1. Just Story Telling
Trailing PE across Beverage Companies

Company Name	Trailing PE	Expected Growth	Standard Deviation
Coca-Cola Bottling	29.18	9.50%	20.58%
Molson Inc. Ltd. 'A'	43.65	15.50%	21.88%
Anheuser-Busch	24.31	11.00%	22.92%
Corby Distilleries Ltd.	16.24	7.50%	23.66%
Chalone Wine Group	21.76	14.00%	24.08%
Andres Wines Ltd. 'A'	8.96	3.50%	24.70%
Todhunter Int'l	8.94	3.00%	25.74%
Brown-Forman 'B'	10.07	11.50%	29.43%
Coors (Adolph) 'B'	23.02	10.00%	29.52%
PepsiCo, Inc.	33.00	10.50%	31.35%
Coca-Cola	44.33	19.00%	35.51%
Boston Beer 'A'	10.59	17.13%	39.58%
Whitman Corp.	25.19	11.50%	44.26%
Mondavi (Robert) 'A'	16.47	14.00%	45.84%
Coca-Cola Enterprises	37.14	27.00%	51.34%
Hansen Natural Corp	9.70	17.00%	62.45%

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A Question

☐ You are reading an equity research report on this sector, and the analyst claims that Andres Wine and Hansen Natural are under valued because they have low PE ratios. Would you agree?

a. Yes

b. No

☐ Why or why not?

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2: Statistical Controls
Comparing PE ratios across Telecom companies

Company Name	PE	Growth
PT Indosat ADR	7.8	0.06
Telebras ADR	8.9	0.075
Telecom Corporation of New Zealand ADR	11.2	0.11
Telecom Argentina Stet - France Telecom SA ADR B	12.5	0.08
Hellenic Telecommunication Organization SA ADR	12.8	0.12
Telecomunicaciones de Chile ADR	16.6	0.08
Swisscom AG ADR	18.3	0.11
Asia Satellite Telecom Holdings ADR	19.6	0.16
Portugal Telecom SA ADR	20.8	0.13
Telefonos de Mexico ADR L	21.1	0.14
Matav RT ADR	21.5	0.22
Telstra ADR	21.7	0.12
Gilat Communications	22.7	0.31
Deutsche Telekom AG ADR	24.6	0.11
British Telecommunications PLC ADR	25.7	0.07
Tele Danmark AS ADR	27	0.09
Telekomunikasi Indonesia ADR	28.4	0.32
Cable & Wireless PLC ADR	29.8	0.14
APT Satellite Holdings ADR	31	0.33
Telefonica SA ADR	32.5	0.18
Royal KPN NV ADR	35.7	0.13
Telecom Italia SPA ADR	42.2	0.14
Nippon Telegraph & Telephone ADR	44.3	0.2
France Telecom SA ADR	45.2	0.19
Korea Telecom ADR	71.3	0.44

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PE, Growth and Risk

Dependent variable is: PE

R squared = 66.2%   R squared (adjusted) = 63.1%

Variable	Coefficient	SE	t-ratio	Probability
Constant	13.1151	3.471	3.78	0.0010
Growth rate	121.223	19.27	6.29	≤ 0.0001
Emerging Market	-13.8531	3.606	-3.84	0.0009

Emerging Market is a dummy: 1 if emerging market

0 if not

Is Telebras under valued?

- □ Plugging in Telebras's expected growth rate and the fact that it is an emerging market company into the regression:

  - ❑ Predicted PE = 13.12 + 121.22 (.075) - 13.85 (1) = 8.35

  - ❑ At an actual price to earnings ratio of 8.9, Telebras is slightly overvalued.

- □ <u>Bottom line</u>: Just because a company trades at a low PE ratio does not make it cheap.

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3: An Eyeballing Exercise
PBV Ratios across European Banks in 2010

Name	PBV Ratio	Return on Equity	Standard Deviation
BAYERISCHE HYPO-UND VEREINSB	0.80	-1.66%	49.06%
COMMERZBANK AG	1.09	-6.72%	36.21%
DEUTSCHE BANK AG -REG	1.23	1.32%	35.79%
BANCA INTESA SPA	1.66	1.56%	34.14%
BNP PARIBAS	1.72	12.46%	31.03%
BANCO SANTANDER CENTRAL HISP	1.86	11.06%	28.36%
SANPAOLO IMI SPA	1.96	8.55%	26.64%
BANCO BILBAO VIZCAYA ARGENTA	1.98	11.17%	18.62%
SOCIETE GENERALE	2.04	9.71%	22.55%
ROYAL BANK OF SCOTLAND GROUP	2.09	20.22%	18.35%
HBOS PLC	2.15	22.45%	21.95%
BARCLAYS PLC	2.23	21.16%	20.73%
UNICREDITO ITALIANO SPA	2.30	14.86%	13.79%
KREDIETBANK SA LUXEMBOURGEOI	2.46	17.74%	12.38%
ERSTE BANK DER OESTER SPARK	2.53	10.28%	21.91%
STANDARD CHARTERED PLC	2.59	20.18%	19.93%
HSBC HOLDINGS PLC	2.94	18.50%	19.66%
LLOYDS TSB GROUP PLC	3.33	32.84%	18.66%
Average	2.05	12.54%	24.99%
Median	2.07	11.82%	21.93%

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The median test…

- We are looking for stocks that trade at low price to book ratios, while generating high returns on equity, with low risk. But what is a low price to book ratio? Or a high return on equity? Or a low risk

- One simple measure of what is par for the sector are the median values for each of the variables. A simplistic decision rule on under and over valued stocks would therefore be:

  - Undervalued stocks: Trade at price to book ratios below the median for the sector,(2.07), generate returns on equity higher than the sector median (11.82%) and have standard deviations lower than the median (21.93%).

  - Overvalued stocks: Trade at price to book ratios above the median for the sector and generate returns on equity lower than the sector median.

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The Statistical Alternative

- We are looking for stocks that trade at low price to book ratios, while generating high returns on equity. But what is a low price to book ratio? Or a high return on equity?

- Taking the sample of 18 banks, we ran a regression of PBV against ROE and standard deviation in stock prices (as a proxy for risk).

   PBV =   2.27   +   3.63 ROE -   2.68 Std dev

   (5.56)   (3.32)   (2.33)

   R squared of regression = 79%

- Reading the regression tea leaves:

  - Every 1% increase in the return on equity at a European bank increases its price to book ratio by 0.0363.

  - Every 1% increase in the standard deviation in equity reduces the price to book ratio by 0.0268.

  - The regression predictions will have a standard error, which is inversely proportionate to the R squared.

And these predictions?

| Name	PBV Ratio	Return on Equity	Standard Deviation	Predicted PBV	Under/Over (%)
BAYERISCHE HYPO-UND VEREINSB	0.80	-1.66%	49.06%	0.89	-10.60%
COMMERZBANK AG	1.09	-6.72%	36.21%	1.05	3.25%
DEUTSCHE BANK AG -REG	1.23	1.32%	35.79%	1.36	-9.26%
BANCA INTESA SPA	1.66	1.56%	34.14%	1.41	17.83%
BNP PARIBAS	1.72	12.46%	31.03%	1.89	-8.75%
BANCO SANTANDER CENTRAL HISP	1.86	11.06%	28.36%	1.91	-2.66%
SANPAOLO IMI SPA	1.96	8.55%	26.64%	1.86	5.23%
BANCO BILBAO VIZCAYA ARGENTA	1.98	11.17%	18.62%	2.17	-9.12%
SOCIETE GENERALE	2.04	9.71%	22.55%	2.02	1.37%
ROYAL BANK OF SCOTLAND GROUP	2.09	20.22%	18.35%	2.51	-16.65%
HBOS PLC	2.15	22.45%	21.95%	2.49	-13.71%
BARCLAYS PLC	2.23	21.16%	20.73%	2.48	-9.96%
UNICREDITO ITALIANO SPA	2.30	14.86%	13.79%	2.44	-5.72%
KREDIETBANK SA LUXEMBOURGEOI	2.46	17.74%	12.38%	2.58	-4.79%
ERSTE BANK DER OESTER SPARK	2.53	10.28%	21.91%	2.05	23.11%
STANDARD CHARTERED PLC	2.59	20.18%	19.93%	2.47	5.00%
HSBC HOLDINGS PLC	2.94	18.50%	19.66%	2.41	21.91%
LLOYDS TSB GROUP PLC	3.33	32.84%	18.66%	2.96	12.40%

