00						
- Debt	$ 58,379.00						
- Minority Interets	$ 1,245.00						
Value of Equity	$ 165,477.41						
Number of shares	4209.7						
Value per share	$ 39.31						

Operating margin converges on Shell's historical average margin of 9.35% from 200-2015

Return on capital reverts and stays at Shell's historic average of 12.37% from 200-2015

Added long term investments in joint ventures and subtracted out minority interest in consolidated holdings.

Infosys: March 2018 (in Rupees)

Cash flows from existing assets

	LTM	2011-2017	Industry (US data)
Revenue growth =	3.28%	14.22%	15.31%
Pre-tax operating margin =	24.29%	26.16%	8.35%
Sales to capital ratio =	1.81	2.50	3.69
Return on invested capital =	31.57%	47.80%	27.96%

The Payoff from growth

Revenues will grow 10% a year for next 5 years, tapering down to 5.38% growth in year 10

Operatng margin (per-tax) will continue to decline from 24.29% to 23%

Sales/Invested Capital will stay at ten-year average of 1.81

Maturty and Closure

Stable Growth
g = 5.38%;
Cost of capital = 9.88%
ROC= 15%;
Reinvestment Rate=g/ROC
= 5.83%/15.00%= 35.87%

Terminal Value = 169,632/(.0988-..0538) = 3,769,597

Rupee Cashflows

	PV
PV(Terminal value)	₹ 1,366,411
PV (CF over next 10 years)	₹ 790,711
Value of operating assets =	₹ 2,157,122
- Debt	₹ -
- Minority interests	₹ -
+ Cash	₹ 230,727
+ Non-operating assets	₹ 61,081
Value of equity	₹ 2,448,930
- Value of options	₹ 945
Value of equity in common stock	₹ 2,447,985
Number of shares	₹ 2,283
Estimated value /share	**₹ 1,072.22**

	Base year	1	2	3	4	5	6	7	8	9	10	Terminal year
Revenue growth rate		10.00%	10.00%	10.00%	10.00%	10.00%	9.08%	8.15%	7.23%	6.30%	5.38%	5.38%
Revenues	₹ 683,119	₹ 751,431	₹ 826,574	₹ 909,231	₹ 1,000,155	₹ 1,100,170	₹ 1,200,021	₹ 1,297,847	₹ 1,391,656	₹ 1,479,386	₹ 1,558,976	₹ 1,642,849
EBIT (Operating) margin	24.29%	24.16%	24.03%	23.90%	23.78%	23.65%	23.52%	23.39%	23.26%	23.13%	23.00%	23.00%
EBIT (Operating income)	₹ 165,945	₹ 181,568	₹ 198,657	₹ 217,348	₹ 237,790	₹ 260,148	₹ 282,208	₹ 303,536	₹ 323,678	₹ 342,170	₹ 358,565	₹ 377,855
Tax rate	28.00%	28.00%	28.00%	28.00%	28.00%	28.00%	28.40%	28.80%	29.20%	29.60%	30.00%	30.00%
EBIT(1-t)	₹ 119,480	₹ 130,729	₹ 143,033	₹ 156,491	₹ 171,209	₹ 187,306	₹ 202,061	₹ 216,118	₹ 229,164	₹ 240,888	₹ 250,995	₹ 264,499
- Reinvestment		₹ 37,842	₹ 41,626	₹ 45,789	₹ 50,368	₹ 55,404	₹ 55,313	₹ 54,191	₹ 51,966	₹ 48,599	₹ 44,090	₹ 94,867
FCFF		₹ 92,887	₹ 101,407	₹ 110,702	₹ 120,841	₹ 131,902	₹ 146,747	₹ 161,927	₹ 177,198	₹ 192,289	₹ 206,905	₹ 169,632
Cost of capital		11.02%	11.02%	11.02%	11.02%	11.02%	10.80%	10.57%	10.34%	10.11%	9.88%	
Cumulated discount factor		0.9007	0.8113	0.7307	0.6581	0.5928	0.5350	0.4839	0.4386	0.3983	0.3625	
PV(FCFF)		₹ 83,664	₹ 82,268	₹ 80,890	₹ 79,531	₹ 78,190	₹ 78,514	₹ 78,356	₹ 77,712	₹ 76,588	₹ 74,999	

Discount at Rs Cost of Capital (WACC) = 11.02% (.100) = 11.02%

The Risk in the Cash flows

On March 27, 2018, Infosys was trading at Rs 1150/ share

Cost of Equity 11.02%

Cost of Debt NO DEBT

Weights E = 100% D = 0%

Riskfree Rate:
Rupee Risk free Rate =
7.33% - 1.95% = 5.38%

+

Beta = 1.03

X

Firm's D/E Ratio: 0%

Business	Revenues	EV/Sales	Estimated Value	Value Weight	Unlevered Beta
Computer Software	₹ 2,101	6.3640	₹ 13,371	13.51%	1.1114
Computer Services	₹ 66,383	1.2899	₹ 85,630	86.49%	1.0136
Company	**₹ 68,484**		**₹ 99,001**		**1.0268**

ERP = 5.50%				
Region	Revenues	ERP	Weight	Weighted ERP
North America	₹ 42,408	5.08%	62.01%	3.1499%
Europe	₹ 15,302	6.01%	22.37%	1.3437%
Rest of the World	₹ 8,504	6.21%	12.43%	0.7721%
India	₹ 2,180	7.27%	3.19%	0.2317%
Total	**₹ 68,394**		**100.00%**	**5.4974%**

Aswath D...

The **Chimera DCF** mixes dollar cash flows with peso discount rates, nominal cash flows with real costs of capital and cash flows before debt payments with costs of equity, violating basic consistency rules

In a **Trojan Horse DCF**, Just as the Greeks used a wooden horse to smuggle soldiers into Troy, analysts use the Trojan Horse of cash flows to smuggle in a pricing (in the form of a terminal value, estimated by using a multiple).

In a **Dreamstate DCF**, you build amazing companies on spreadsheets, making outlandish assumptions about growth and operating margins over time.

$$D+CF \neq DCF$$

A **Kabuki DCF** is a work of art, where analyst and rule maker (or court) go through the motions of valuation, with the intent of developing models that are legally or accounting-rule defensible rather than yielding reasonable values.

In a **Robo DCF**, the analyst builds a valuation almost entirely from the most recent financial statements and automated forecasts.

In a **Dissonant DCF**, assumptions about growth, risk and cash flows are not consistent with each other, with little or no explanation given for the mismatch.

A **Mutant DCF** is a collection of numbers where items have familiar names (free cash flow, cost of capital) but the analyst putting it together has neither a narrative nor a sense of the basic principles of

III. Don't mistake modeling for valuation

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

From story to numbers and beyond..

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. Keep it simple & focused.

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. No fairy tales or runaway stories.

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 Zero: 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

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.	**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.

