IT'S ALL RELATIVE: EINSTEIN MEETS PE!

Aswath Damodaran

Updated: January 2014

The Essence of relative valuation?

- In relative valuation, the value of an asset is compared to the values assessed by the market for similar or comparable assets.
- To do relative valuation then,
  - we need to identify comparable assets and obtain market values for these assets
  - convert these market values into standardized values, since the absolute prices cannot be compared This process of standardizing creates price multiples.
  - compare the standardized value or multiple for the asset being analyzed to the standardized values for comparable asset, controlling for any differences between the firms that might affect the multiple, to judge whether the asset is under or over valued

Relative valuation is pervasive…

- Most asset valuations are relative.
- Most equity valuations on Wall Street are relative valuations.
  - Almost 85% of equity research reports are based upon a multiple and comparables.
  - More than 50% of all acquisition valuations are based upon multiples
  - Rules of thumb based on multiples are not only common but are often the basis for final valuation judgments.
- While there are more discounted cashflow valuations in consulting and corporate finance, they are often relative valuations masquerading as discounted cash flow valuations.
  - The objective in many discounted cashflow valuations is to back into a number that has been obtained by using a multiple.
  - The terminal value in a significant number of discounted cashflow valuations is estimated using a multiple.

Why relative valuation?

"If you think I'm crazy, you should see the gu
lives across the hall"

Jerry Seinfeld talking about Kramer in a Seinfeld episode

" A little inaccuracy sometimes saves tons of explanation"

H.H. Munro

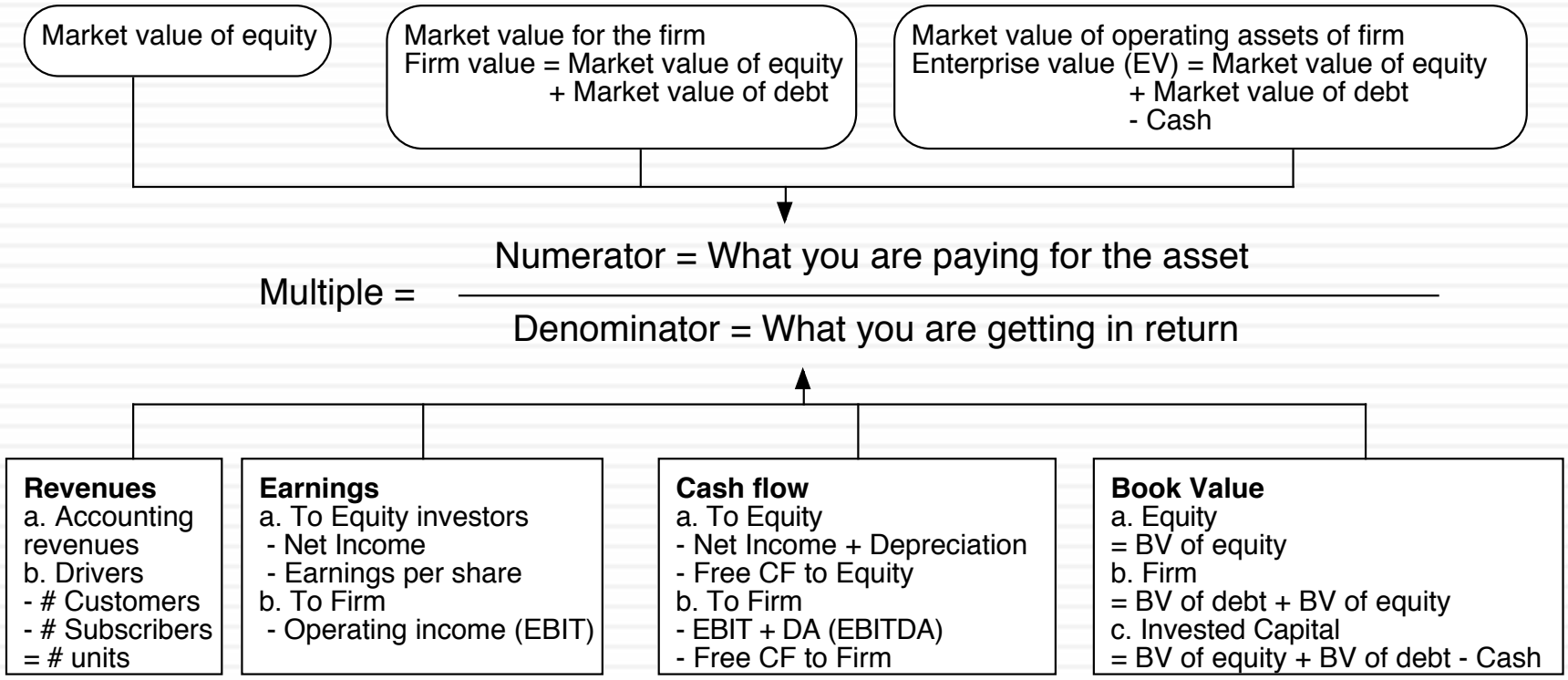
" If you are going to screw up, make sure that you have lots of company"