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4: More Statistics and a Larger Sample
Price to Book versus ROE: Largest firms in the US: January 2010
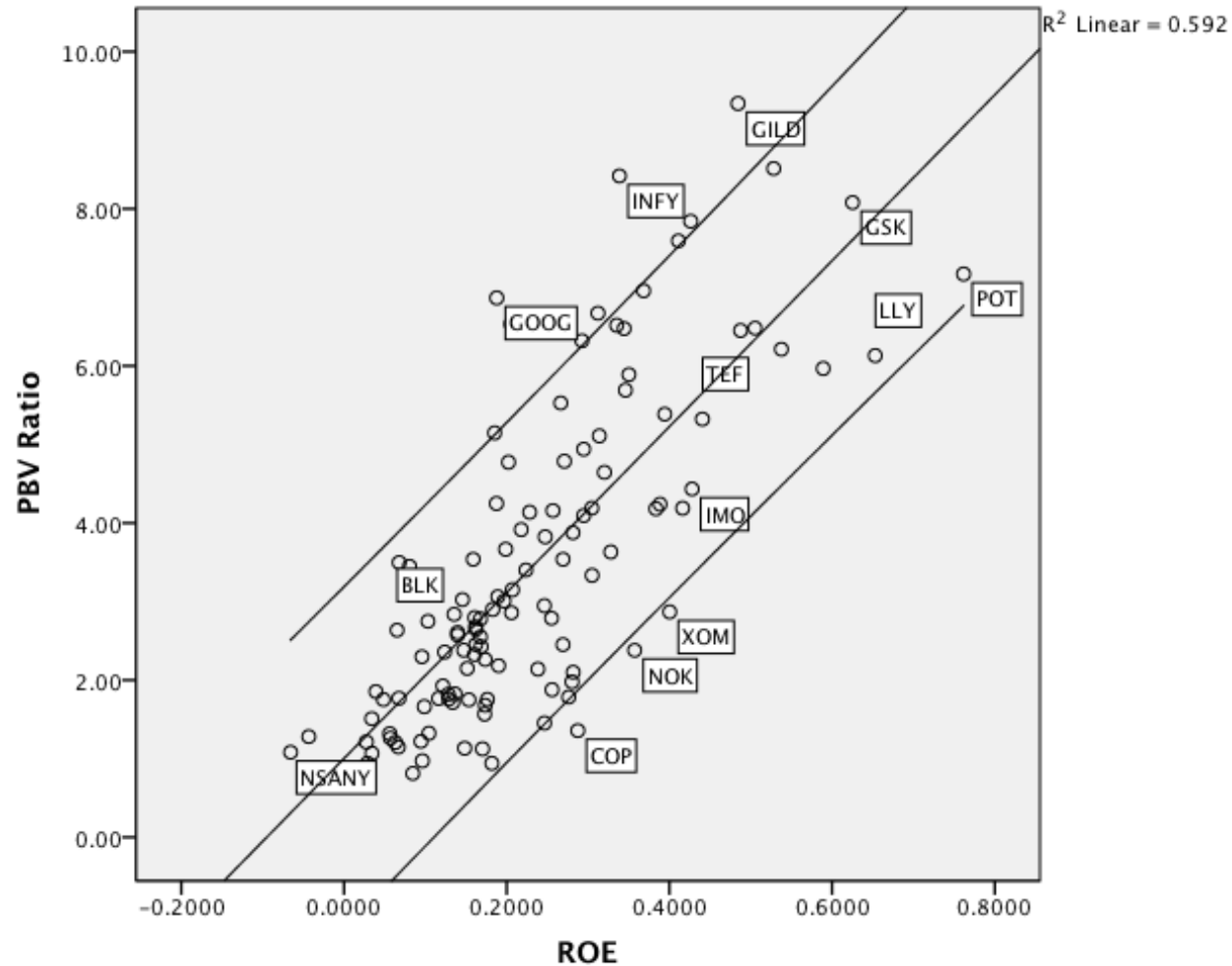
Missing growth?
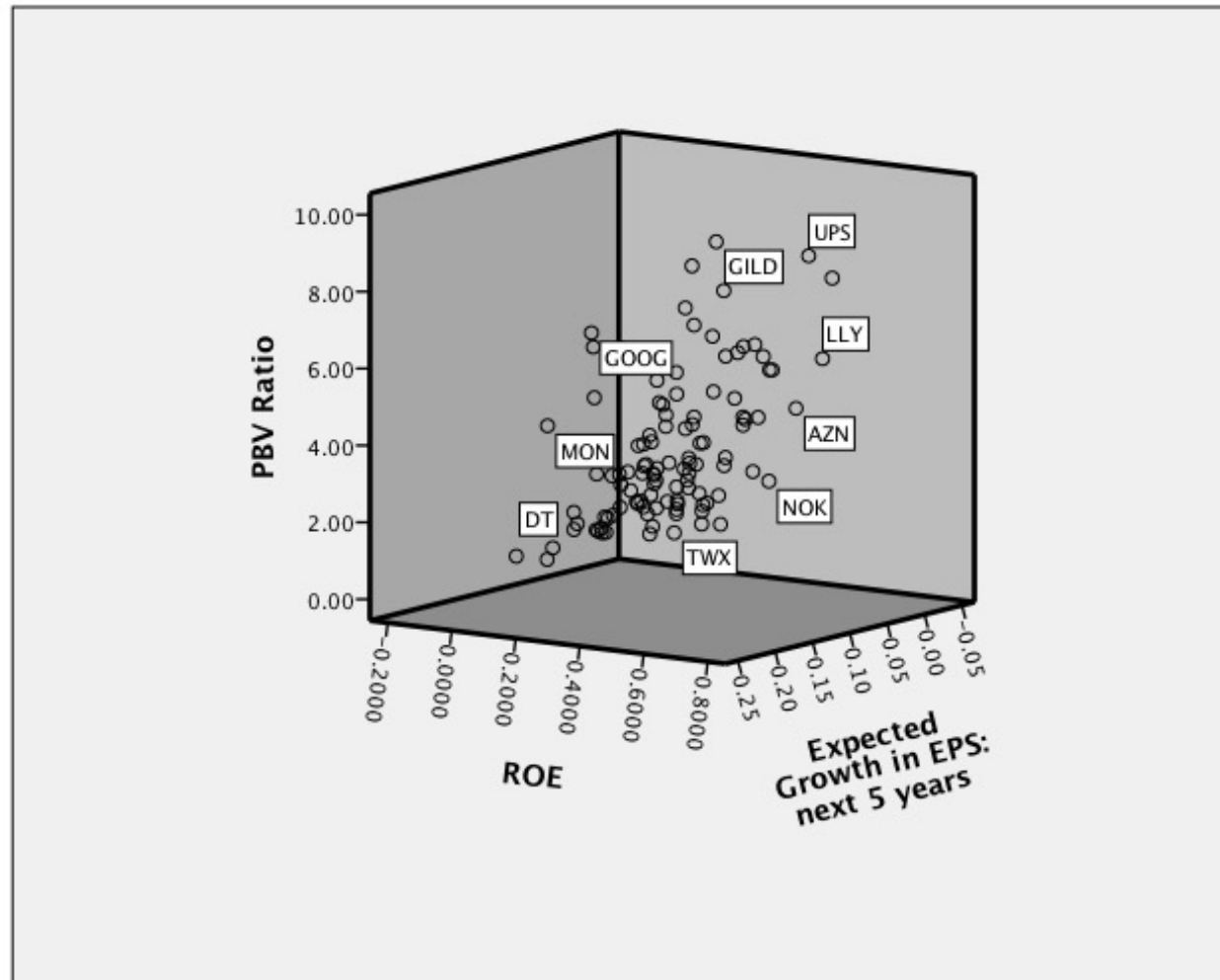
PBV, ROE and Risk: Large Cap US firms

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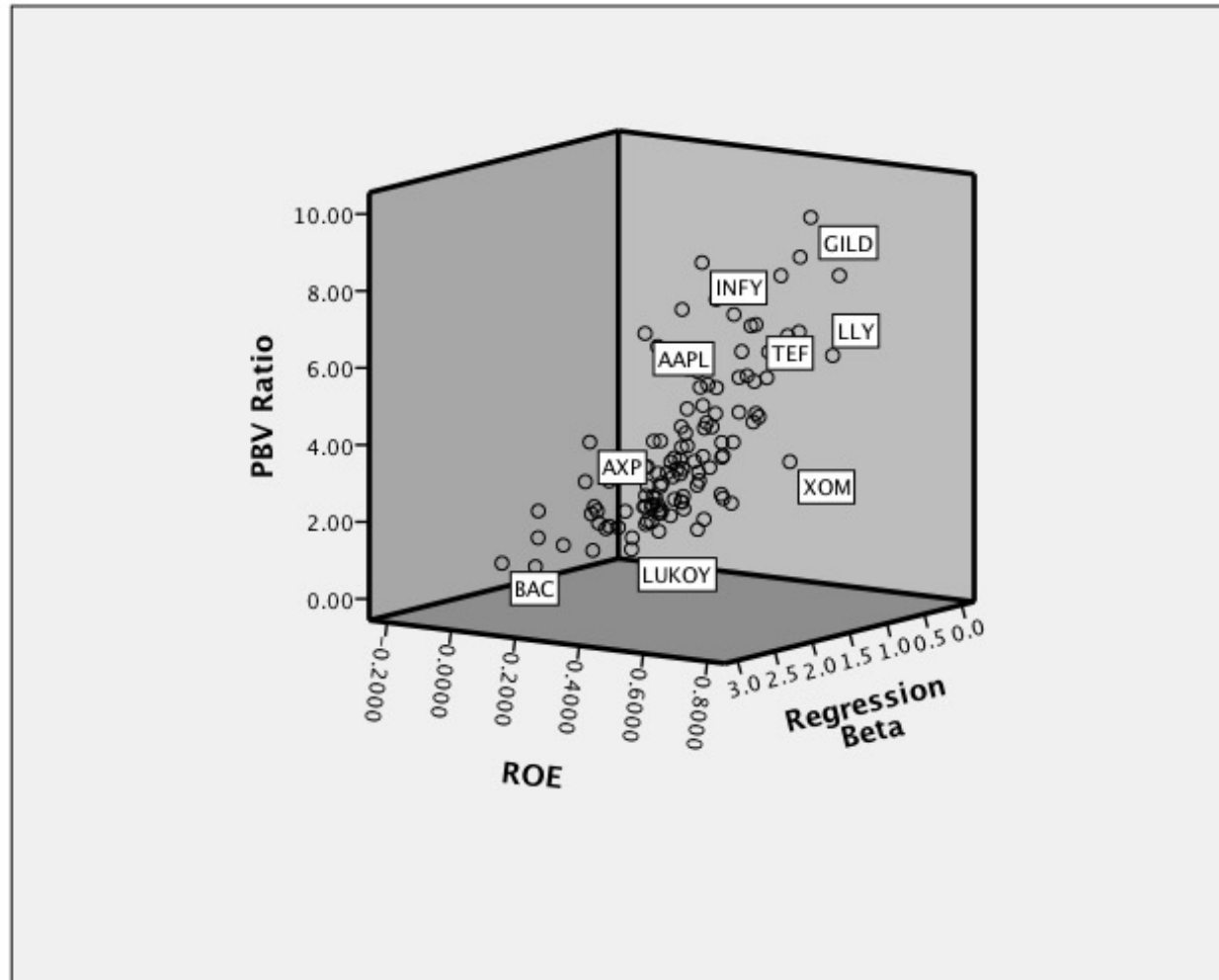
Bringing it all together... Largest US stocks in January 2010