Uber App (between The drivers and The customers)

Convenience, comfort and /or cost savings, relative to traditional cab

Pricing & payment
Fare quotes, based on distance, car type & demand period → 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

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

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

Reinvest to grow
Should be kept low because Uber does not invest in cars or other expensive infrastructure. → 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 1: 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

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 2: 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

35
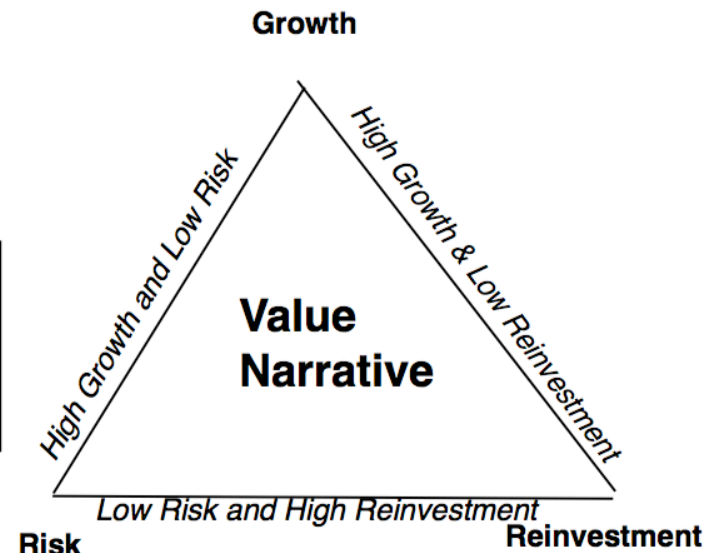
Uber: Possible, Plausible and Probable

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
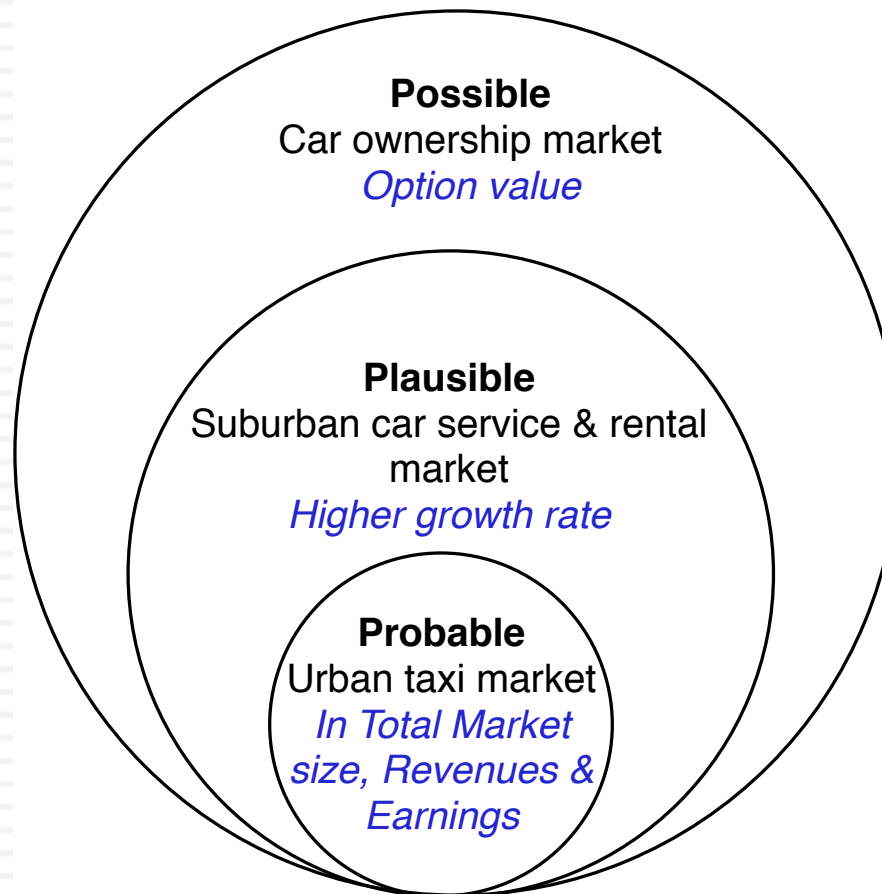
The Impossible: The Runaway Story

The Story
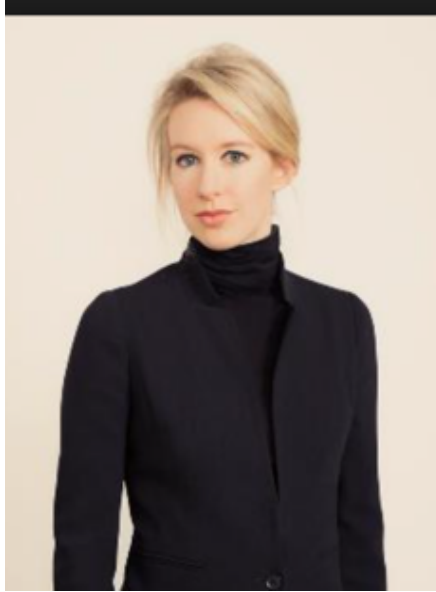
The Checks (?)

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.

Step 3: Connect your narrative to key drivers of value

The Uber narrative (June 2014)

Total Market	Uber is an **urban car service company**, competing against taxis & limos in urban areas, but it may expand demand for car service. **The global taxi/limo business is $100 billion in 2013, growing at 6% a year.**
X	
Market Share	Uber will have competitive advantages against traditional car companies & against newcomers in this business, but no global networking benefits. **Target market share is 10%**
=	
Revenues (Sales)	
-	
Operating Expenses	Uber will maintain its current model of keeping 20% of car service payments, even in the face of competition, because of its first mover advantages. It will maintain its current low-infrastructure cost model, allowing it to earn high margins. **Target pre-tax operating margin is 40%.**
=	
Operating Income	
-	
Taxes	
=	
After-tax Operating Income	Uber has a low capital intensity model, since it does not own cars or other infrastructure, allowing it to maintain a high **sales to capital ratio for the sector (5.00)**
-	
Reinvestment	
=	
After-tax Cash Flow	The company is young and still trying to establish a business model, leading to a **high cost of capital (12%)** up front. As it grows, it will become safer and its cost of capital will drop to 8%.

Adjust for time value & risk

Adjusted for operating risk with a discount rate and for failure with a probability of failure.	→ **VALUE OF OPERATING ASSETS**
Cash	Uber has cash & capital, but there is a chance of failure. **10% probability of failure.**

Step 4: Value the company (Uber)

Uber: Intrinsic valuation - June 8, 2014 (in US $)

Stable Growth (after year 10)
Expected growth rate = 2.50%
Cost of capital = 8%
Return on capital= 25%
Reinvestment Rate= 2.5%/25% = 10%

Terminal Value$_{10}$= 793/(.08-025) = $14,418

Global taxi market is $100 billion currently, expected to grow 6% a year for next ten years.

Uber will keep 20% of the gross cab receipts as its revenues

Uber's market share of this market will increase to 10% over the next 10 years.

Term yr
EBIT (1-t) $881
- Reinv   88
FCFF $793

Uber's operating expenses will amount to 60% of its revenues. (Operating margin=40%)

Uber will pay a tax rate of 30% on its income, increasing to 40% over the next 10 years

Uber will generate $5 in incremental revenues for every dollar of incremental capital.

	1	2	3	4	5	6	7	8	9	10
Overall market	$106,000	$112,360	$119,102	$126,248	$133,823	$141,852	$150,363	$159,385	$168,948	$179,085
Share of market (gross)	3.63%	5.22%	6.41%	7.31%	7.98%	8.49%	8.87%	9.15%	9.36%	10.00%
Revenues as percent of gross	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%
Annual Revenue	$769	$1,173	$1,528	$1,846	$2,137	$2,408	$2,666	$2,916	$3,163	$3,582
Operating margin	7.00%	10.67%	14.33%	18.00%	21.67%	25.33%	29.00%	32.67%	36.33%	40.00%
Operating Income	$54	$125	$219	$332	$463	$610	$773	$953	$1,149	$1,433
Effective tax rate	31%	32%	33%	34%	35%	36%	37%	38%	39%	40%
- Taxes	$17	$40	$72	$113	$162	$220	$286	$362	$448	$573
After-tax operating income	$37	$85	$147	$219	$301	$390	$487	$591	$701	$860
Sales/Capital Ratio	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
- Reinvestment	$94	$81	$71	$64	$58	$54	$52	$50	$49	$84
Free Cash Flow to the Firm	-$57	$4	$76	$156	$243	$336	$435	$541	$652	$776

Based on the investment of $1.2 billion made by investors, the imputed value for Uber's operating assets, in June 2014 ,was $17 billion.