Ex-portfolio manager

The Market Imperative....

- Relative valuation is much more likely to reflect market perceptions and moods than discounted cash flow valuation. This can be an advantage when it is important that the price reflect these perceptions as is the case when
  - the objective is to sell a security at that price today (as in the case of an IPO)
  - investing on "momentum" based strategies
- With relative valuation, there will always be a significant proportion of securities that are under valued and over valued.
- Since portfolio managers are judged based upon how they perform on a relative basis (to the market and other money managers), relative valuation is more tailored to their needs
- Relative valuation generally requires less information than discounted cash flow valuation (especially when multiples are used as screens)

Multiples are just standardized estimates of price…



The Four Steps to Deconstructing Multiples

- Define the multiple
  - In use, the same multiple can be defined in different ways by different users. When comparing and using multiples, estimated by someone else, it is critical that we understand how the multiples have been estimated
- Describe the multiple
  - Too many people who use a multiple have no idea what its cross sectional distribution is. If you do not know what the cross sectional distribution of a multiple is, it is difficult to look at a number and pass judgment on whether it is too high or low.
- Analyze the multiple
  - It is critical that we understand the fundamentals that drive each multiple, and the nature of the relationship between the multiple and each variable.
- Apply the multiple
  - Defining the comparable universe and controlling for differences is far more difficult in practice than it is in theory.

Definitional Tests

- Is the multiple consistently defined?
  - Proposition 1: Both the value (the numerator) and the standardizing variable (the denominator) should be to the same claimholders in the firm. In other words, the value of equity should be divided by equity earnings or equity book value, and firm value should be divided by firm earnings or book value.
- Is the multiple uniformly estimated?
  - The variables used in defining the multiple should be estimated uniformly across assets in the "comparable firm" list.
  - If earnings-based multiples are used, the accounting rules to measure earnings should be applied consistently across assets. The same rule applies with book-value based multiples.

Example 1: Price Earnings Ratio: Definition

PE = Market Price per Share / Earnings per Share

- There are a number of variants on the basic PE ratio in use. They are based upon how the price and the earnings are defined.
- Price: is usually the current price
  is sometimes the average price for the year
- EPS: EPS in most recent financial year
  EPS in trailing 12 months
  Forecasted earnings per share next year
  Forecasted earnings per share in future year

Example 2: Staying on PE ratios

- Assuming that you are comparing the PE ratios across technology companies, many of which have options outstanding. What measure of PE ratio would yield the most consistent comparisons?
  a. Price/ Primary EPS (actual shares, no options)
  b. Price/ Fully Diluted EPS (actual shares + all options)
  c. Price/ Partially Diluted EPS (counting only in-the-money options)
  d. Other

Example 3: Enterprise Value /EBITDA Multiple

- The enterprise value to EBITDA multiple is obtained by netting cash out against debt to arrive at enterprise value and dividing by EBITDA.