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.819[a]	.670	.661	1.19253

a. Predictors: (Constant), ROE, Expected Growth in EPS: next 5 years, Regression Beta

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.406	.424		.958	.340
	Regression Beta	−.065	.253	−.015	−.256	.799
	Expected Growth in EPS: next 5 years	9.340	2.366	.228	3.947	.000
	ROE	10.546	.771	.777	13.672	.000

a. Dependent Variable: PBV Ratio

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Updated PBV Ratios – Largest Market Cap US companies -Updated to January 2022

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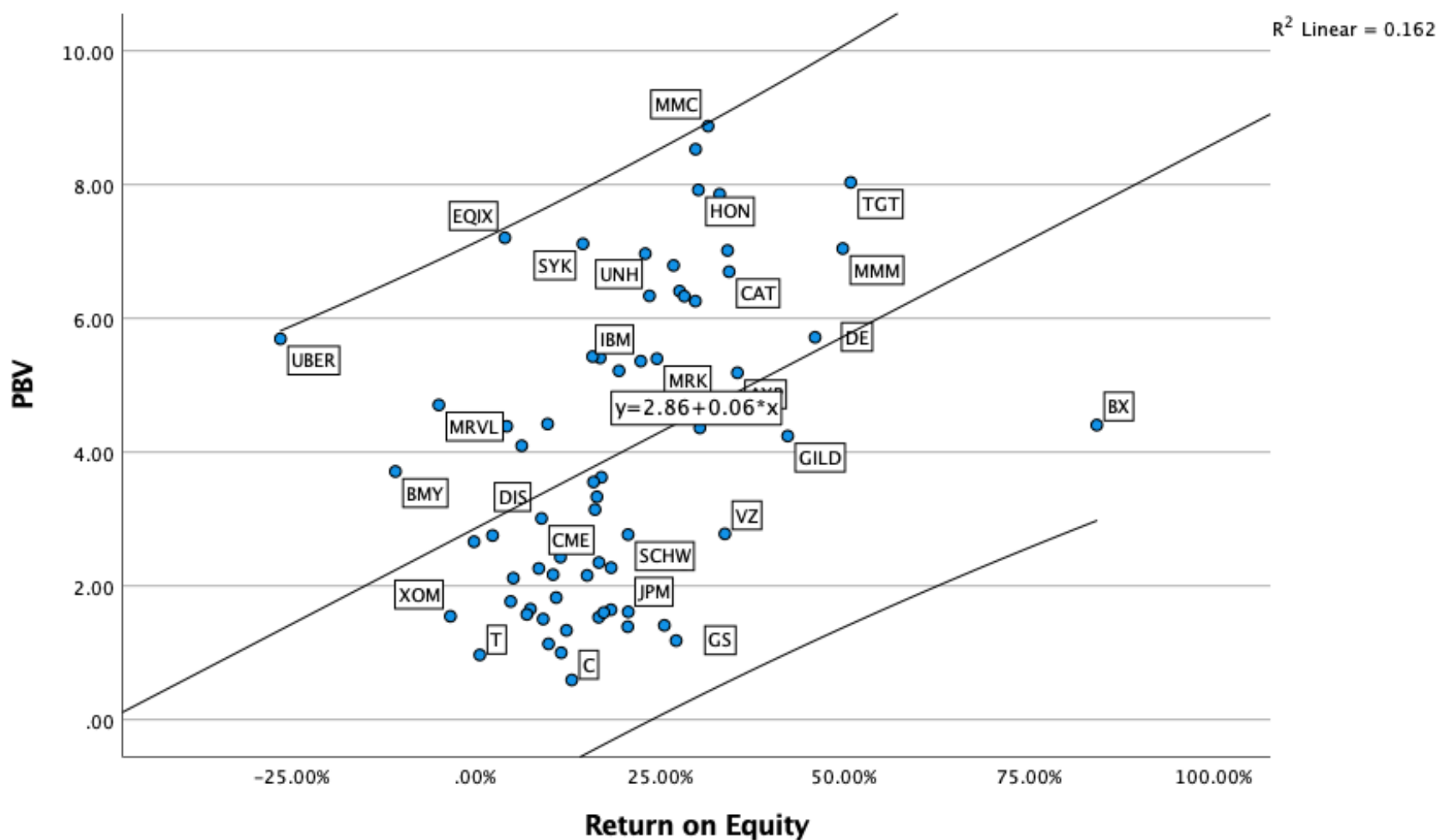
Example 5: Overlooked fundamentals? EV/EBITDA Multiple for Trucking Companies

| Company Name	Value	EBITDA	Value/EBITDA
KLLM Trans. Svcs.	$ 114.32	$ 48.81	2.34
Ryder System	$ 5,158.04	$ 1,838.26	2.81
Rollins Truck Leasing	$ 1,368.35	$ 447.67	3.06
Cannon Express Inc.	$ 83.57	$ 27.05	3.09
Hunt (J.B.)	$ 982.67	$ 310.22	3.17
Yellow Corp.	$ 931.47	$ 292.82	3.18
Roadway Express	$ 554.96	$ 169.38	3.28
Marten Transport Ltd.	$ 116.93	$ 35.62	3.28
Kenan Transport Co.	$ 67.66	$ 19.44	3.48
M.S. Carriers	$ 344.93	$ 97.85	3.53
Old Dominion Freight	$ 170.42	$ 45.13	3.78
Trimac Ltd	$ 661.18	$ 174.28	3.79
Matlack Systems	$ 112.42	$ 28.94	3.88
XTRA Corp.	$ 1,708.57	$ 427.30	4.00
Covenant Transport Inc	$ 259.16	$ 64.35	4.03
Builders Transport	$ 221.09	$ 51.44	4.30
Werner Enterprises	$ 844.39	$ 196.15	4.30
Landstar Sys.	$ 422.79	$ 95.20	4.44
AMERCO	$ 1,632.30	$ 345.78	4.72
USA Truck	$ 141.77	$ 29.93	4.74
Frozen Food Express	$ 164.17	$ 34.10	4.81
Arnold Inds.	$ 472.27	$ 96.88	4.87
Greyhound Lines Inc.	$ 437.71	$ 89.61	4.88
USFreightways	$ 983.86	$ 198.91	4.95
Golden Eagle Group Inc.	$ 12.50	$ 2.33	5.37
Arkansas Best	$ 578.78	$ 107.15	5.40
Airlease Ltd.	$ 73.64	$ 13.48	5.46
Celadon Group	$ 182.30	$ 32.72	5.57
Amer. Freightways	$ 716.15	$ 120.94	5.92
Transfinancial Holdings	$ 56.92	$ 8.79	6.47
Vitran Corp. 'A'	$ 140.68	$ 21.51	6.54
Interpool Inc.	$ 1,002.20	$ 151.18	6.63
Intrenet Inc.	$ 70.23	$ 10.38	6.77
Swift Transportation	$ 835.58	$ 121.34	6.89
Landair Services	$ 212.95	$ 30.38	7.01
CNF Transportation	$ 2,700.69	$ 366.99	7.36
Budget Group Inc	$ 1,247.30	$ 166.71	7.48
Caliber System	$ 2,514.99	$ 333.13	7.55
Knight Transportation Inc	$ 269.01	$ 28.20	9.54
Heartland Express	$ 727.50	$ 64.62	11.26
Greyhound CDA Transn Corp	$ 83.25	$ 6.99	11.91
Mark VII	$ 160.45	$ 12.96	12.38
Coach USA Inc	$ 678.38	$ 51.76	13.11
US 1 Inds Inc.	$ 5.60	$ (0.17)	NA
Average			**5.61**

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A Test on EBITDA

☐ Ryder System looks very cheap on a Value/EBITDA multiple basis, relative to the rest of the sector. What explanation (other than misvaluation) might there be for this difference?

☐ What general lessons would you draw from this on the EV/EBITDA multiples for infrastructure companies as their infrastructure ages?