Discount back the cash flows (including terminal value) at the cumulated cost of capital.

Value of operating assets = $6,595

Adust for probability of failure (10%)
Expected value = $6,595 (.9) = $5,895

Cost of capital for first 5 years = Top decile of US companies = 12%

Cost of capital declines from 12% to 8% from years 6 to 10.

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 Gurley Pushback

1. <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.

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

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

Aswath Damodaran

Uber: Personal Mobility Player?

Uber is primarily a ride sharing company, with ambtions of being a global logistics player. Its revenue growth has been astonishing, though it is starting to slow, but it remains a big money loser, as it searches for a business model that delivers more stickiness. In this story, Uber uses a combination of economies of scale and a more capital intensive business model to create a pathway to profitability. Along the way, it will become a less risky company, though its losses leave it exposed to a 5% chance of failure.

The Assumptions

	Base year	Years 1-5	Years 6-10	After year 10	Story link
Total Market	$400,000	Grow 10.39% a year		Grows 2.75% a year	Global logistics
Gross Market Share	12.45%	6.71%>30%		30%	Global Network benefits
Revenue Share	20.13%	Unchanged		20.13%	Market dominance keeps billing share high.
Operating Margin	-24.39%	-24.39% ->20%		15.00%	Full employee & more regulations
Reinvestment	NA	Sales to capital ratio of 4.00		Reinvestment rate = 7.5%	Low capital investment model
Cost of capital	NA	9.97%	9,97%->8.24%	8.24%	At 75th percentile of US firms
Risk of failure	5% chance of failure, if pricing meltdown leads to capital being cut off				Cash on hand + Capital access

The Cash Flows

	Total Market	Market Share	Revenues	EBIT (1-t)	Reinvestment	FCFF
1	$ 441,560	14.20%	$ 12,627	$ (2,369)	$ 650	$ (3,019)
2	$ 487,438	15.96%	$ 15,661	$ (2,057)	$ 759	$ (2,816)
3	$ 538,083	17.71%	$ 19,189	$ (1,441)	$ 882	$ (2,323)
4	$ 593,990	19.47%	$ 23,281	$ (438)	$ 1,023	$ (1,461)
5	$ 655,705	21.22%	$ 28,017	$ 1,050	$ 1,184	$ (134)
6	$ 723,833	22.98%	$ 33,485	$ 3,139	$ 1,367	$ 1,771
7	$ 799,039	24.73%	$ 39,787	$ 5,292	$ 1,576	$ 3,716
8	$ 882,059	26.49%	$ 47,037	$ 5,292	$ 1,813	$ 3,479
9	$ 973,705	28.24%	$ 55,365	$ 6,229	$ 2,082	$ 4,147
10	$1,074,873	30.00%	$ 64,915	$ 7,303	$ 2,387	$ 4,915
Terminal year	$1,101,745	30.00%	$ 66,537	$ 7,485	$ 936	$ 6,550

The Value

Terminal value	$ 114,108
PV(Terminal value)	$ 46,258
PV (CF over next 10 years)	$ 501
Value of operating assets =	$ 46,759
Probability of failure	5%
Value in case of failure	$ -
Adjusted Value for operating assets	$ 44,421
+ Cash on hand	$ 6,406
+ Cross holdings	$ 8,700
+ IPO Proceeds	$ 9,000
- Debt	$ 6,869
Value of equity	$ 52,958
Value per share	$ 45.00

IV. Don't mistake precision for accuracy.. And accuracy for payoff..

Better accurate than precise
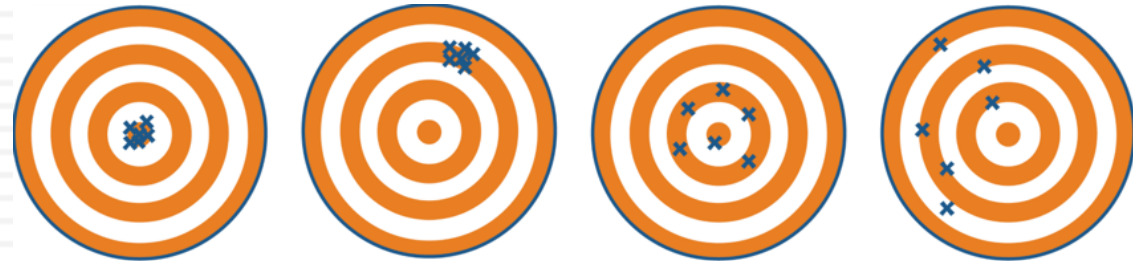
It's all relative

Aswath Damodaran
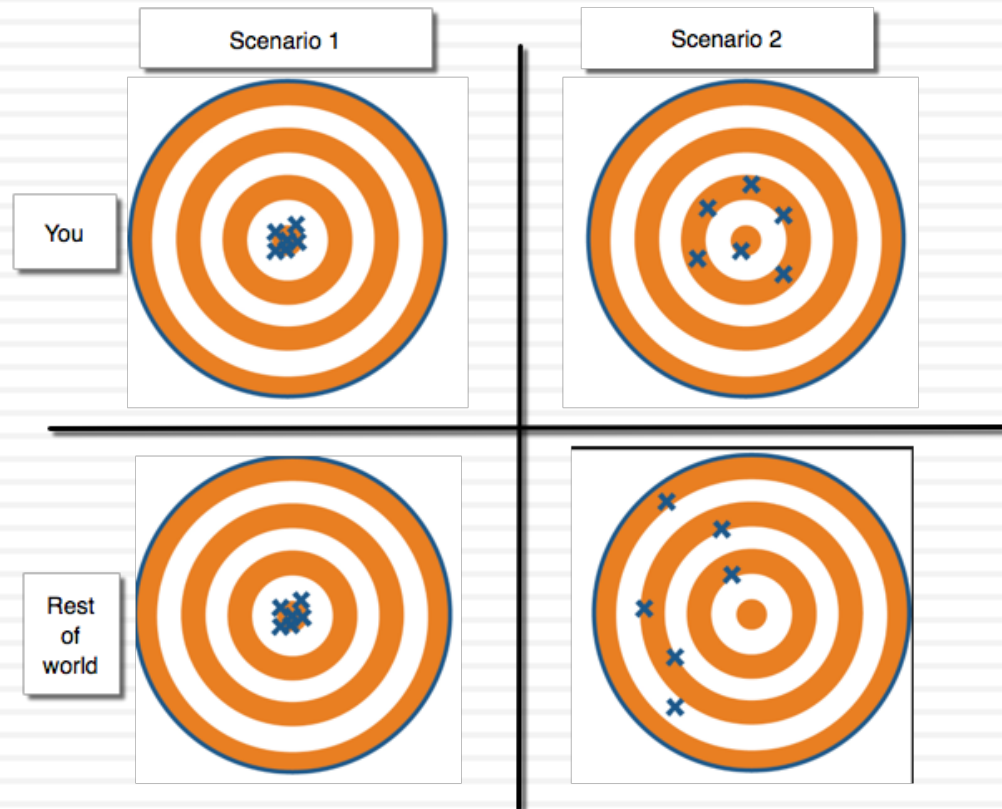
Valuing a start up or a young company is hard to do..

