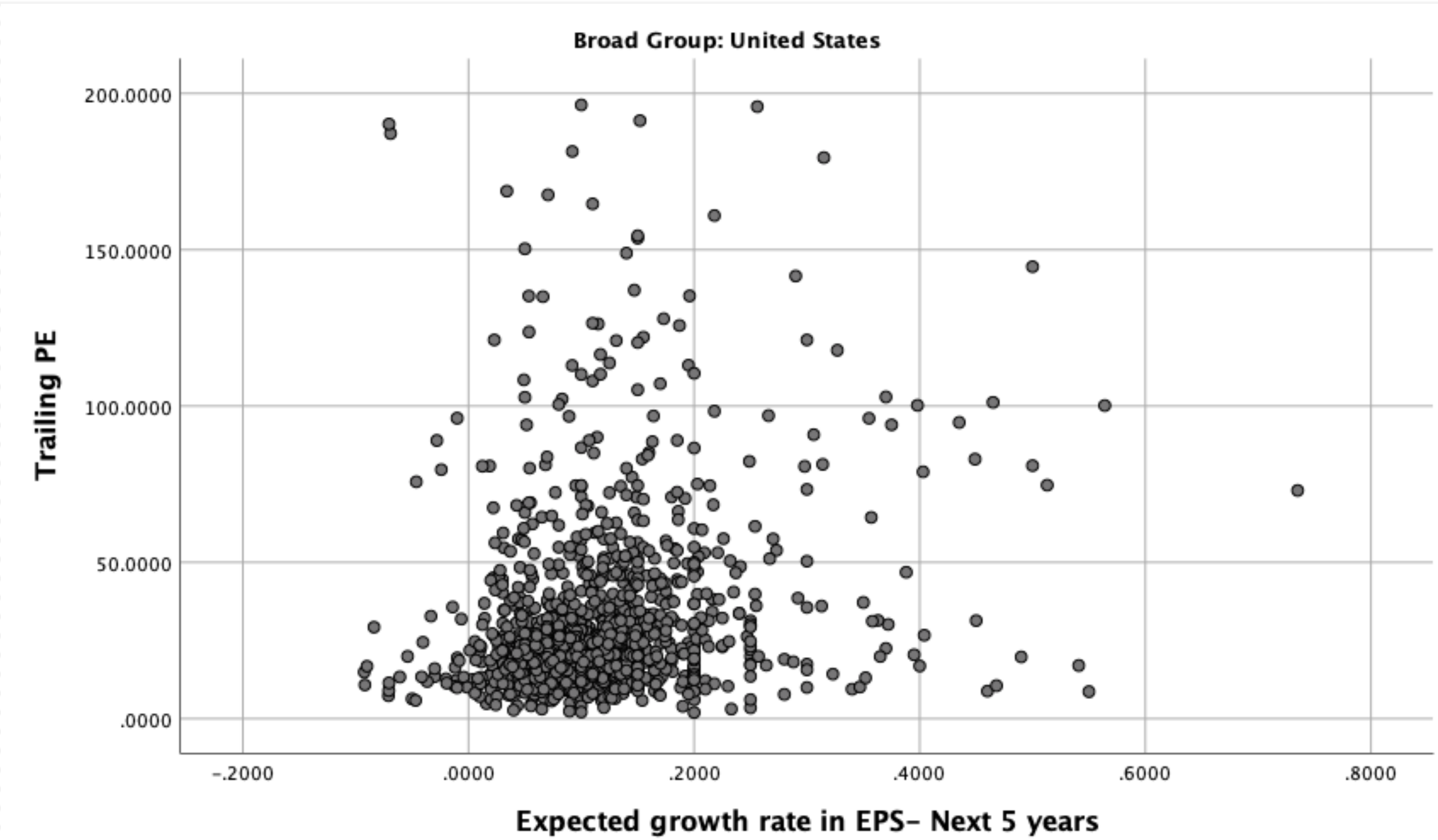
Pricing across the entire market: Why not?

- In contrast to the 'comparable firm' approach, the information in the entire cross-section of firms can be used to predict PE ratios.
- The simplest way of summarizing this information is with a multiple regression, with the PE ratio as the dependent variable, and proxies for risk, growth and payout forming the independent variables.

I. PE Ratio versus the market
PE versus Expected EPS Growth: January 2020



PE Ratio: Standard Regression for US stocks - January 2020

Model Summary[a]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.502[b]	.252	.249	2397.56351

a. Broad Group = United States

b. Predictors: (Constant), Expected growth rate in EPS– Next 5 years, Beta, Payout ratio

The regression is run with growth and payout entered as absolute, i.e., 25% is entered as 25)

Coefficients[a,b,c]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	9.393	2.278		4.123	.000
	Beta	-6.031	1.576	-.125	-3.827	.000
	Payout ratio	20.227	1.551	.428	13.045	.000
	Expected growth rate in EPS– Next 5 years	137.187	12.074	.364	11.362	.000

a. Broad Group = United States

b. Dependent Variable: Trailing PE

c. Weighted Least Squares Regression – Weighted by Market Cap (in US $)

Problems with the regression methodology

- The basic regression assumes a linear relationship between PE ratios and the financial proxies, and that might not be appropriate.
- The basic relationship between PE ratios and financial variables itself might not be stable, and if it shifts from year to year, the predictions from the model may not be reliable.
- The independent variables are correlated with each other. For example, high growth firms tend to have high risk. This multi-collinearity makes the coefficients of the regressions unreliable and may explain the large changes in these coefficients from period to period.