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Example 6: Pricing across time - PS Ratios Grocery Stores - US in January 2007
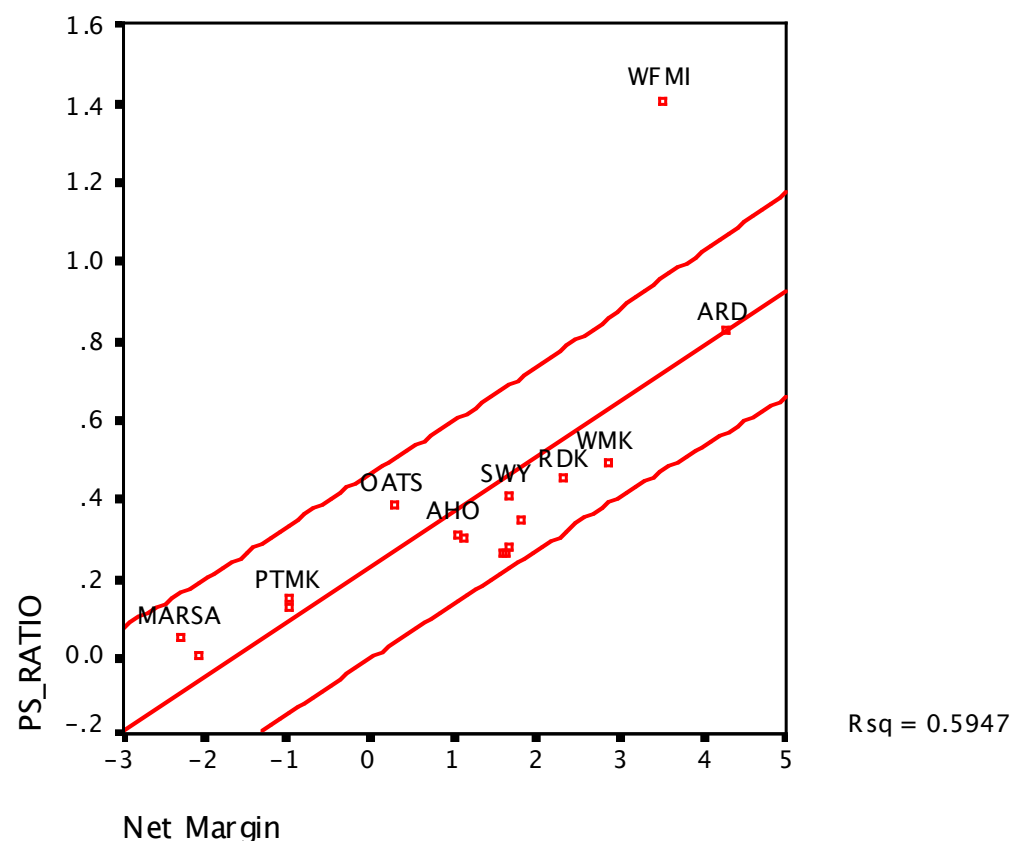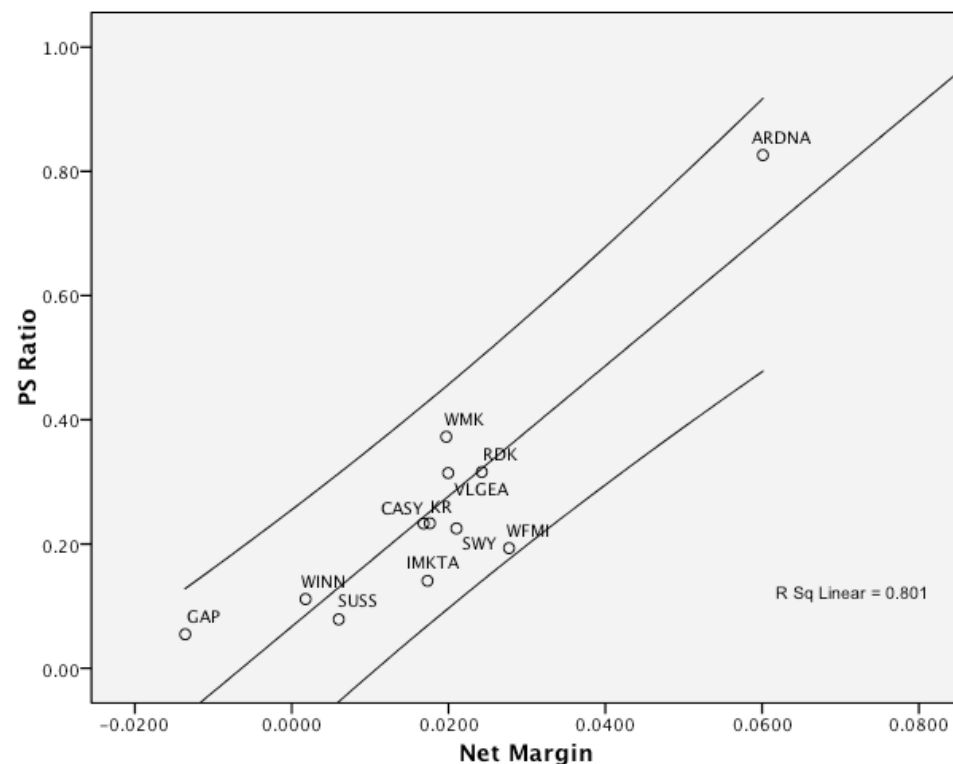

Whole Foods: In 2007: Net Margin was 3.41% and Price/ Sales ratio was 1.41
Predicted Price to Sales = 0.07 + 10.49 (0.0341) = 0.43

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The difference two years can make: Grocery Stores - US in January 2009
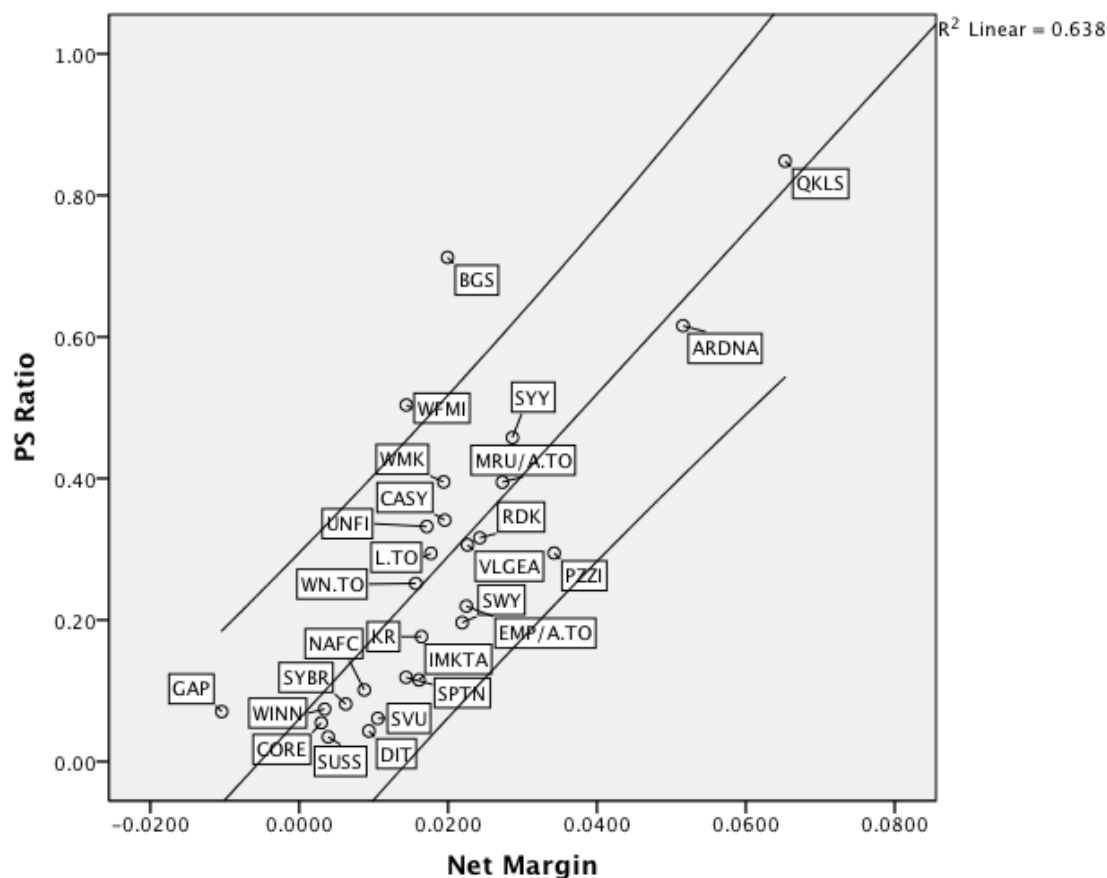

Whole Foods: In 2009, Net Margin had dropped to 2.77% and Price to Sales ratio was down to 0.31.