Figure 3: Estimation Issues - Young and Start-up Companies

Making judgments on revenues/ profits difficult because you cannot draw on history. If you have no product/service, it is difficult to gauge market potential or profitability. The company's entire value lies in future growth but you have little to base your estimate on.

Cash flows from existing assets non-existent or negative.

What is the value added by growth assets?

What are the cashflows from existing assets?

When will the firm become a mature fiirm, and what are the potential roadblocks?

Different claims on cash flows can affect value of equity at each stage.

How risky are the cash flows from both existing assets and growth assets?

What is the value of equity in the firm?

Limited historical data on earnings, and no market prices for securities makes it difficult to assess risk.

Will the firm make it through the gauntlet of market demand and competition? Even if it does, assessing when it will become mature is difficult because there is so little to go on.

And the dark side will beckon..

□ With young start up companies, you will be told that it is "too difficult" or even "impossible" to value these companies, because there is so little history and so much uncertainty in the future.

□ Instead, you will be asked to come over to the "dark side", where

- You will see value metrics that you have never seen before
- You will hear "macro" stories, justifying value
- You will be asked to play the momentum game

□ While all of this behavior is understandable, none of it makes the uncertainty go away. You have a choice. You can either hide from uncertainty or face up to it.

Twitter: Priming the Pump for Valuation

1. Make small revenues into big revenues

	2011		2012		2013	
	%	$	%	$	%	$
Google	32.09%	$27.74	31.46%	$32.73	33.24%	$38.83
Facebook	3.65%	$3.15	4.11%	$4.28	5.04%	$5.89
Yahoo!	3.95%	$3.41	3.37%	$3.51	3.10%	$3.62
Microsoft	1.27%	$1.10	1.63%	$1.70	1.78%	$2.08
IAC	1.15%	$0.99	1.39%	$1.45	1.47%	$1.72
AOL	1.17%	$1.01	1.02%	$1.06	0.95%	$1.11
Amazon	0.48%	$0.41	0.59%	$0.61	0.71%	$0.83
Pandora	0.28%	$0.24	0.36%	$0.37	0.50%	$0.58
Twitter	0.16%	$0.14	0.28%	$0.29	0.50%	$0.58
Linkedin	0.18%	$0.16	0.25%	$0.26	0.32%	$0.37
Millennial Media	0.05%	$0.04	0.07%	$0.07	0.10%	$0.12
Other	55.59%	$48.05	55.47%	$57.71	52.29%	$61.09
Total Market	100%	$86.43	100.00%	$104.04	100.00%	$116.82

2. Make losses into profits

Company	Operating Margin
Google Inc. (NasdaqGS:GOOG)	22.82%
Facebook, Inc. (NasdaqGS:FB)	29.99%
Yahoo! Inc. (NasdaqGS:YHOO)	13.79%
Netlfix	3.16%
Groupon	2.53%
LinkedIn Corporation (NYSE:LNKD)	5.18%
Pandora Media, Inc. (NYSE:P)	-9.13%
Yelp, Inc. (NYSE:YELP)	-6.19%
OpenTable, Inc. (NasdaqGS:OPEN)	24.90%
RetailMeNot	45.40%
Travelzoo Inc. (NasdaqGS:TZOO)	15.66%
Zillow, Inc. (NasdaqGS:Z)	-66.60%
Trulia, Inc. (NYSE:TRLA)	-6.79%
Aggregate	20.40%

My estimate for Twitter: Operating margin of 25% in year 10

3. Reinvest for growth

		Annual growth rate in Global Advertising Spending			
		2.00%	2.50%	3.00%	3.50%	4.00%
Online advertising share of market	20%	$124.78	$131.03	$137.56	$144.39	$151.52
	25%	$155.97	$163.79	$171.95	$180.49	$189.40
	30%	$187.16	$196.54	$206.34	$216.58	$227.28
	35%	$218.36	$229.30	$240.74	$252.68	$265.16
	40%	$249.55	$262.06	$275.13	$288.78	$303.04

My estimate for 2023: Overall online advertising market will be close to $200 billion and Twitter will have about 5.7% ($11.5 billion)

	Sales/ Invested Capital
Twitter (2013)	1.10
Advertising Companies	1.40
Social Media Companies	1.05

My estimate for Twitter: Sales/Capital will be 1.50 for next 10 years

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

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

Terminal year (11)

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

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

X

Risk Premium
6.15%

75% from US(5.75%) + 25% from rest of world (7.23%)

90% advertising (1.44) + 10% info svcs (1.05)

D/E=1.71%

Amazon Simulation

Revenue Growth Rate	
Minimum	5.00%
Maximum	25.00%

Operating Margin	
Mean	12.50%%
Std Dev	2.00%

Sales/Invested Capital	
Minimum	3.95
Likeliest	5.95
Maximum	7.95

Cost of Capital	
Location	5.00%
Mean	7.97%
Std. Dev.	0.80%

Correlation = 0.40

Base Case	$1,255.09
Mean	$1,343.67
Median	$1,241.98

Percentiles	Value/Share
0%	$234.29
10%	$705.19
20%	$832.65
30%	$957.69
40%	$1,092.41
50%	$1,241.97
60%	$1,411.82
70%	$1,605.37
80%	$1,837.98
90%	$2,152.15
100%	$3,887.62

Amazon: Simulated Values in September 2018
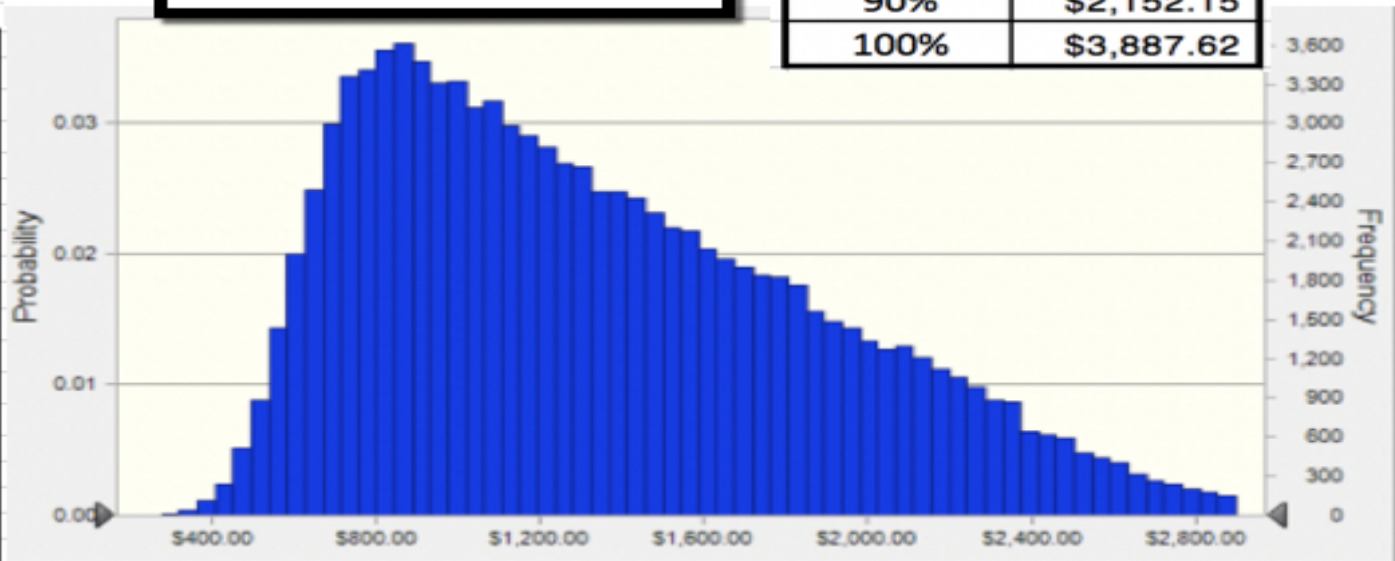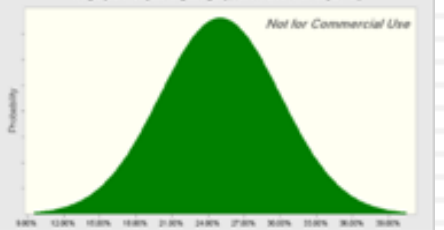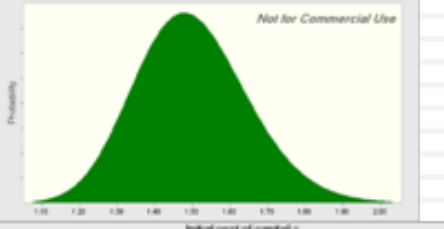
A sobering reminder: You will be "wrong" and it is okay