The Negative Intercept Problem

- When the intercept in a multiple regression is negative, there is the possibility that forecasted values can be negative as well.
- One way (albeit imperfect) is to re-run the regression without an intercept. When the intercept in a multiple regression is negative, there is the possibility that forecasted values can be negative as well. One way (albeit imperfect) is to re-run the regression without an intercept. In 2019, when the intercept was negative, this would have yielded the following:

Coefficients[a,b,c,d]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	Expected growth rate in EPS- Next 5 years	1.373	.069	.532	19.871	.000
	Beta	1.208	1.032	.033	1.171	.242
	Payout Ratio (New)	.235	.007	.485	32.225	.000

a. Broad Group = United States

b. Dependent Variable: Trailing PE

c. Linear Regression through the Origin

d. Weighted Least Squares Regression - Weighted by Market Cap (in US $)

The Multicollinearity Problem

Correlations[a]

		Trailing PE	Beta	Payout ratio	Expected growth rate in EPS- Next 5 years
Trailing PE	Pearson Correlation	1	.033	.322**	.211**
	Sig. (2-tailed)		.088	.000	.000
	N	2757	2690	1585	1289
Beta	Pearson Correlation	.033	1	-.110**	.173**
	Sig. (2-tailed)	.088		.000	.000
	N	2690	6202	1573	1564
Payout ratio	Pearson Correlation	.322**	-.110**	1	-.156**
	Sig. (2-tailed)	.000	.000		.000
	N	1585	1573	1589	840
Expected growth rate in EPS- Next 5 years	Pearson Correlation	.211**	.173**	-.156**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	1289	1564	840	1597

**. Correlation is significant at the 0.01 level (2-tailed).

a. Broad Group = United States

Using the PE ratio regression

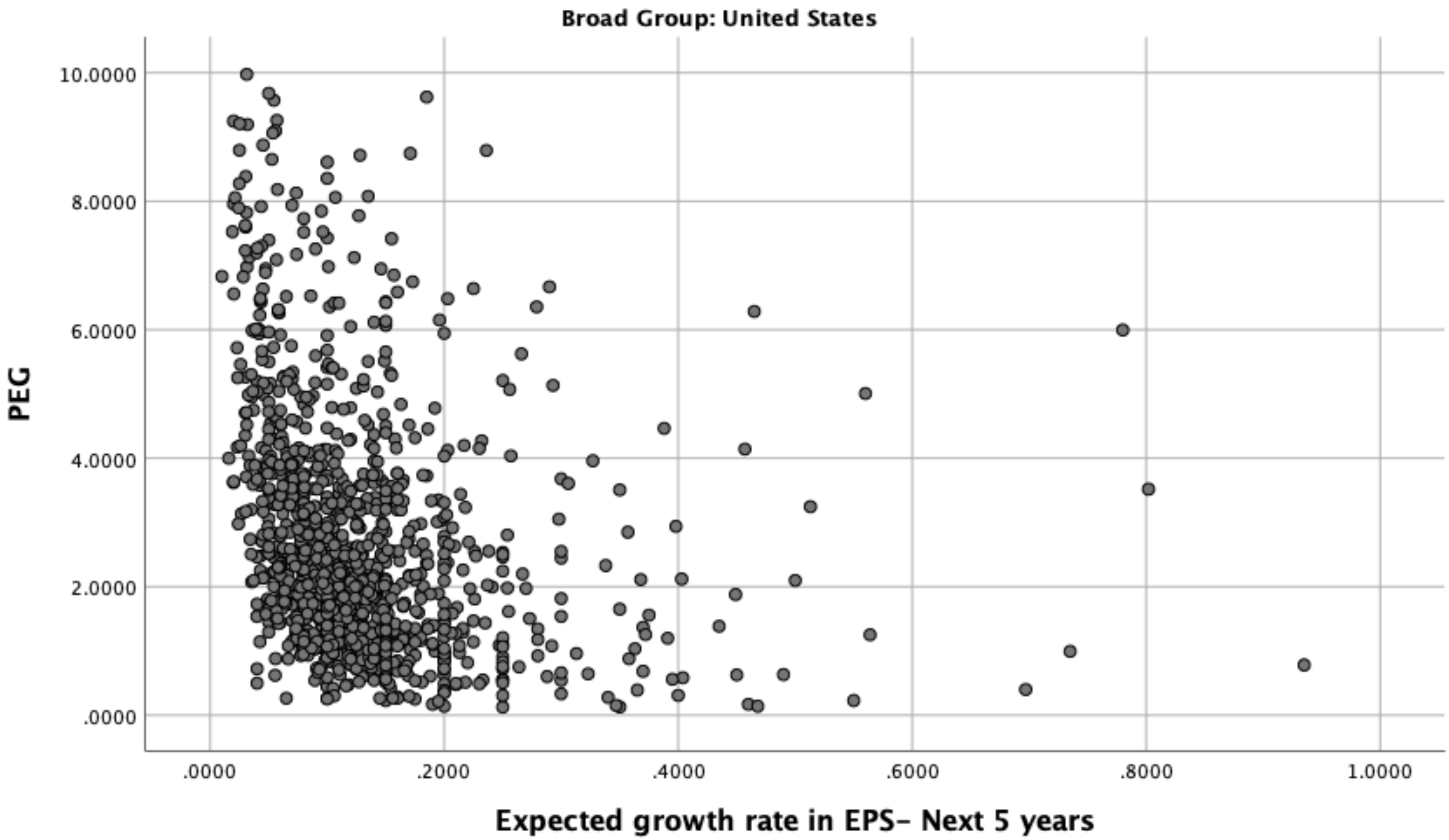
- Assume that you were given the following information for Disney. The firm has an expected growth rate of 15%, a beta of 1.25 and a 20% dividend payout ratio. Based upon the regression, estimate the predicted PE ratio for Disney.
  - Predicted PE = 9.39 - 6.03 (Beta) + 20.23 (Payout) + 137.19 (Growth)
- Disney is actually trading at 25 times earnings. What does the predicted PE tell you?