Predicted Price to Sales = 0.07 + 10.49 (.0277) = 0.36
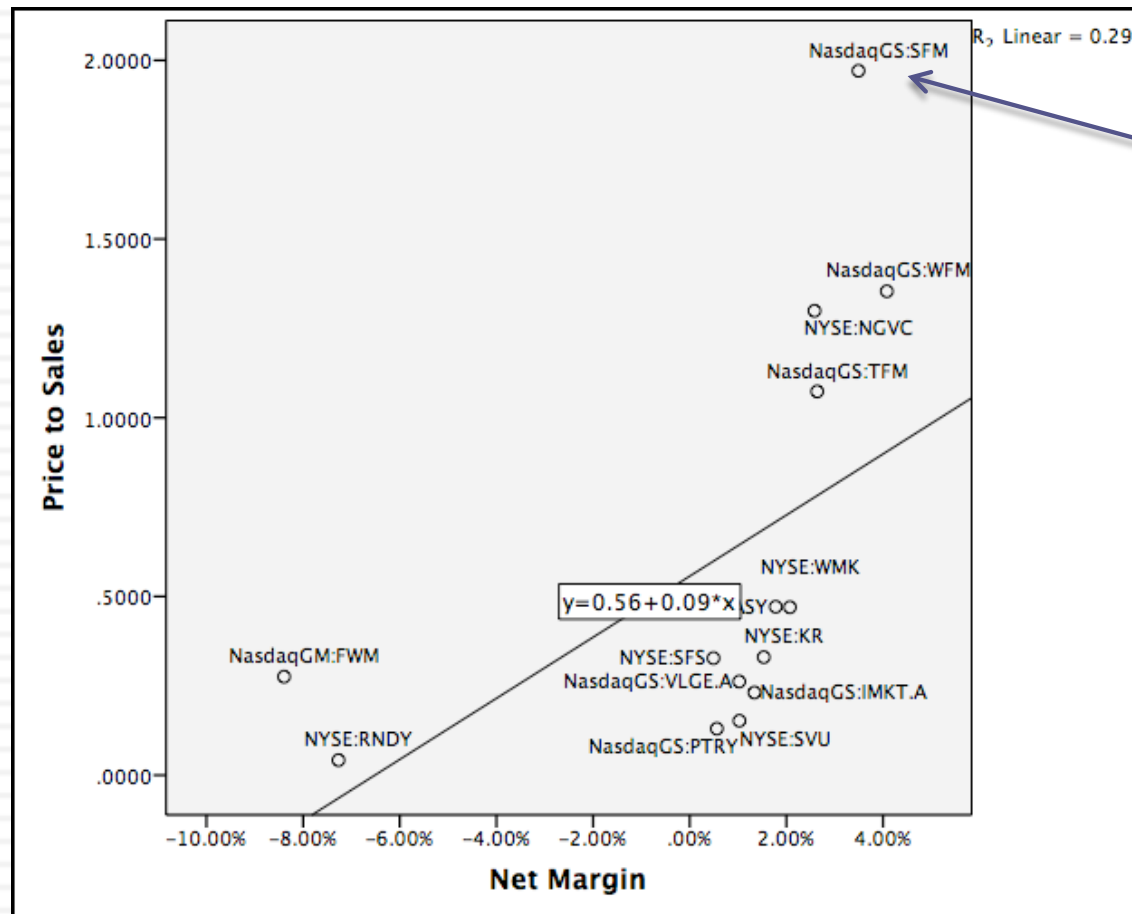
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Is this steady State? In 2010..

Whole Foods: In 2010, Net Margin had dropped to 1.44% and Price to Sales ratio increased to 0.50.
Predicted Price to Sales = 0.06 + 11.43 (.0144) = 0.22

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There is a new kid in town: January 2015

There is a new star in town (Sprouts)
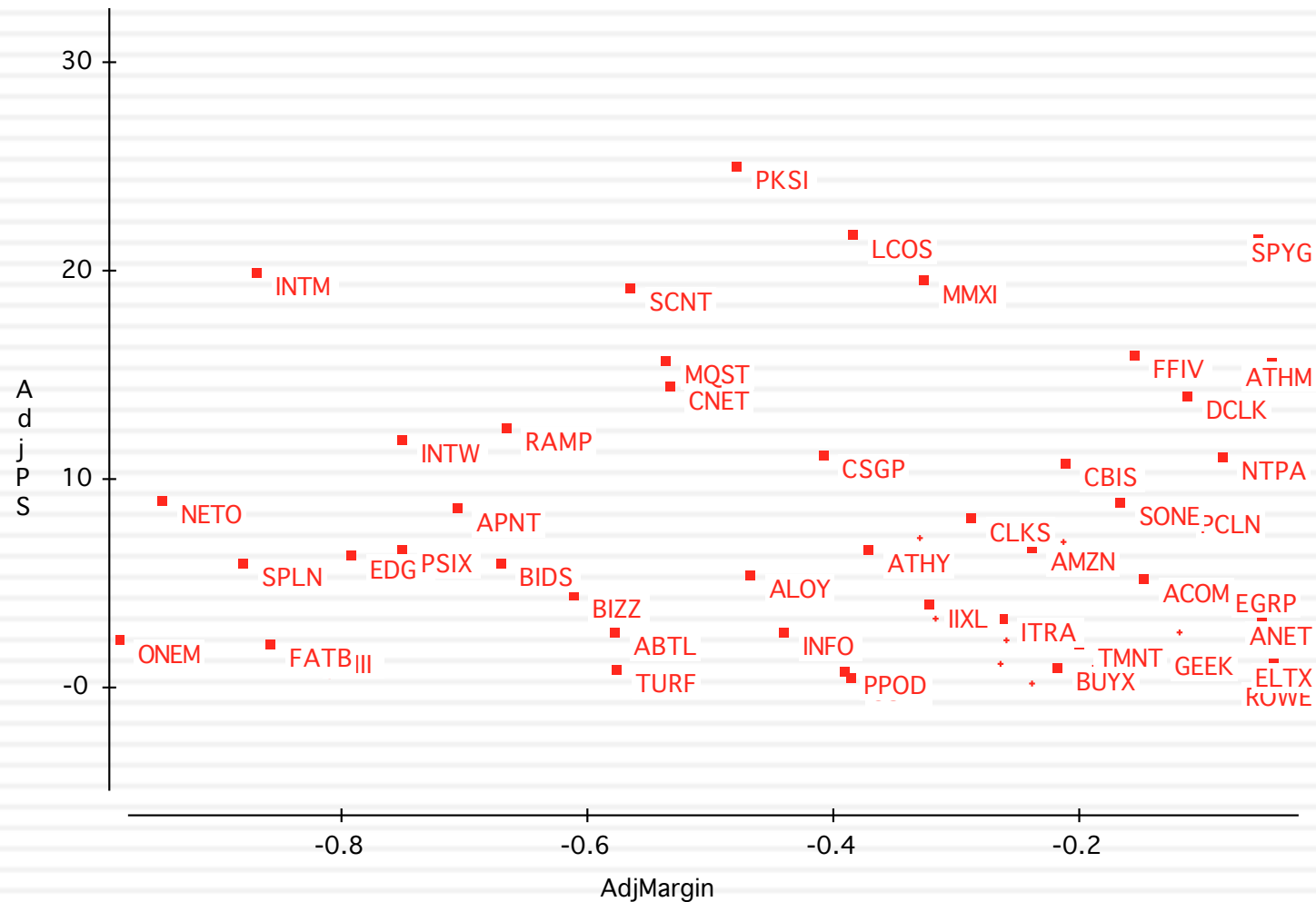
PS = 0.557 + 0.085 Net Margin
Whole Foods = 0.557 + 8.50 (0.0408) = 0.90
At 1.35 times sales, Whole Foods is overvalued (again)

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Example 7: Nothing's working! Internet Stocks in early 2000..

PS Ratios and Margins are not highly correlated

- Regressing PS ratios against current margins yields the following

    PS = 81.36 - 7.54(Net Margin)   R2 = 0.04

                    (0.49)

- This is not surprising. These firms are priced based upon expected margins, rather than current margins.

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Solution 1: Use proxies for survival and growth: Amazon in early 2000

- Hypothesizing that firms with higher revenue growth and higher cash balances should have a greater chance of surviving and becoming profitable, we ran the following regression: (The level of revenues was used to control for size)

PS = 30.61 - 2.77 ln(Rev) + 6.42 (Rev Growth) + 5.11 (Cash/Rev)