- 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.

- Remember that it is not just your value that is changing, but so is the price, and the price will change a great deal more than the value.

Aswath Damodaran

And your value is not a fact, but an estimate..

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%

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

Aswath Damodaran
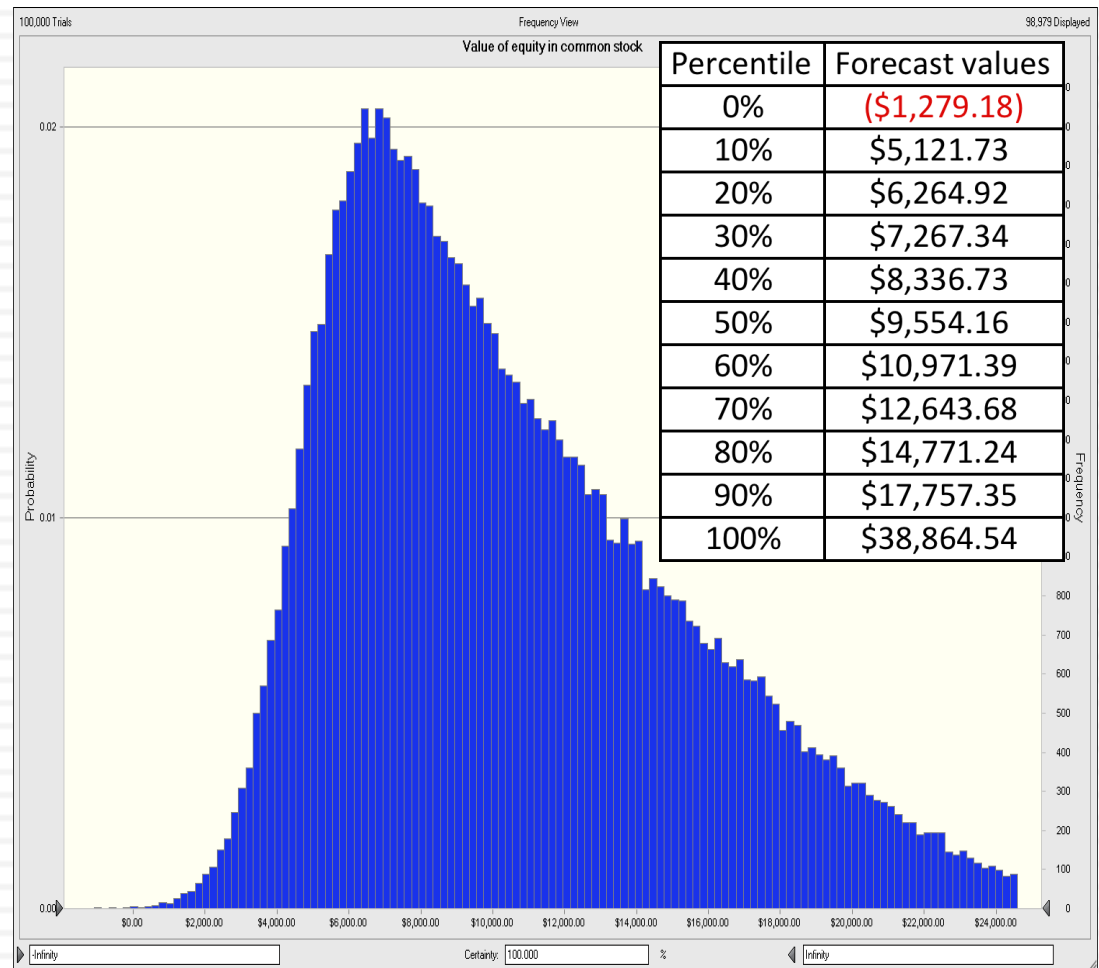
Forecasting in the face of uncertainty. A test:

□ 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%

Aswath Damodaran

V. Valuation is a craft, and you should never stop learning

- □ In a science, if you get the inputs right, you should get the output right. The laws of physics and mathematics are universal and there are no exceptions. **Valuation is not a science**.

- □ In an art, there are elements that can be taught but there is also a magic that you either have or you do not. The essence of an art is that you are either a great artist or you are not. **Valuation is not an art.**

- □ A craft is a skill that you learn <u>by doing</u>. The more you do it, the better you get at it. **Valuation is a craft.**

Existing Users				New Users				Corporate Expenses					
Inputs				**Inputs**				**Inputs**					
Net Revenue/User =	$ 110.16			Cost of acquiring user =	$ 113.71			Corporate Expenses	$ 2,812.72				
Operating Expense/User=	$ 65.12			Value of new user =	$ 373.54			CAGR - Next 10 years	7.00%				
Operating Profit/User =	$ 45.05			Growth rate in net users (1-5)	12.00%			Discount Rate =	8.24%				
CAGR in Revenue/User	12.00%			Growth rate in net users (6-10)	6.00%								
Annual Renewal Rate =	95.00%			Discount Rate	9.97%								
User Life =	15												
Discount Rate =	8.24%												
Output				**Output**				**Output**					
Value/User =	$ 487.25			# Users in year 10 =	214.62								
# Existing Users =	91.00			# Net New Users (10 years)	123.62								
Value of Existing Users =	**$44,339.77**	+		**Value of New Users =**	**$60,253.08**	-		**PV of Corporate Expenses**	**$(63,216.48)**	=	Value of Operating A	$41,376.37
											+ Cash	$15,407.00
Existing users will stick with Uber and				*Uber will continue to add new users, but at a*				*Uber's corporate expenses will continue to*			+ Cross Holdings	$ 8,700.00
increase how much they spend on its				*decreasing pace, with a cost of acquiring a*				*grow, notwithstanding economies of scale, as*			- Debt	$ 6,869.00
services, the longer they stay.				*new user staying stable (with the current cost*				*the company increases spending moderately*			**Value of equity**	**$58,614.37**
Operating expneses are mostly fixed,				*incrteasing at the inflation rate). The new user*				*on autonomous cars.*			# Shares	1158.30
but there will be mild econmies of				*spending profile will mirror existing users.*								
scale.											Value/Share	$ 50.60

VI. Don't mistake price for value!

Drivers of intrinsic value
- Cashflows from existing assets
- Growth in cash flows
- Quality of Growth

Drivers of price
- Market moods & momentum
- Surface stories about fundamentals

Accounting Estimates

Valuation Estimates

INTRINSIC VALUE

Value

THE GAP
Is there one?
If so, will it close?
If it will close, what will cause it to close?