- Assume now that you value Disney against just its peer group. Will you come to the same valuation judgment as you did when you looked at it relative to the market? Why or why not?

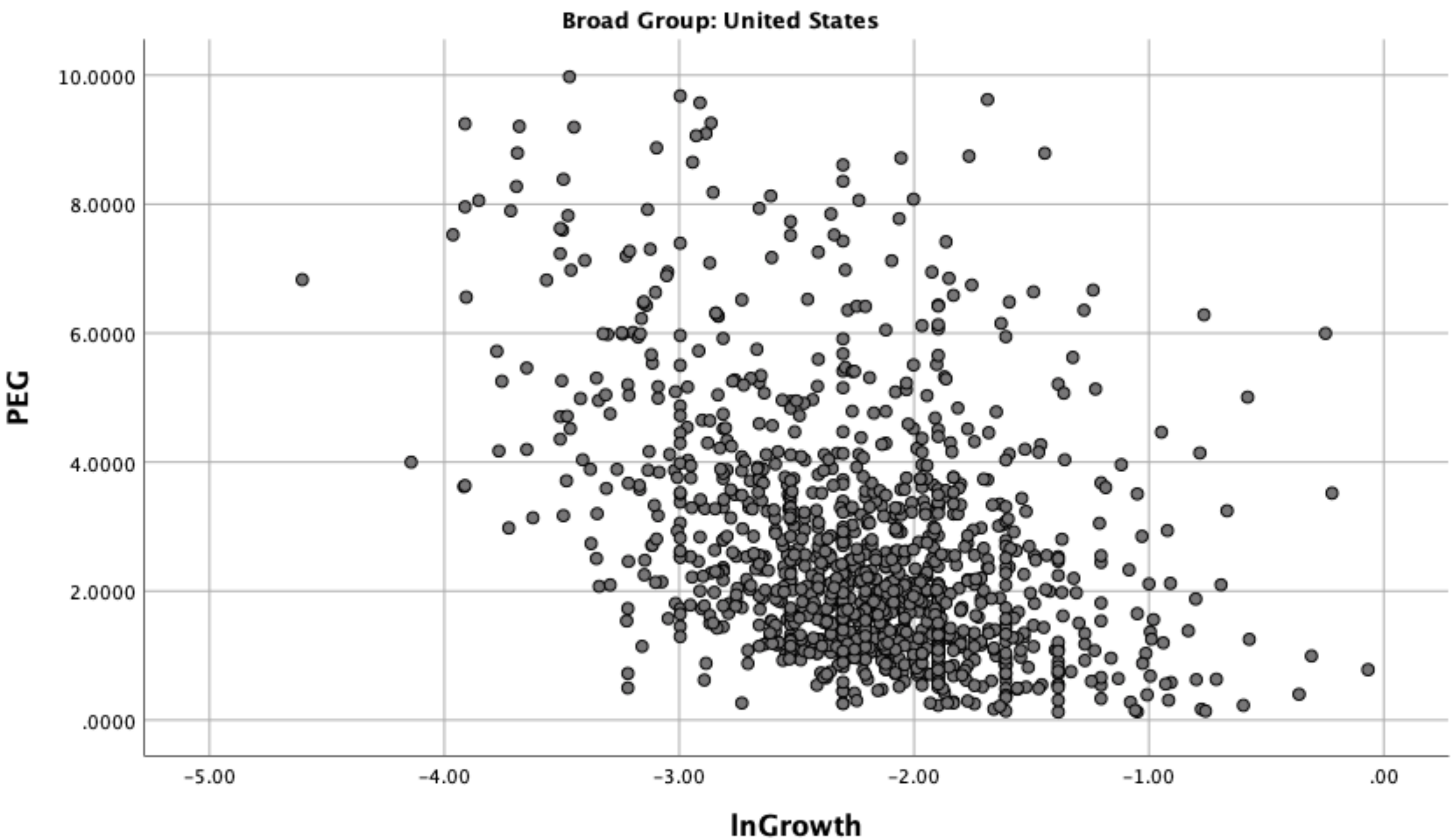
The value of growth

Date	Market price of extra % growth	Implied ERP
Jan 20	1.37	5.20%
Jan 19	1.40	5.96%
Jan 18	1.14	5.08%
Jan 17	1.71	5.69%
Jan-16	0.75	6.12%
Jan-15	0.99	5.78%
Jan-14	1.49	4.96%
Jan-13	0.58	5.78%
Jan-12	0.41	6.04%
Jan-11	0.84	5.20%
Jan-10	0.55	4.36%
Jan-09	0.78	6.43%
Jan-08	1.427	4.37%
Jan-07	1.178	4.16%
Jan-06	1.131	4.07%
Jan-05	0.914	3.65%
Jan-04	0.812	3.69%
Jan-03	2.621	4.10%
Jan-02	1.003	3.62%
Jan-01	1.457	2.75%
Jan-00	2.105	2.05%

II. PEG Ratio versus the market
PEG versus Growth



PEG versus ln(Expected Growth)



PEG Ratio Regression - US stocks January 2020

Model Summary[a]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.674[b]	.454	.451	192.633928

a. Broad Group = United States

b. Predictors: (Constant), lnGrowth, Net Profit Margin, Beta, Payout ratio

Coefficients[a,b,c]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.036	.330		3.138	.002
	Beta	-1.515	.134	-.330	-11.339	.000
	Payout ratio	1.362	.150	.278	9.096	.000
	Net Profit Margin	.898	.367	.068	2.446	.015
	lnGrowth	-1.079	.107	-.306	-10.097	.000

a. Broad Group = United States

b. Dependent Variable: PEG

c. Weighted Least Squares Regression - Weighted by Market Cap (in US $)

Statistically insignificant?