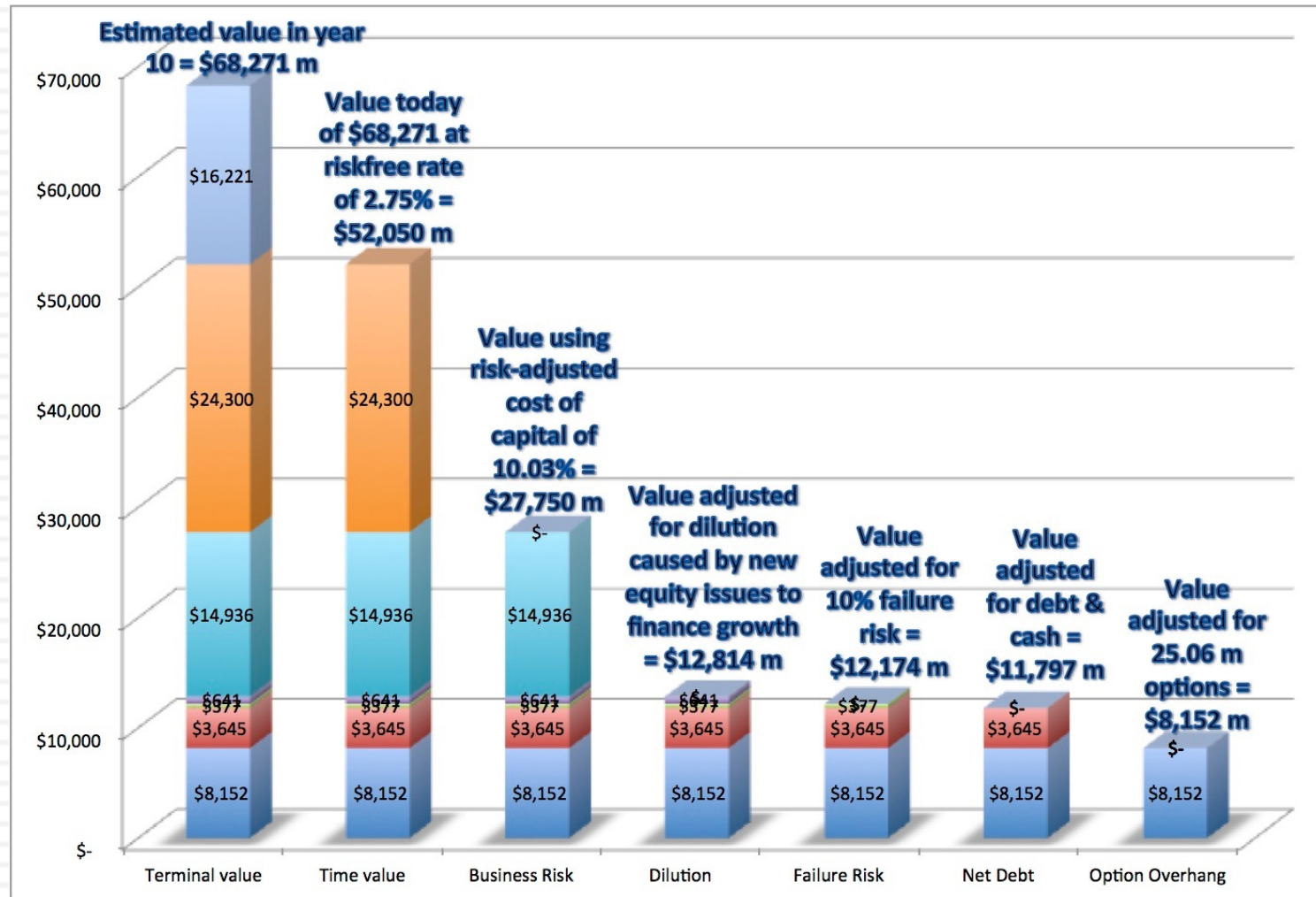$\qquad$ (0.66) $\qquad$ (2.63) $\qquad$ (3.49)

R squared = 31.8%

- Predicted PS = 30.61 - 2.77(7.1039) + 6.42(1.9946) + 5.11 (.3069) = 30.42

- Actual PS = 25.63

Stock is undervalued, relative to other internet stocks.

Solution 2: Use forward multiples
Watch out for bumps in the road (Tesla)

Solution 3: Let the market tell you what matters.. Social media in October 2013

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

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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?

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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 2022

Scatter Plot of Trailing PE by Expected growth rate in EPS– Next 5 years

Broad Group: United States

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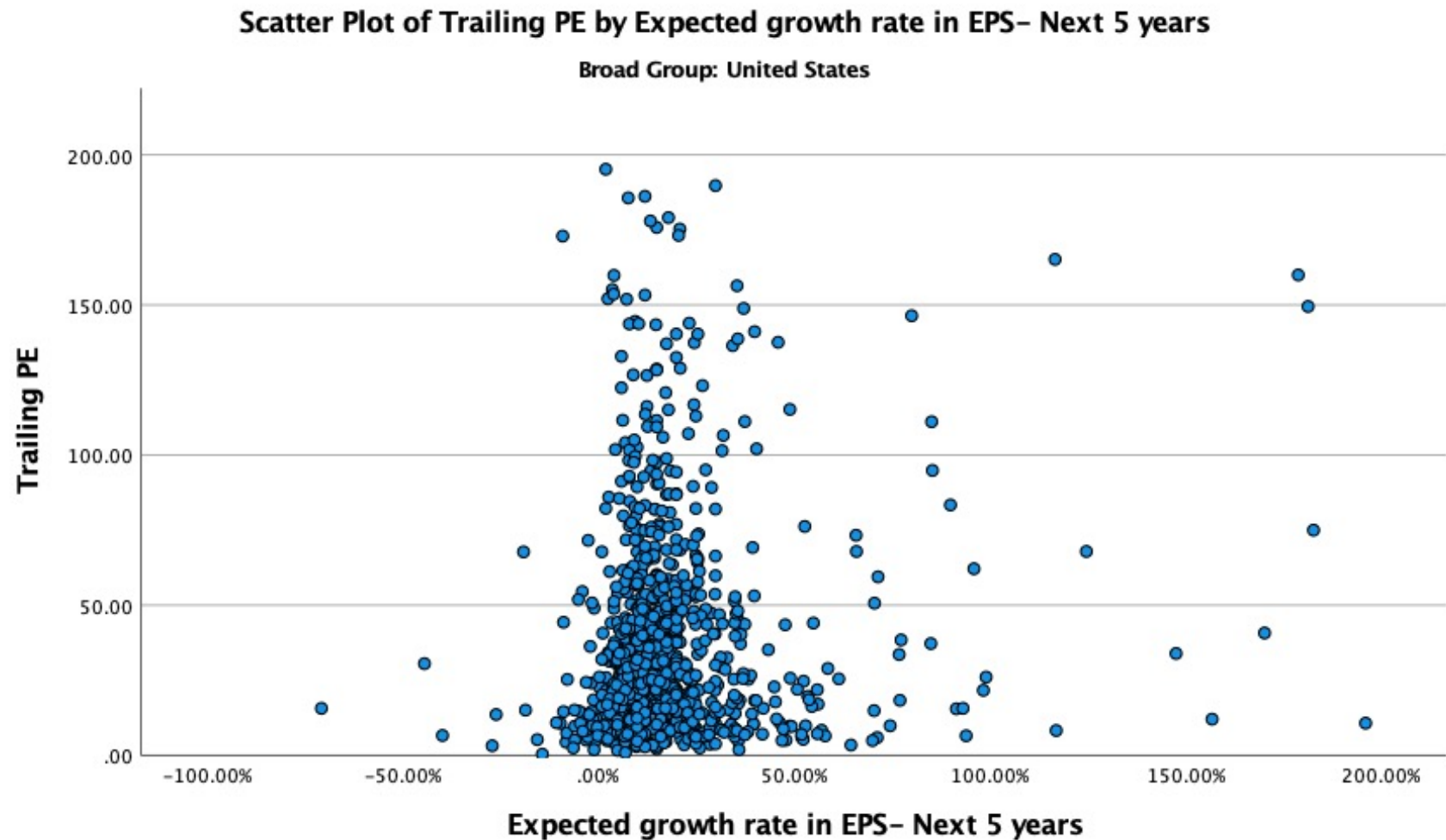
PE Ratio: Standard Regression for US stocks - January 2022

Model Summary[a]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.231[b]	.053	.051	4834.03933

a. Broad Group = United States

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

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		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	33.327	2.694		12.369	<.001
	Beta	−7.107	2.474	−.086	−2.873	.004
	Payout ratio	.075	.021	.105	3.537	<.001
	Expected growth rate in EPS– Next 5 years	.494	.063	.243	7.897	<.001

a. Broad Group = United States

b. Dependent Variable: Trailing PE

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

Aswa

Problems with the regression methodology

- <u>Non-linearity</u>: The basic regression assumes a linear relationship between PE ratios and the financial proxies, and that might not be appropriate.

- <u>Non-stationarity</u>: 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. For instance, the 2022 regression has a markedly lower R-squared than the regressions in prior years, as the COVID effect on earnings plays out.

- <u>Multi-collinearity</u>: 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.

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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.

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		Standardized Coefficients		
		B	Std. Error	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 $)

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If a coefficient has the wrong sign: The Multicollinearity Problem

Correlations[a]

		Trailing PE	Beta	Expected growth rate in EPS– Next 5 years	Payout ratio
Trailing PE	Pearson Correlation	1	.048[*]	.125[**]	.188[**]
	Sig. (2–tailed)		.012	<.001	<.001
	N	2834	2726	1221	2819
Beta	Pearson Correlation	.048[*]	1	.163[**]	−.017
	Sig. (2–tailed)	.012		<.001	.369
	N	2726	5792	1461	2782
Expected growth rate in EPS– Next 5 years	Pearson Correlation	.125[**]	.163[**]	1	−.188[**]
	Sig. (2–tailed)	<.001	<.001		<.001
	N	1221	1461	1574	1240
Payout ratio	Pearson Correlation	.188[**]	−.017	−.188[**]	1
	Sig. (2–tailed)	<.001	.369	<.001	
	N	2819	2782	1240	2905

*. Correlation is significant at the 0.05 level (2–tailed).