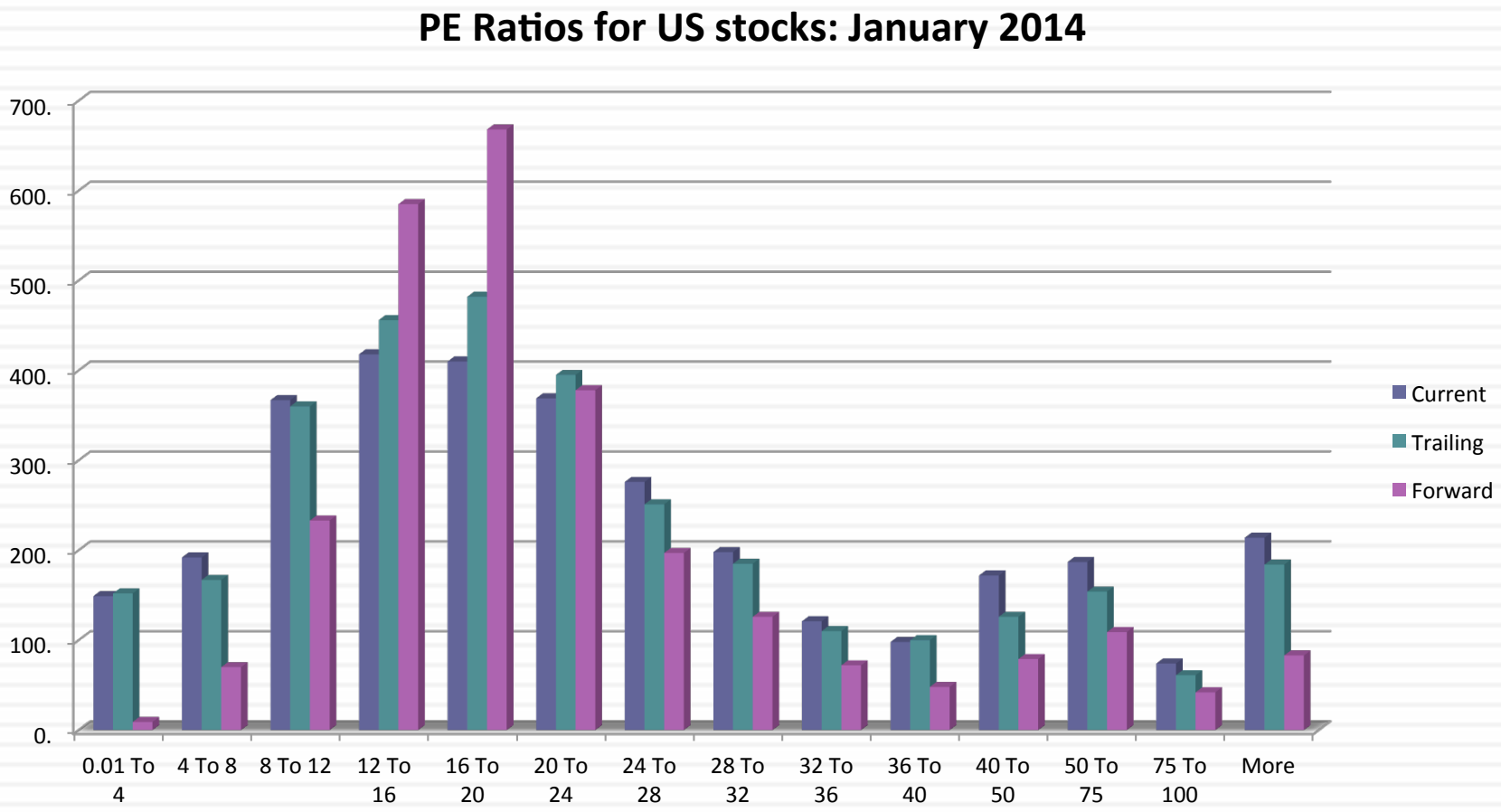
$$\frac{\text{Enterprise Value}}{\text{EBITDA}} = \frac{\text{Market Value of Equity + Market Value of Debt - Cash}}{\text{Earnings before Interest, Taxes and Depreciation}}$$

- Why do we net out cash from firm value?
- What happens if a firm has cross holdings which are categorized as:
  - Minority interests?
  - Majority active interests?

Descriptive Tests

- What is the average and standard deviation for this multiple, across the universe (market)?
- What is the median for this multiple?
  - The median for this multiple is often a more reliable comparison point.
- How large are the outliers to the distribution, and how do we deal with the outliers?
  - Throwing out the outliers may seem like an obvious solution, but if the outliers all lie on one side of the distribution (they usually are large positive numbers), this can lead to a biased estimate.
- Are there cases where the multiple cannot be estimated? Will ignoring these cases lead to a biased estimate of the multiple?
- How has this multiple changed over time?