- If a coefficient in a regression is statistically insignificant, all it is doing is adding noise to the regression prediction.
  - There are simple statistical tests of significance, such as the t statistics (>2 is very good, 1-2 is marginal, <1 is noise)
  - With small samples, don't overload the regression with independent variables.
- Take the variable out of the regression, even if the fundamentals say it should matter. In pricing, it is the market that determines what matters.

I. PE ratio regressions across markets – January 2020

Region	Regression – January 2020	R^2
US	PE = 9.39 – 6.03 Beta + 20.23 Payout + 137.19 g_{EPS}	25.2%
Europe	PE = 11.67 – 1.47 Beta + 13.95 Payout + 76.10 g_{EPS}	22.1%
Japan	PE = 13.06 + 4.86 Payout + 97.36 g_{EPS}	29.6%
Emerging Markets	PE = 13.28– 2.72 Beta + 8.24 Payout + 80.068 g_{EPS}	26.5%
Australia, NZ, Canada	PE = 3.88 – 2.63 Beta + 16.96 Payout + 133.96 g_{EPS}	33.7%
Global	**PE = 12.20 – 3.42 Beta + 15.40 Payout + 89.94 g_{EPS}**	**24.1%**

g_{EPS}=Expected Growth: Expected growth in EPS or Net Income: Next 5 years (decimals)
Beta: Regression or Bottom up Beta
Payout ratio: Dividends/ Net income from most recent year. Set to zero, if net income < 0

II. Price to Book Ratio: Fundamentals hold in every market

Region	Regression – January 2020	R^2
US	PBV= -0.41 - 0.75 Beta + 2.14 Payout + 7.87 g_{EPS} + 16.03 ROE	52.5%
Europe	PBV= 1.69 - 0.56 Beta + 0.78 Payout + 7.05 g_{EPS} + 7.05 ROE	31.5%
Japan	PBV= -0.26 + 0.14 Beta -0.54 Payout + 8.74 g_{EPS} + 16.42 ROE	48.5%
Emerging Markets	PBV= -0.04 - 0.14 Beta + 0.75 Payout + 5.97 g_{EPS} + 11.90 ROE	39.2%
Australia, NZ, Canada	PBV= -0.45 - 0.27 Beta + 1.36 Payout + 6.76 g_{EPS} + 11.63 ROE	55.2%
Global	**PBV= 0.36 - 0.35 Beta + 1.36 Payout + 6.76 g_{EPS} + 11.23 ROE**	**39.2%**

g_{EPS}=Expected Growth: Expected growth in EPS/ Net Income: Next 5 years
Beta: Regression or Bottom up Beta
Payout ratio: Dividends/ Net income from most recent year. Set to zero, if net income < 0
ROE: Net Income/ Book value of equity in most recent year.

III. EV/EBITDA – January 2020

Region	Regression – January 2020	R squared
United States	EV/EBITDA= 22.95 – 20.20 DFR + 33.62 g - 20.50 Tax Rate	34.5%
Europe	EV/EBITDA= 18.25 – 9.30 DFR + 42.98 g - 14.60 Tax Rate	24.5%
Japan	EV/EBITDA= 12.10 – 4.60 DFR + 67.395 g - 10.80 Tax Rate	13.2%
Emerging Markets	EV/EBITDA= 20.22 – 14.90 DFR + 36.89 g - 20.50 Tax Rate	28.8%
Australia, NZ & Canada	EV/EBITDA= 19.08 – 13.60 DFR + 29.20 g - 15.40 Tax Rate	20.4%
Global	**EV/EBITDA= 20.36 – 13.00 DFR + 36.22 g - 18.60 Tax Rate**	**27.4%**

g = Expected Revenue Growth: Expected growth in revenues: Near term (2 or 5 years)
DFR = Debt Ratio : Total Debt/ (Total Debt + Market value of equity)
Tax Rate: Effective tax rate in most recent year   ROIC = Return on Capital

IV. EV/Sales Regressions across markets…

Region	Regression – January 2020	R Squared
United States	EV/Sales = 3.26 – 3.800 Tax Rate + 1.30 DFR + 5.62 g + 6.24 Op. Margin	12.4%
Europe	EV/Sales = 1.66 - 2.50 Tax Rate + 2.60 DFR + 5.14 g + 8.76 Op. Margin	17.5%
Japan	EV/Sales = 0.82 - 1.80 Tax Rate + 1.00 DFR + 12.45 g + 10.32 Op. Margin	40.8%
Emerging Markets	EV/Sales = 2.94 -3.40 Tax Rate – 0.60 DFR + 4.36 g + 5.99 Op. Margin	19.7%
Australia, NZ & Canada	EV/Sales = 0.42 – 1.40 Tax Rate + 4.50 DFR + 8.61 g + 7.37 Op. Margin	19.0%
Global	**EV/Sales = 2.982 -4.10 Tax Rate – 0.80 DFR + 4.81 g + 6.74 Op. Margin**	**16.3%**

g =Expected Revenue Growth: Expected growth in revenues: Near term (2 or 5 years)
ERP: ERP for country in which company is incorporated
Tax Rate: Effective tax rate in most recent year; Operating Margin: Operating Income/ Sales