Price

PRICE

Test 1: Are you pricing or valuing?
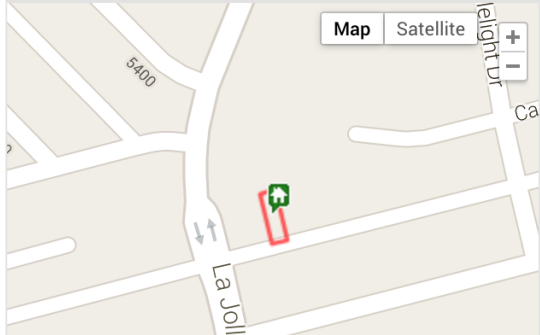
Test 2: Are you pricing or valuing?

Europe
Switzerland

Biotechnology
Biotechnology

Reuters	Bloomberg	Exchange	Ticker
BION.S	BION SW	SWX	BION

Price at 12 Aug 2013 (CHF)	124.00
Price Target (CHF)	164.50
52-week range (CHF)	128.40 - 84.90

Strong sector and stock-picking continue

Impressive performance

Over the past two years, BB Biotech shares have roughly tripled, which could tempt investors to take profits. However, this performance has been well backed by a deserved revival of the biotech industry, encouraging fundamental news, M&A, and increased money flow into health care stocks. In addition, BBB returned to index outperformance by modifying its stock-picking approach. Hence, despite excellent performance, the shares still trade at a 23% discount to the net asset value of the portfolio. Hence, the shares are an attractive value vehicle to capture growth opportunities in an attractive sector.

### Biotech industry remains attractive

With the re-rating of the pharma sector, investors have also showed increased interest in biotech stocks. Established biotech stocks have delivered encouraging financial results and approvals, while there has also been substantial industry consolidation, which is not surprising in times of "cheap" money and high liquidity. BB Biotech remains an attractive vehicle to capture the future potential of the biotech sector. In addition, investors benefit from a 23% discount to NAV and attractive cash distribution policy of 5% yield p.a. Hence, we reiterate our Buy on BB Biotech shares.

Key changes

Target Price	106.50 to 164.50 ↑	54.5%

Source: Deutsche Bank

Price/price relative

— BB BIOTECH
— SPI Swiss Performanc (Rebased)
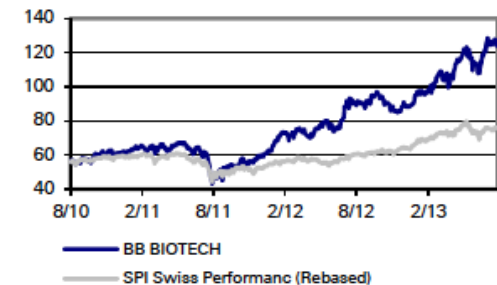
Performance (%)	1m	3m	12m
Absolute	-1.4	5.4	37.4

Aswath Damodaran

Classifying Investments

1. <u>Cash flow generating assets</u>: Generate cash flows now or are expected to do so in the future. Can be a fixed cash flow claim, a residual claim or a contingent claim.

2. <u>Commodities</u>: Used as raw material to meet another need (energy, food etc.).

3. <u>Currencies</u>: Measure of cash flows, medium of exchange or store of value.

4. <u>Collectibles</u>: May have aesthetic or emotional value but derives its pricing from its scarcity (supply) and the perception of others that it is wanted.

Value versus Price

	To value	To price
Assets	Can be valued based upon expected cashflows, with higher cashflows & lower risk = higher value.	Can be priced against similar assets, after controlling for cash flows and risk.
Commodity	Can be valued, based upon utilitarian demand and supply, but with long lags in both.	Can be priced against its own history (normalized price over time)
Currency	Cannot be valued	Can be priced against other currencies, with greater acceptance & more stable purchasing power = higher price.
Collectible	Cannot be valued	Can be priced based upon scarcity and desirability.

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The determinants of price

Mood and Momentum
Price is determined in large part by mood and momentum, which, in turn, are driven by behavioral factors (panic, fear, greed).

Liquidity & Trading Ease
While the value of an asset may not change much from period to period, liquidity and ease of trading can, and as it does, so will the price.
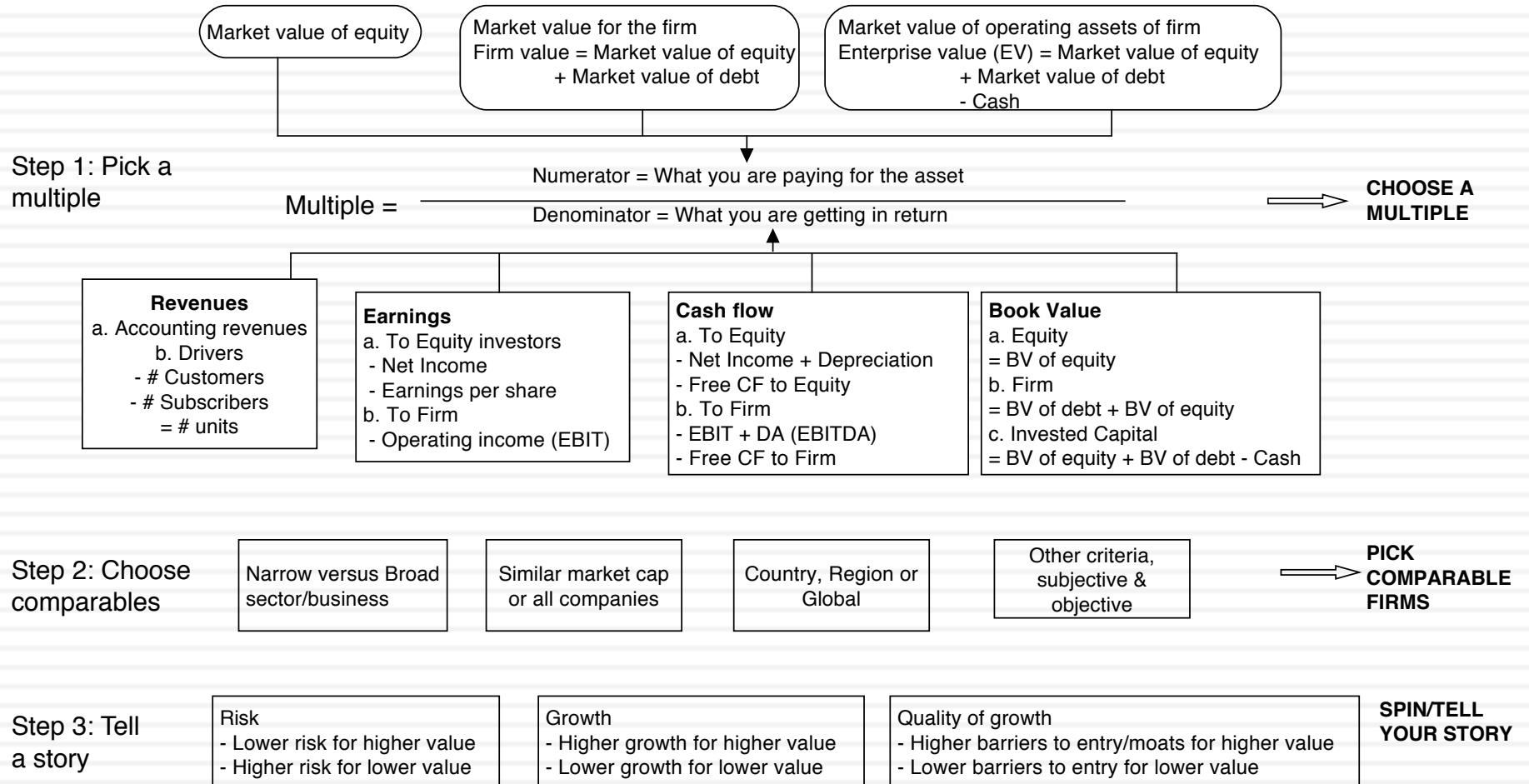
The Market Price