1. Multiples have skewed distributions…

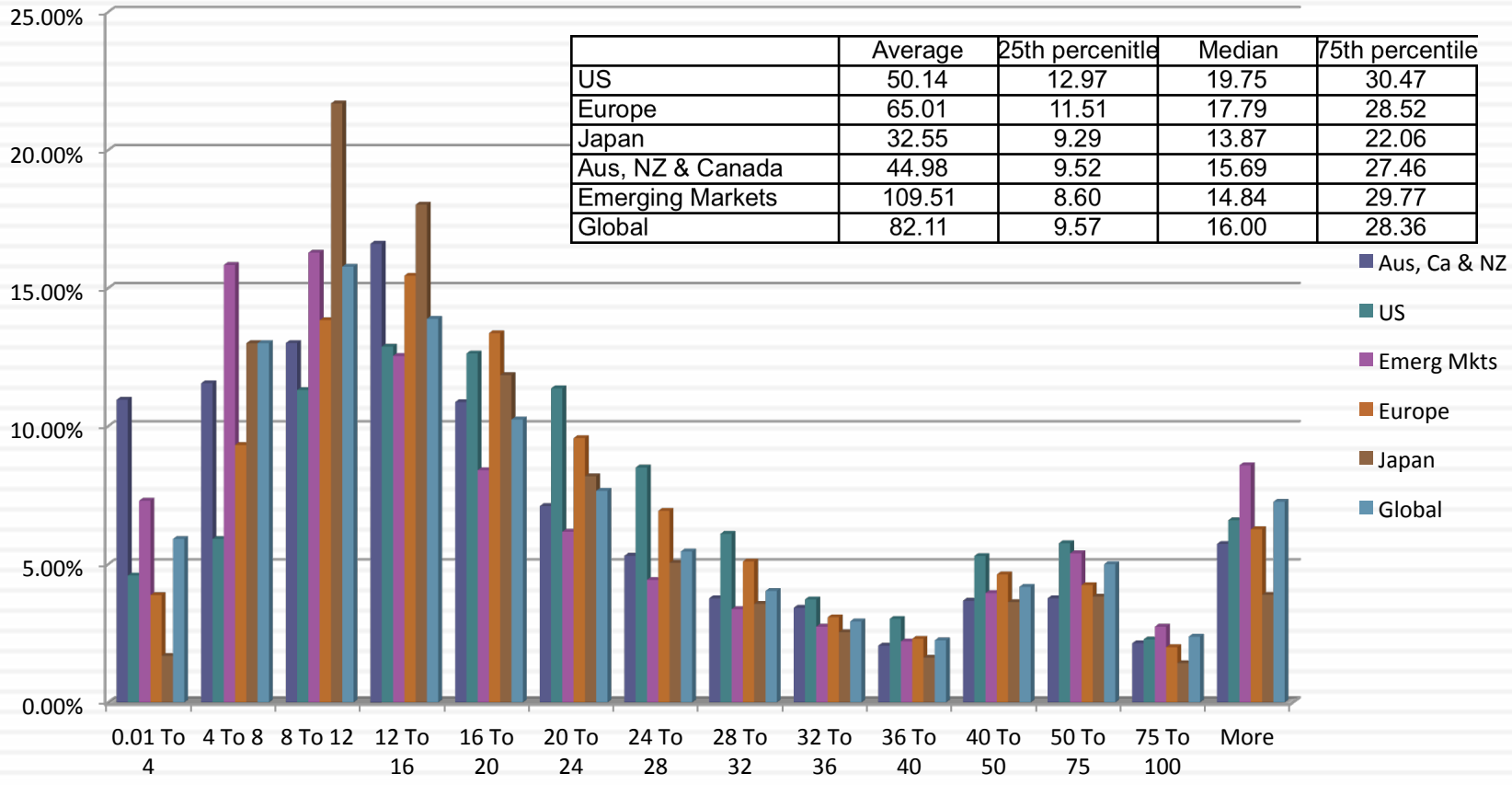


2. Making statistics "dicey"

	Current PE	*Trailing PE*	*Forward PE*
Number of firms	*7766*	*7766*	*7766*
Number with PE	3248	3186	2699
Average	52.13	50.14	38.62
Median	20.78	19.75	18.54
Minimum	0.25	0.4	0.52
Maximum	7,117.43	7,117.43	16,820.
Standard deviation	242.03	249.64	349.38
Standard error	4.25	4.42	6.72
Skewness	18.29	17.62	42.99
25th percentile	13.004	12.97	14.7
75th percentile	33.66	30.47	25.13