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

a. Broad Group = United States
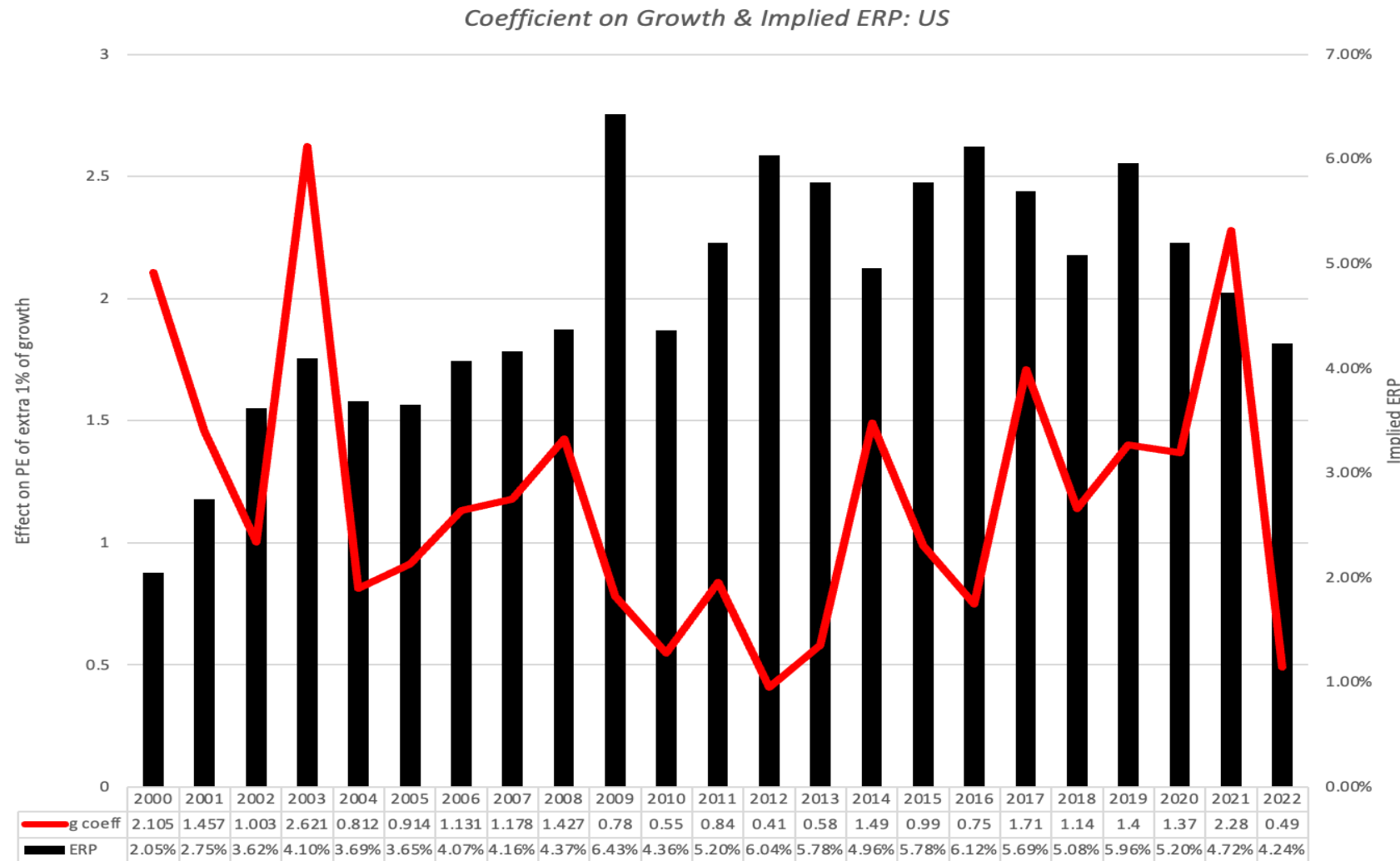
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Using the PE ratio regression

☐ Assume that you were given the following information for Disney. The firm has an expected growth rate of 15%, a beta of 0.90 and a 20% dividend payout ratio. Based upon the regression, the predicted PE ratio for Disney is:

  ◼ Predicted PE = 33.33 – 7.11 (0.9) + 0.075(20) + 0.494 (15) = 35.84

☐ Disney is actually trading at 38 times earnings. What does the predicted PE tell you?

☐ Assume now that you priced Disney against just its peer group. Will you come to the same pricing judgment as you did when you looked at it relative to the market? Why or why not?
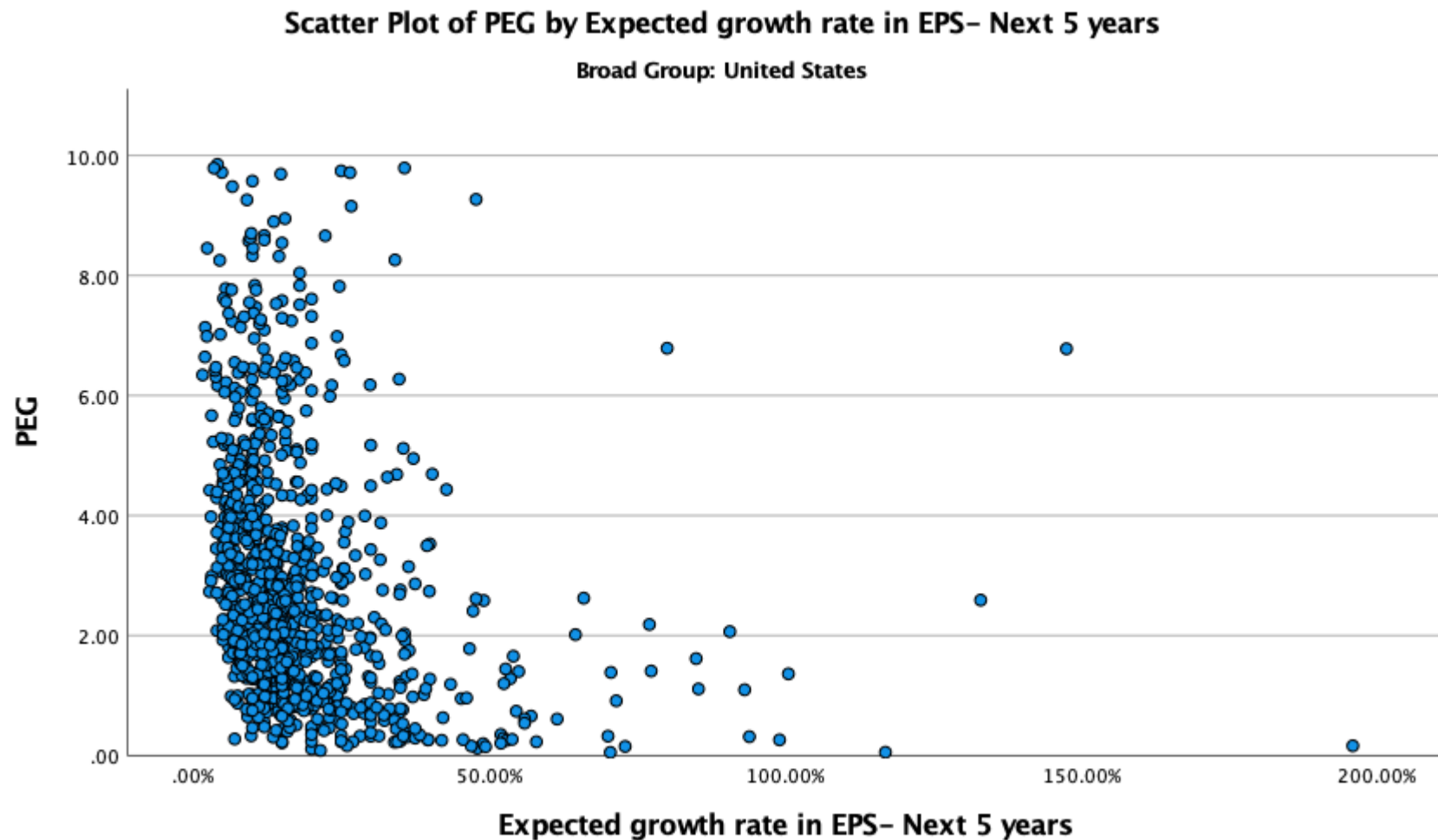
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The value of growth

Coefficient on Growth & Implied ERP: US

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
g coeff	2.105	1.457	1.003	2.621	0.812	0.914	1.131	1.178	1.427	0.78	0.55	0.84	0.41	0.58	1.49	0.99	0.75	1.71	1.14	1.4	1.37	2.28	0.49
ERP	2.05%	2.75%	3.62%	4.10%	3.69%	3.65%	4.07%	4.16%	4.37%	6.43%	4.36%	5.20%	6.04%	5.78%	4.96%	5.78%	6.12%	5.69%	5.08%	5.96%	5.20%	4.72%	4.24%

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II. PEG Ratio versus the market
PEG versus Growth

Scatter Plot of PEG by Expected growth rate in EPS– Next 5 years

Broad Group: United States

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PEG versus ln(Expected Growth)