V. EV/Invested Capital

Region	Regression – January 2020	R Squared
United States	EV/IC = 3.77– 3.70 DFR + 2.30 g + 8.43 ROIC	62,.6%
Europe	EV/IC = 2.62– 2.40 DFR + 2.89 g + 7.29 ROIC	59.4%
Japan	EV/IC = 1.40– 1.50 DFR + 6.06 g + 10.32 ROIC	55.1%
Emerging Markets	EV/IC = 2.40– 3.00 DFR + 3.78 g + 5.47 ROIC	54.3%
Australia, NZ & Canada	EV/IC = 1.99 – 1.50 DFR + 1.66 g + 6.21 ROIC	49.7%
Global	**EV/IC = 2.79– 2.90 DFR + 2.58 g + 8.62 ROIC**	**57.5%**

The Pricing Game: Choices

Measure	Choices	Considerations/ Questions
Value	Enterprise, Equity or Firm Value?	1. Is this a financial service business? 2. Are there big differences in leverage?
Scalar	Revenues, Earnings, Cash Flows or Book Value?	1. How are you measuring value? 2. Is the scaling number positive? 3. How (and how much) do accounting choices affect the scaling measure?
Timing & Normalizing	Current, Trailing, Forward or Really Forward?	1. Where are you in the life cycle? 2. How much cyclicality is there in the number? 3. Can you get forecasted values?
Comparable	What is your peer group? (Global or local? Similar size or all firms? …)	1. How much do companies share in common globally? 2. Does company size affect business economics? 3. How big a sample of firms do you need? 4. How do you plan to control for differences?

Relative Valuation: Some closing propositions

- Proposition 1: In a relative valuation, all that you are concluding is that a stock is under or over valued, relative to your comparable group.
  - Your relative valuation judgment can be right and your stock can be hopelessly over valued at the same time.
- Proposition 2: In asset valuation, there are no similar assets. Every asset is unique.
  - If you do not control for fundamental differences in risk, cash flows and growth across firms when comparing how they are priced, your valuation conclusions will reflect your flawed judgments rather than market misvaluations.
- Bottom line: Relative valuation is pricing, not valuation.

Reviewing: The Four Steps to Understanding Multiples

- Define the multiple
  - Check for consistency
  - Make sure that they are estimated uniformly
- Describe the multiple
  - Multiples have skewed distributions: The averages are seldom good indicators of typical multiples
  - Check for bias, if the multiple cannot be estimated
- Analyze the multiple
  - Identify the companion variable that drives the multiple
  - Examine the nature of the relationship
- Apply the multiple

A DETOUR: ASSET BASED VALUATION

Value assets, not cash flows?

What is asset based valuation?

- In intrinsic valuation, you value a business based upon the cash flows you expect that business to generate over time.
- In relative valuation, you value a business based upon how similar businesses are priced.
- In asset based valuation, you value a business by valuing its individual assets. These individual assets can be tangible or intangible.

Why would you do asset based valuation?

- Liquidation: If you are liquidating a business by selling its assets piece meal, rather than as a composite business, you would like to estimate what you will get from each asset or asset class individually.
- Accounting mission: As both US and international accounting standards have turned to "fair value" accounting, accountants have been called upon to redo balance sheet to reflect the assets at their fair rather than book value.
- Sum of the parts: If a business is made up of individual divisions or assets, you may want to value these parts individually for one of two groups:
  - Potential acquirers may want to do this, as a precursor to restructuring the business.
  - Investors may be interested because a business that is selling for less than the sum of its parts may be "cheap".

How do you do asset based valuation?

- Intrinsic value: Estimate the expected cash flows on each asset or asset class, discount back at a risk adjusted discount rate and arrive at an intrinsic value for each asset.
- Relative value: Look for similar assets that have sold in the recent past and estimate a value for each asset in the business.
- Accounting value: You could use the book value of the asset as a proxy for the estimated value of the asset.

When is asset-based valuation easiest to do?

- Separable assets: If a company is a collection of separable assets (a set of real estate holdings, a holding company of different independent businesses), asset-based valuation is easier to do. If the assets are interrelated or difficult to separate, asset-based valuation becomes problematic. Thus, while real estate or a long term licensing/franchising contract may be easily valued, brand name (which cuts across assets) is more difficult to value separately.
- Stand alone earnings/ cash flows: An asset is much simpler to value if you can trace its earnings/cash flows to it. It is much more difficult to value when the business generates earnings, but the role of individual assets in generating these earnings cannot be isolated.
- Active market for similar assets: If you plan to do a relative valuation, it is easier if you can find an active market for "similar" assets which you can draw on for transactions prices.

I. Liquidation Valuation

- In liquidation valuation, you are trying to assess how much you would get from selling the assets of the business today, rather than the business as a going concern.
- Consequently, it makes more sense to price those assets (i.e., do relative valuation) than it is to value them (do intrinsic valuation). For assets that are separable and traded (example: real estate), pricing is easy to do. For assets that are not, you often see book value used either as a proxy for liquidation value or as a basis for estimating liquidation value.
- To the extent that the liquidation is urgent, you may attach a discount to the estimated value.

II. Accounting Valuation: Glimmers from FAS 157

- The ubiquitous "market participant": Through FAS 157, accountants are asked to attach values to assets/liabilities that market participants would have been willing to pay/ receive.
- Tilt towards relative value: "The definition focuses on the price that would be received to sell the asset or paid to transfer the liability (an exit price), not the price that would be paid to acquire the asset or received to assume the liability (an entry price)." The hierarchy puts "market prices", if available for an asset, at the top with intrinsic value being accepted only if market prices are not accessible.
- Split mission: While accounting fair value is titled towards relative valuation, accountants are also required to back their relative valuations with intrinsic valuations. Often, this leads to reverse engineering, where accountants arrive at values first and develop valuations later.