Incremental information
Since you make money on price changes, not price levels, the focus is on incremental information (news stories, rumors, gossip) and how it measures up, relative to expectations

Group Think
To the extent that pricing is about gauging what other investors will do, the price can be determined by the "herd".

Aswath Damodaran

Multiples and Comparable Transactions

Market value of equity	Market value for the firm Firm value = Market value of equity + Market value of debt	Market value of operating assets of firm Enterprise value (EV) = Market value of equity + Market value of debt - Cash

Step 1: Pick a multiple

$$\text{Multiple} = \frac{\text{Numerator} = \text{What you are paying for the asset}}{\text{Denominator} = \text{What you are getting in return}}$$

→ **CHOOSE A MULTIPLE**

Revenues a. Accounting revenues b. Drivers - # Customers - # Subscribers = # units	**Earnings** a. To Equity investors - Net Income - Earnings per share b. To Firm - Operating income (EBIT)	**Cash flow** a. To Equity - Net Income + Depreciation - Free CF to Equity b. To Firm - EBIT + DA (EBITDA) - Free CF to Firm	**Book Value** a. Equity = BV of equity b. Firm = BV of debt + BV of equity c. Invested Capital = BV of equity + BV of debt - Cash

Step 2: Choose comparables

Narrow versus Broad sector/business	Similar market cap or all companies	Country, Region or Global	Other criteria, subjective & objective

→ **PICK COMPARABLE FIRMS**

Step 3: Tell a story

Risk - Lower risk for higher value - Higher risk for lower value	Growth - Higher growth for higher value - Lower growth for lower value	Quality of growth - Higher barriers to entry/moats for higher value - Lower barriers to entry for lower value

SPIN/TELL YOUR STORY

Pricing Twitter: Start with the "comparables"

Company	Market Cap	Enterprise value	Revenues	EBITDA	Net Income	Number of users (millions)	EV/User	EV/Revenue	EV/EBITDA	PE
Facebook	$173,540.00	$160,090.00	$7,870.00	$3,930.00	$1,490.00	1230.00	$130.15	20.34	40.74	116.47
Linkedin	$23,530.00	$19,980.00	$1,530.00	$182.00	$27.00	277.00	$72.13	13.06	109.78	871.48
Pandora	$7,320.00	$7,150.00	$655.00	-$18.00	-$29.00	73.40	$97.41	10.92	NA	NA
Groupon	$6,690.00	$5,880.00	$2,440.00	$125.00	-$95.00	43.00	$136.74	2.41	47.04	NA
Netflix	$25,900.00	$25,380.00	$4,370.00	$277.00	$112.00	44.00	$576.82	5.81	91.62	231.25
Yelp	$6,200.00	$5,790.00	$233.00	$2.40	-$10.00	120.00	$48.25	24.85	2412.50	NA
Open Table	$1,720.00	$1,500.00	$190.00	$63.00	$33.00	14.00	$107.14	7.89	23.81	52.12
Zynga	$4,200.00	$2,930.00	$873.00	$74.00	-$37.00	27.00	$108.52	3.36	39.59	NA
Zillow	$3,070.00	$2,860.00	$197.00	-$13.00	-$12.45	34.50	$82.90	14.52	NA	NA
Trulia	$1,140.00	$1,120.00	$144.00	-$6.00	-$18.00	54.40	$20.59	7.78	NA	NA
Tripadvisor	$13,510.00	$12,860.00	$945.00	$311.00	$205.00	260.00	$49.46	13.61	41.35	65.90
						Average	$130.01	11.32	350.80	267.44
						Median	$97.41	10.92	44.20	116.47

Aswath Damodaran

Read the tea leaves: See what the market cares about

	Market Cap	Enterprise value	Revenues	EBITDA	Net Income	Number of users (millions)
Market Cap	1.					
Enterprise value	0.9998	1.				
Revenues	0.8933	0.8966	1.			
EBITDA	0.9709	0.9701	0.8869	1.		
Net Income	0.8978	0.8971	0.8466	0.9716	1.	
Number of users (millions)	0.9812	0.9789	0.8053	0.9354	0.8453	1.

Twitter had 240 million users at the time of its IPO. What price would you attach to the company?

Aswath Damodaran

Use the "market metric" and "market price"

- The most important variable, in late 2013, in determining market value and price in this sector (social media, ill defined as that is) is the number of users that a company has.

- Looking at comparable firms, it looks like the market is paying about $100/user in valuing social media companies, with a premium for "predictable" revenues (subscriptions) and user intensity.

- Twitter has about 240 million users and can be valued based on the $100/user:

- Enterprise value = 240 * 100 = $24 billion

Aswath Damodaran

VII. Investing is an act of faith..

- When investing, we are often told that if you are virtuous (careful in your research, good at valuation, have a long time horizon), you will be rewarded (with high returns).

- That pitch is amplified by anecdotal evidence of righteous ones, i.e., those who have followed the path to success.

- Those who chose not to be virtuous are labeled as "speculators", viewed as shallow and deserving of the fate that awaits them.

- If you have faith in investing, you will be tested.