Scatter Plot of PEG by lnGrowth
Broad Group: United States

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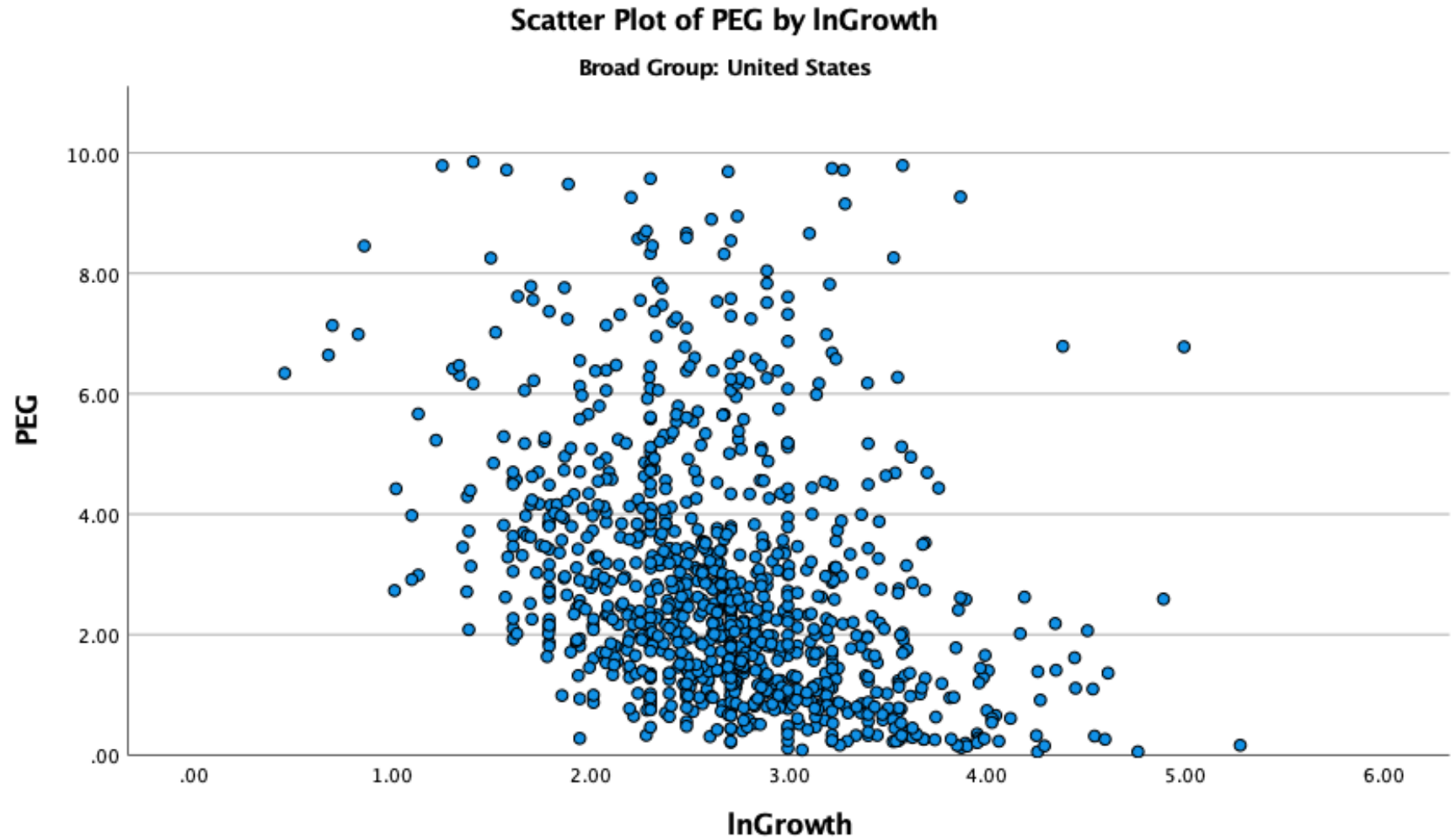
PEG Ratio Regression - US stocks January 2022

Model Summary[a]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.361[b]	.131	.128	331.81260

a. Broad Group = United States

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

Coefficients[a,b,c]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.229	.346		15.119	<.001
	Beta	-.427	.189	-.073	-2.253	.024
	Payout ratio	.009	.002	.149	4.265	<.001
	lnGrowth	-.735	.113	-.234	-6.514	<.001

a. Broad Group = United States

b. Dependent Variable: PEG

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

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I. PE ratio regressions across markets

Region	Regression – January 2022	R^2
US	PE = 33.33 – 7.11 Beta + 7.50 Payout + 49.4 g_{EPS}	5.1%
Europe	PE = 30.23 -9.06Beta + 12.60 Payout + 27.40 g_{EPS}	9.4%
Japan	PE = 18.17– 3.40 Beta + 7.40 Payout + 59.70 g_{EPS}	12.5%
Emerging Markets	PE = 15.08 + 0.40 Beta + 2.60 Payout + 66.90 g_{EPS}	16.7%
Australia, NZ, Canada	PE = 16.65 -5.88 Beta + 10.20 Payout + 100.20 g_{EPS}	29.4%
Global	**PE = 28.52 – 5.89 Beta + 6.20 Payout + 51.30 g_{EPS}**	**7.6%**

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

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II. PEG ratio regressions across markets

Region	Regression – January 2021	R^2
US	PEG $= 5.23 - 0.43$ Beta $+ 0.90$ Payout $- 0.74 \ln(g_{EPS})$	12.8%
Europe	PEG $= 6.18 - 0.67$ Beta $- 0.10$ Payout $- 0.95 \ln(g_{EPS})$	21.9%
Japan	PEG $= 5.34 - 0.19$ Beta $- 0.10$ Payout $- 0.93 \ln(g_{EPS})$	18.7%
Emerging Markets	PEG $= 2.83 - 0.31$ Beta $+ 1.10$ Payout $- 0.21 \ln(g_{EPS})$	11.1%
Australia, NZ, Canada	PEG $= 5.34 - 0.57$ Beta $+ 0.80$ Payout $- 0.99 \ln(g_{EPS})$	26.4%
Global	**PEG $= 5.16 - 0.60$ Beta $+ 0.40$ Payout $- 6.81 \ln(g_{EPS})$**	**14.3%**

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

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

Region	Regression – January 2021	R^2
US	$PBV = 4.71 - 2.23\ Beta - 0.20\ Payout + 1.80\ g_{EPS} + 8.00\ ROE$	31.3%
Europe	$PBV = 3.68 - 1.27\ Beta + 0.20\ Payout + 5.00\ g_{EPS} + 5.50\ ROE$	20.3%
Japan	$PBV = 1.35 - 0.75\ Beta - 0.80\ Payout + 6.60\ g_{EPS} + 12.00\ ROE$	22.9%
Emerging Markets	$PBV = 0.15\ Beta + 1.40\ Payout + 2.20\ g_{EPS} + 10.70\ ROE$	31.1%
Australia, NZ, Canada	$PBV = 1.40 - 1.17\ Beta + 0.30\ Payout + 6.80\ g_{EPS} + 8.70\ ROE$	36.2%
Global	**$PBV = 2.55 - 0.86\ Beta + 0.20\ Payout + 1.90\ g_{EPS} + 8.60\ ROE$**	**24.4%**

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.

IV. EV/EBITDA

Region	Regression – January 2021	R squared
United States	EV/EBITDA= 29.24 – 34.00 DFR + 68.40 g - 49.30 Tax Rate	28.4%
Europe	EV/EBITDA= 25.86 – 16.90 DFR + 34.300 g - 27.30 Tax Rate	21.0%
Japan	EV/EBITDA= 14,76 + 2.70 DFR + 84.70 g - 28.40 Tax Rate	33.1%
Emerging Markets	EV/EBITDA= 24.54 – 21.10 DFR + 51.30 g - 37.70 Tax Rate	26.0%
Australia, NZ & Canada	EV/EBITDA= 27.47 – 19.10 DFR + 8.00 g - 28.10 Tax Rate	8.2%
Global	**EV/EBITDA= 27.39 – 21.00 DFR + 52.50 g - 41.20 Tax Rate**	**25.1%**

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

V. EV/Sales Regressions across markets…

Region	Regression – January 2020	R Squared
United States	EV/Sales = 4.51 – 6.40 Tax Rate – 0.70 DFR + 2.90 g + 6.90 Op. Margin	20.6%
Europe	EV/Sales = 3.24 – 2.80 Tax Rate + 0.60 DFR + 3.10 g + 5.30 Op. Margin	9.5%
Japan	EV/Sales = 1.86 – 2.10 Tax Rate – 0.10 DFR + 5.40 g + 6.00 Op. Margin	20.2%
Emerging Markets	EV/Sales = 2.76 – 0.20 Tax Rate – 1.70 DFR + 5.00g + 5.50 Op. Margin	26.9%
Australia, NZ & Canada	EV/Sales = 1.90 – 1.10 Tax Rate + 5.50 DFR + 2.50 g + 4.50 Op. Margin	17.2%
Global	**EV/Sales = 3.68 – 3.800 Tax Rate – 0.60 DFR + 3.40 g + 6.40 Op. Margin**	**18.0%**

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

VI. EV/Invested Capital

Region	Regression – January 2020	R Squared
United States	EV/IC = 4.47– 4.50 DFR + 1.80 g + 5.50 ROIC	57.2%
Europe	EV/IC = 4.03– 4.30 DFR + 0.60 g + 4.00 ROIC	50.8%
Japan	EV/IC = 2.31 – 2.60 DFR + 2.30 g + 6.60 ROIC	48.5%
Emerging Markets	EV/IC = 3.22 – 3.90 DFR + 2.70 g + 2.80 ROIC	52.2%
Australia, NZ & Canada	EV/IC = 3.56 – 3.70 DFR + 0.10 g + 2.50 ROIC	41.3%
Global	**EV/IC = 3. 85 – 4.10 DFR + 1.50 g + 4.70 ROIC**	**51.3%**

g =Expected Revenue Growth: Expected growth in revenues: Near term (2 or 5 years)
DFR: Debt Ratio
ROIC = Return on Invested Capital

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.

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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**

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