III. Sum of the parts valuation

- You can value a company in pieces, using either relative or intrinsic valuation. Which one you use will depend on who you are and your motives for doing the sum of the parts valuation.
- If you are long term, passive investor in the company, your intent may be to find market mistakes that you hope will get corrected over time. If that is the case, you should do an intrinsic valuation of the individual assets.
- If you are an activist investor that plans to acquire the company or push for change, you should be more focused on relative valuation, since your intent is to get the company to split up and gain the increase in value.

Let's try this
United Technologies: Raw Data - 2009

Division	*Business*	*Revenues*	*EBITDA*	*Pre-tax Operating Income*	*Capital Expenditures*	*Depreciation*	*Total Assets*
Carrier	Refrigeration systems	$14,944	$1,510	$1,316	$191	$194	$10,810
Pratt & Whitney	Defense	$12,965	$2,490	$2,122	$412	$368	$9,650
Otis	Construction	$12,949	$2,680	$2,477	$150	$203	$7,731
UTC Fire & Security	Security	$6,462	$780	$542	$95	$238	$10,022
Hamilton Sundstrand	Manufacturing	$6,207	$1,277	$1,099	$141	$178	$8,648
Sikorsky	Aircraft	$5,368	$540	$478	$165	$62	$3,985

The company also had corporate expenses, unallocated to the divisions of $408 million in the most recent year.

United Technologies: Relative Valuation Median Multiples

Division	*Business*	*EBITDA*	*EV/EBITDA for sector*	*Value of Business*
Carrier	Refrigeration systems	$1,510	5.25	$7,928
Pratt & Whitney	Defense	$2,490	8.00	$19,920
Otis	Construction	$2,680	6.00	$16,080
UTC Fire & Security	Security	$780	7.50	$5,850
Hamilton Sundstrand	Industrial Products	$1,277	5.50	$7,024
Sikorsky	Aircraft	$540	9.00	$4,860
Sum of the parts value for business =				$61,661

United Technologies: Relative Valuation Plus Scaling variable & Choice of Multiples

Division	Business	Revenues	EBITDA	Operating Income	Capital Invested
Carrier	Refrigeration systems	$14,944	$1,510	$1,316	$6,014
Pratt & Whitney	Defense	$12,965	$2,490	$2,122	$5,369
Otis	Construction	$12,949	$2,680	$2,477	$4,301
UTC Fire & Security	Security	$6,462	$780	$542	$5,575
Hamilton Sundstrand	Industrial Products	$6,207	$1,277	$1,099	$4,811
Sikorsky	Aircraft	$5,368	$540	$478	$2,217
Total		$58,895	$9,277	$8,034	$28,287

Business	Best Multiple	Regression	R^2
Refrigeration systems	EV/EBITDA	EV/EBITDA = 5.35 – 3.55 Tax Rate + 14.17 ROC	42%
Defense	EV/Revenues	EV/Revenues = 0.85 + 7.32 Pre-tax Operating Margin	47%
Construction	EV/EBITDA	EV/EBITDA = 3.17 – 2.87 Tax Rate + 14.66 ROC	36%
Security	EV/Capital	EV/ Capital = 0.55 + 8.22 ROC	55%
Industrial Products	EV/Revenues	EV/Revenues = 0.51 + 6.13 Pre-tax Operating Margin	48%
Aircraft	EV/Capital	EV/ Capital = 0.65 + 6.98 ROC	40%

United Technologies: Relative Valuation
Sum of the Parts value

Division	Scaling Variable	Current value for scaling variable	ROC	Operating Margin	Tax Rate	Predicted Multiple	Estimated Value
Carrier	EBITDA	$1,510	13.57%	8.81%	38%	5.35 – 3.55 (.38) + 14.17 (.1357) =5.92	$8,944.47
Pratt & Whitney	Revenues	$12,965	24.51%	16.37%	38%	0.85 + 7.32 (.1637) =2.05	$26,553.29
Otis	EBITDA	$2,680	35.71%	19.13%	38%	3.17 – 2.87 (.38)+14.66 (.3571) =7.31	$19,601.70
UTC Fire & Security	Capital	$5,575	6.03%	8.39%	38%	0.55 + 8.22 (.0603) =1.05	$5,828.76
Hamilton Sundstrand	Revenues	$6,207	14.16%	17.71%	38%	0.51 + 6.13 (.1771) =1.59	$9,902.44
Sikorsky	Capital	$2,217	13.37%	8.90%	38%	0.65 + 6.98 (.1337) =1.58	$3,509.61
Sum of the parts value for operating assets =							$74,230.37

United Technologies: DCF parts valuation Cost of capital, by business

Division	Unlevered Beta	Debt/Equity Ratio	Levered beta	Cost of equity	After-tax cost of debt	Debt to Capital	Cost of capital
Carrier	0.83	30.44%	0.97	9.32%	2.95%	23.33%	7.84%
Pratt & Whitney	0.81	30.44%	0.95	9.17%	2.95%	23.33%	7.72%
Otis	1.19	30.44%	1.39	12.07%	2.95%	23.33%	9.94%
UTC Fire & Security	0.65	30.44%	0.76	7.95%	2.95%	23.33%	6.78%
Hamilton Sundstrand	1.04	30.44%	1.22	10.93%	2.95%	23.33%	9.06%
Sikorsky	1.17	30.44%	1.37	11.92%	2.95%	23.33%	9.82%

United Technologies: DCF valuation Fundamentals, by business

Division	*Total Assets*	*Capital Invested*	*Cap Ex*	*Allocated Reinvestment*	*Operating income after taxes*	*Return on capital*	*Reinvestment Rate*
Carrier	$10,810	$6,014	$191	$353	$816	13.57%	43.28%
Pratt & Whitney	$9,650	$5,369	$412	$762	$1,316	24.51%	57.90%
Otis	$7,731	$4,301	$150	$277	$1,536	35.71%	18.06%
UTC Fire & Security	$10,022	$5,575	$95	$176	$336	6.03%	52.27%
Hamilton Sundstrand	$8,648	$4,811	$141	$261	$681	14.16%	38.26%
Sikorsky	$3,985	$2,217	$165	$305	$296	13.37%	102.95%