Aswath Damodaran

Active Investing is a loser's game

Tough to Beat
Percentage of U.S. large-company mutual funds outperforming the Vanguard 500 Index Fund
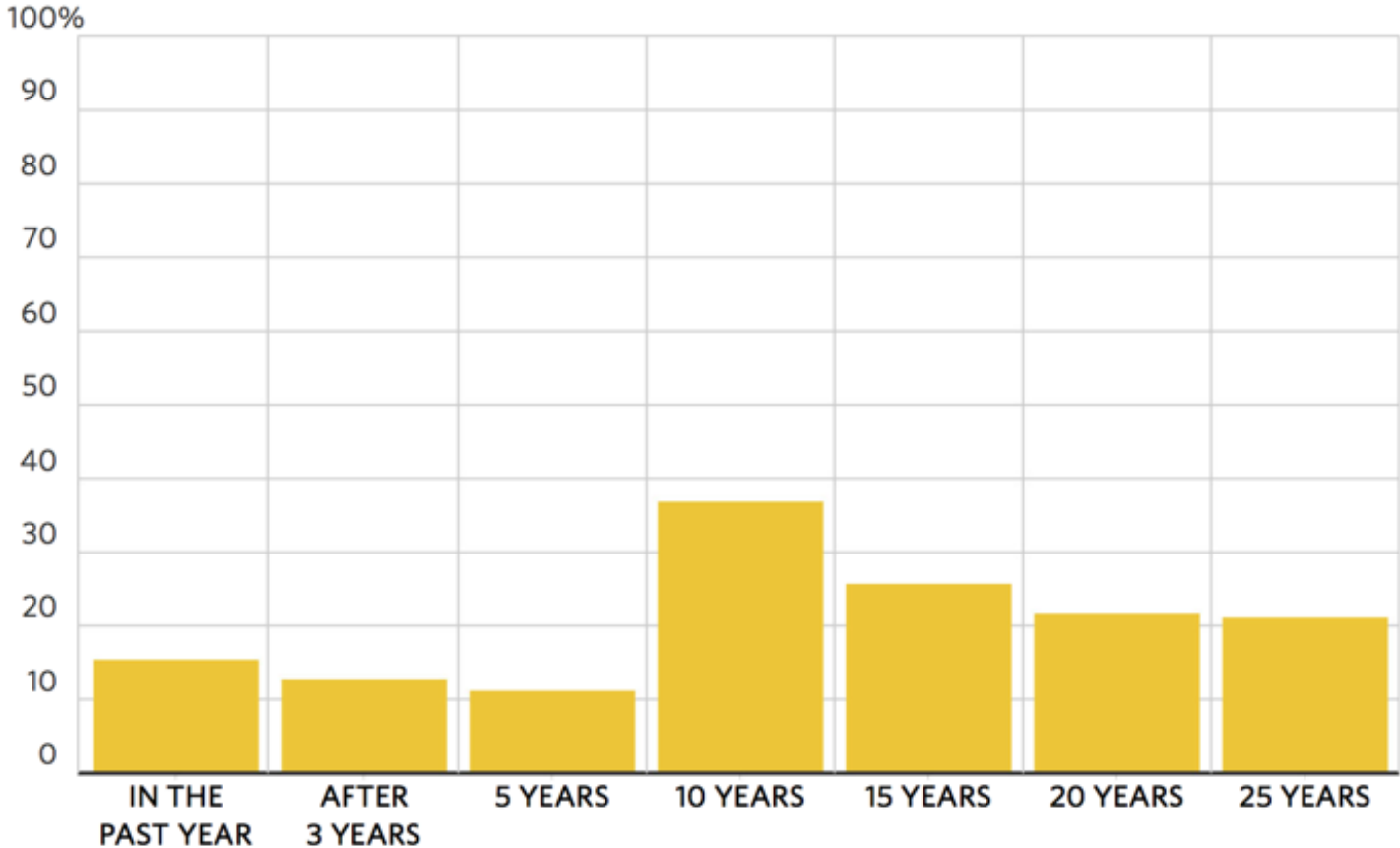
And it stays that way across styles..

	% of US Mutual Funds that beat their respective indices			
	Value	Growth	Core	All
Large	82.17%	86.54%	88.26%	84.15%
Mid-cap	70.27%	81.48%	76.51%	76.69%
Small	92.31%	91.89%	91.44%	90.13%
All Equity				88.43%
Real Estate				82.64%

S&P computes these percentages for the last year, the last 3 years & the last 10 years. There is not a single period or a single fund grouping where the number is <50%.

And the "smart" money does not stay smart for very long

Funds' Flop

Three-year rolling relative performance of stock hedge funds

November
-1.2%

*Compared to a 50/50 MSCI World Net Return Local Currency/LIBOR 3 Month USD index
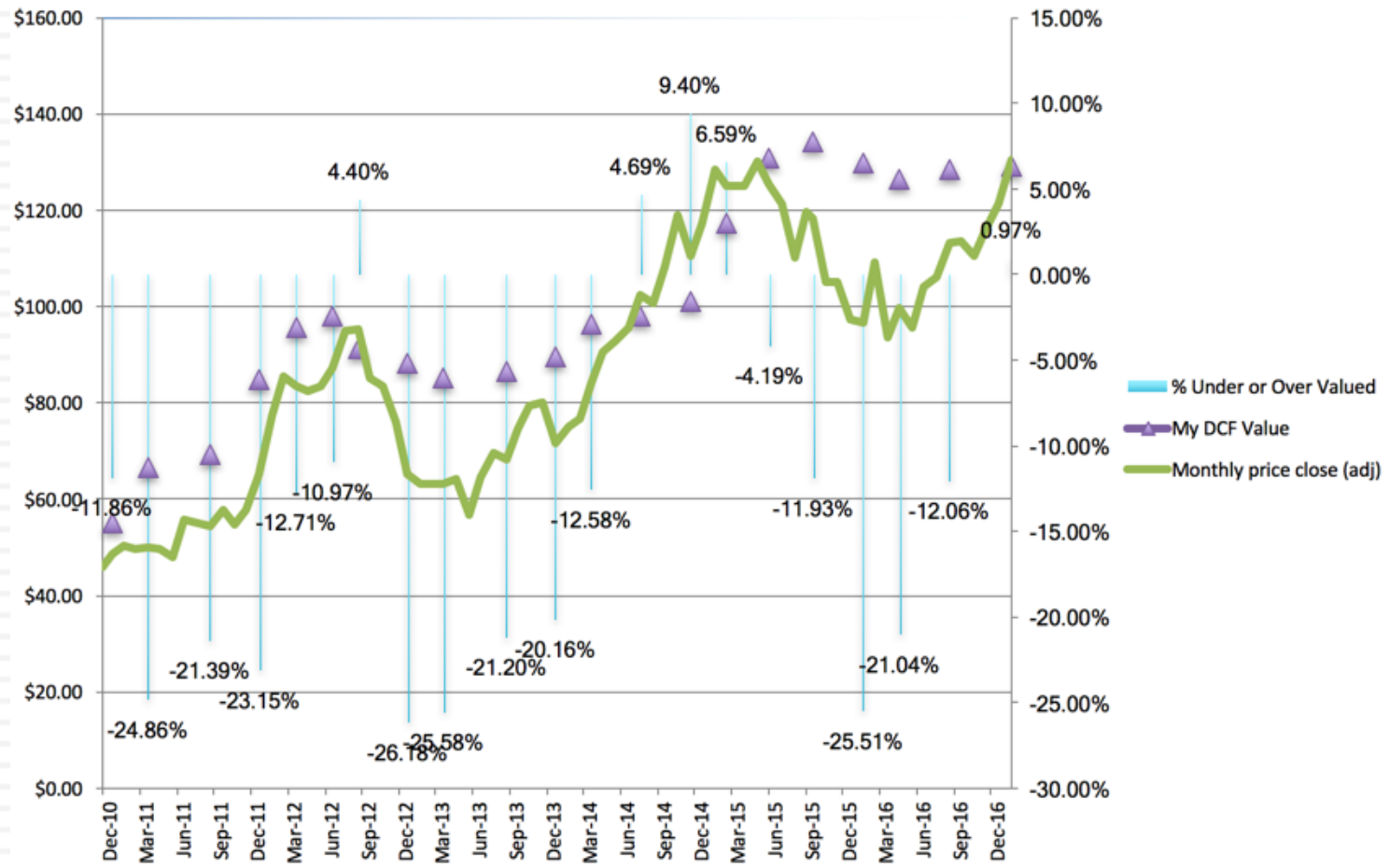
Source: Partners Capital Investment Group analysis of data from HFR, MSCI and WSJ Market Data Group

THE WALL STREET JOURNAL.

Investment Heaven is a promise, not a guarantee..

Apple, Price and Value - 2010 to 2017

Aswath Damodaran

Follow the yellow brick road..