United Technologies, DCF valuation Growth Choices

Division	Cost of capital	*Return on capital*	*Reinvestment Rate*	*Expected growth*	*Length of growth period*	*Stable growth rate*	*Stable ROC*
Carrier	7.84%	13.57%	43.28%	5.87%	5	3%	7.84%
Pratt & Whitney	7.72%	24.51%	57.90%	14.19%	5	3%	12.00%
Otis	9.94%	35.71%	18.06%	6.45%	5	3%	14.00%
UTC Fire & Security	6.78%	6.03%	52.27%	3.15%	0	3%	6.78%
Hamilton Sundstrand	9.06%	14.16%	38.26%	5.42%	5	3%	9.06%
Sikorsky	9.82%	13.37%	102.95%	13.76%	5	3%	9.82%

United Technologies, DCF valuation Values of the parts

Business	*Cost of capital*	*PV of FCFF*	*PV of Terminal Value*	*Value of Operating Assets*
Carrier	7.84%	$2,190	$9,498	$11,688
Pratt & Whitney	7.72%	$3,310	$27,989	$31,299
Otis	9.94%	$5,717	$14,798	$20,515
UTC Fire & Security	6.78%	$0	$4,953	$4,953
Hamilton Sundstrand	9.06%	$1,902	$6,343	$8,245
Sikorsky	9.82%	-$49	$3,598	$3,550
Sum				*$80,250*

United Technologies, DCF valuation Sum of the Parts

Value of the parts = \$80,250

Value of corporate expenses

$$= \frac{\text{Corporate Expenses}_{\text{Current}}(1-t)(1+g)}{(\text{Cost of capital}_{\text{Company}} - g)} = \frac{408(1-.38)(1.03)}{(.0868-.03)} = \$\ 4,587$$

Value of operating assets (sum of parts DCF) = \$75,663

Value of operating assets (sum of parts RV) = \$74,230

Value of operating assets (company DCF) = \$71,410

Enterprise value (based on market prices) = \$52,261

GE in 2018: The Parts

Business	Revenues- 2017	Revenue Growth in 2017	EBIT before G&A	EBIT after G&A	EBIT Margin	Invested Capital	ROIC in 2017	ROIC: 2013-2017	Cost of capital
Power	$ 36.00	-1.64%	$ 2.80	$ 1.69	4.68%	$328.34	3.85%	9.28%	4.91%
Renewable Energy	$ 10.30	14.44%	$ 0.70	$ 0.41	4.00%	$49.91	6.19%	8.00%	6.88%
Oil & Gas	$ 17.20	33.33%	$ 0.20	$ (0.31)	-1.78%	$275.95	-0.83%	3.71%	8.82%
Aviation	$ 27.40	4.18%	$ 6.60	$ 5.80	21.19%	$192.73	22.59%	20.27%	8.52%
Healthcare	$ 19.10	4.37%	$ 3.40	$ 2.86	15.00%	$132.81	16.18%	15.07%	7.97%
Transportation	$ 4.20	-10.64%	$ 0.80	$ 0.70	16.56%	$20.73	25.17%	26.67%	7.49%
Lighting	$ 2.00	-58.33%	$ 0.10	$ 0.03	1.59%	$3.34	7.16%	9.66%	8.50%
Capital	$ 9.10	-16.51%	$ (6.80)	$ (7.04)	-77.40%	$723.38	-7.30%	-2.81%	3.64%
Total	$ 125.30	1.29%	$ 7.80	$ 4.15	3.31%	$1,727.18	1.80%	4.50%	6.23%

GE: Value of the Parts

Business	Revenues in 2017	Average EBIT Margin before G&A, 2013-17	Normalized EBIT before G&A	Normalized EBIT (with corporate expenses allocated)	Normalized EBIT (1-t)	Cost of Capital	ROIC - Next 5 years	Expected growth next 5 years	Value of Business
Power	$ 35,990.00	14.34%	$ 5,161.92	$ 4,061.80	$ 3,046.35	4.91%	9.28%	6.10%	$ 73,138.18
Renewable Energy	$ 10,280.00	8.24%	$ 847.46	$ 532.70	$ 399.53	6.88%	8.00%	16.34%	$ 6,455.88
Oil & Gas	$ 17,231.00	10.97%	$ 1,890.80	$ 1,365.19	$ 1,023.89	8.82%	3.71%	-0.13%	$ 11,924.66
Aviation	$ 27,375.00	22.09%	$ 6,046.58	$ 5,209.28	$ 3,906.96	8.52%	20.27%	4.55%	$ 52,849.35
Healthcare	$ 19,116.00	17.01%	$ 3,251.87	$ 2,668.20	$ 2,001.15	7.97%	15.07%	0.99%	$ 26,233.80
Transportation	$ 4,178.00	20.71%	$ 865.41	$ 737.06	$ 552.80	7.49%	26.67%	-6.62%	$ 6,075.26
Lighting	$ 1,987.00	5.24%	$ 104.14	$ 43.03	$ 32.27	8.50%	9.66%	-24.94%	$ 280.49
Total (non-capital)	$ 116,157.00	15.35%	$ 17,829.69	$ 17,551.60	$ 13,163.70				$ 176,957.62
GE Capital Business	$ 9,070.00	3.00%	$ 272.10	$ (5.98)	$ (4.49)	6.23%	0.00%	-4.25%	$ 27,080.96
								Value of businesses	$ 204,038.59
								- GE Debt	$ 83,568.00
								- GE Capital Debt	$ 51,023.00
								- Minority Interests	$ 17,723.00
								+ Cash	$ 43,299.00
								Value of equity	$ 95,023.59
								- Options	$ 218.94
								Value of equity in common stock	$ 94,804.65
								Value per share	$ 10.92

GE: Pricing the Parts

Business	Revenues in 2017	Normalized EBIT, using average margin (2013-17)	DA in 2017	EBITDA	Peer Group EV/EBITDA	Estimated Pricing
Power	$ 35,990.00	$ 4,061.80	$1,358.00	$5,419.80	10.55	$ 57,179
Renewable Energy	$ 10,280.00	$ 532.70	$ 259.00	$ 791.70	15.13	$ 11,978
Oil & Gas	$ 17,231.00	$ 1,365.19	$1,026.00	$2,391.19	12.15	$ 29,053
Aviation	$ 27,375.00	$ 5,209.28	$ 979.00	$6,188.28	6.56	$ 40,595
Healthcare	$ 19,116.00	$ 2,668.20	$ 806.00	$3,474.20	10.97	$ 38,112
Transportation	$ 4,178.00	$ 737.06	$ 135.00	$ 872.06	11.22	$ 9,785
Lighting	$ 1,987.00	$ 43.03	$ 86.00	$ 129.03	12.8	$ 1,652
Total (non-capital)	$ 116,157.00	$ 17,551.60				$ 188,353
GE Capital Business	$ 9,070.00	$ (5.98)	$2,343.00	$2,337.02	10.13	$ 23,674
					Pricing of Business	$ 212,027.44
					- GE Debt	$ 83,568.00
					- GE Capital Debt	$ 51,023.00
					- Minority Interests	$ 17,723.00
					+ Cash	$ 43,299.00
					Pricing of Equity	$ 103,012.44
					- Options	218.94
					Pricing of Equity in common stock	$ 102,793.50
					Estimating Pricing per share	**$11.84**

PRIVATE COMPANY VALUATION

Aswath Damodaran

Process of Valuing Private Companies

- The process of valuing private companies is not different from the process of valuing public companies. You estimate cash flows, attach a discount rate based upon the riskiness of the cash flows and compute a present value. As with public companies, you can either value
  - The entire business, by discounting cash flows to the firm at the cost of capital.
  - The equity in the business, by discounting cashflows to equity at the cost of equity.
- When valuing private companies, you face two standard problems:
  - There is not market value for either debt or equity
  - The financial statements for private firms are likely to go back fewer years, have less detail and have more holes in them.

1. No Market Value?

- Market values as inputs: Since neither the debt nor equity of a private business is traded, any inputs that require them cannot be estimated.
    1. Debt ratios for going from unlevered to levered betas and for computing cost of capital.
    2. Market prices to compute the value of options and warrants granted to employees.
- Market value as output: When valuing publicly traded firms, the market value operates as a measure of reasonableness. In private company valuation, the value stands alone.
- Market price based risk measures, such as beta and bond ratings, will not be available for private businesses.

2. Cash Flow Estimation Issues

- Shorter history: Private firms often have been around for much shorter time periods than most publicly traded firms. There is therefore less historical information available on them.
- Different Accounting Standards: The accounting statements for private firms are often based upon different accounting standards than public firms, which operate under much tighter constraints on what to report and when to report.
- Intermingling of personal and business expenses: In the case of private firms, some personal expenses may be reported as business expenses.
- Separating "Salaries" from "Dividends": It is difficult to tell where salaries end and dividends begin in a private firm, since they both end up with the owner.

Private Company Valuation: Motive matters

- You can value a private company for
  - 'Show' valuations
    - Curiosity: How much is my business really worth?
    - Legal purposes: Estate tax and divorce court
  - Transaction valuations
    - Sale or prospective sale to another individual or private entity.
    - Sale of one partner's interest to another
    - Sale to a publicly traded firm
  - As prelude to setting the offering price in an initial public offering
- You can value a division or divisions of a publicly traded firm
  - As prelude to a spin off
  - For sale to another entity
  - To do a sum-of-the-parts valuation to determine whether a firm will be worth more broken up or if it is being efficiently run.

Private company valuations: Four broad scenarios

- Private to private transactions: You can value a private business for sale by one individual to another.
- Private to public transactions: You can value a private firm for sale to a publicly traded firm.
- Private to IPO: You can value a private firm for an initial public offering.
- Private to VC to Public: You can value a private firm that is expected to raise venture capital along the way on its path to going public.

I. Private to Private transaction

- In private to private transactions, a private business is sold by one individual to another. There are three key issues that we need to confront in such transactions:
  - <u>Neither the buyer nor the seller is diversified</u>. Consequently, risk and return models that focus on just the risk that cannot be diversified away will seriously under estimate the discount rates.
  - <u>The investment is illiquid</u>. Consequently, the buyer of the business will have to factor in an "illiquidity discount" to estimate the value of the business.
  - <u>Key person value</u>: There may be a significant personal component to the value. In other words, the revenues and operating profit of the business reflect not just the potential of the business but the presence of the current owner.

An example: Valuing a restaurant

- Assume that you have been asked to value a upscale French restaurant for sale by the owner (who also happens to be the chef). Both the restaurant and the chef are well regarded, and business has been good for the last 3 years.
- The potential buyer is a former investment banker, who tired of the rat race, has decide to cash out all of his savings and use the entire amount to invest in the restaurant.
- You have access to the financial statements for the last 3 years for the restaurant. In the most recent year, the restaurant reported $ 1.2 million in revenues and $ 400,000 in pre-tax operating profit . While the firm has no conventional debt outstanding, it has a lease commitment of $120,000 each year for the next 12 years.