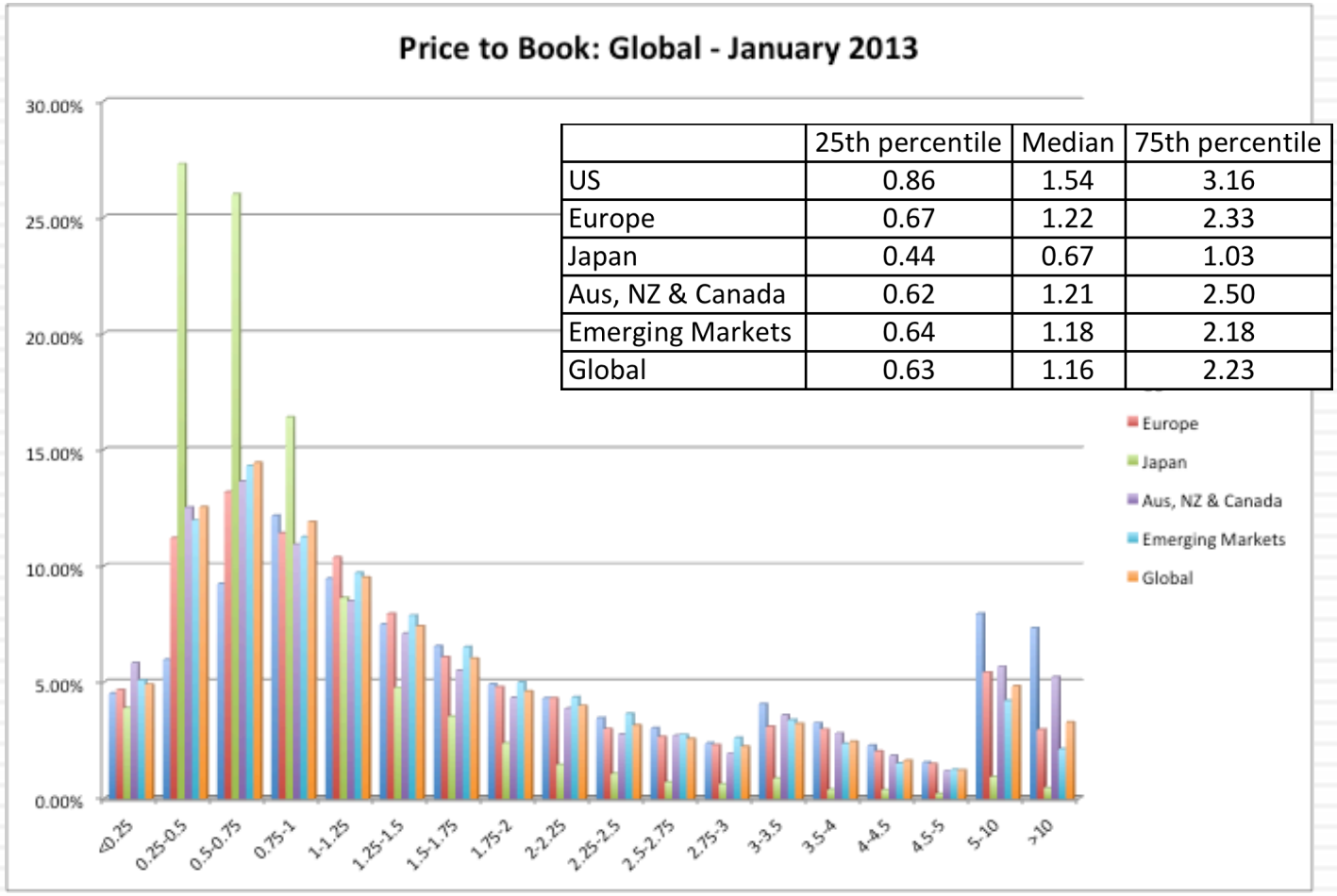
3. Markets have a lot in common : Comparing Global PEs

PE Ratio Distribution: Global Comparison in January 2014



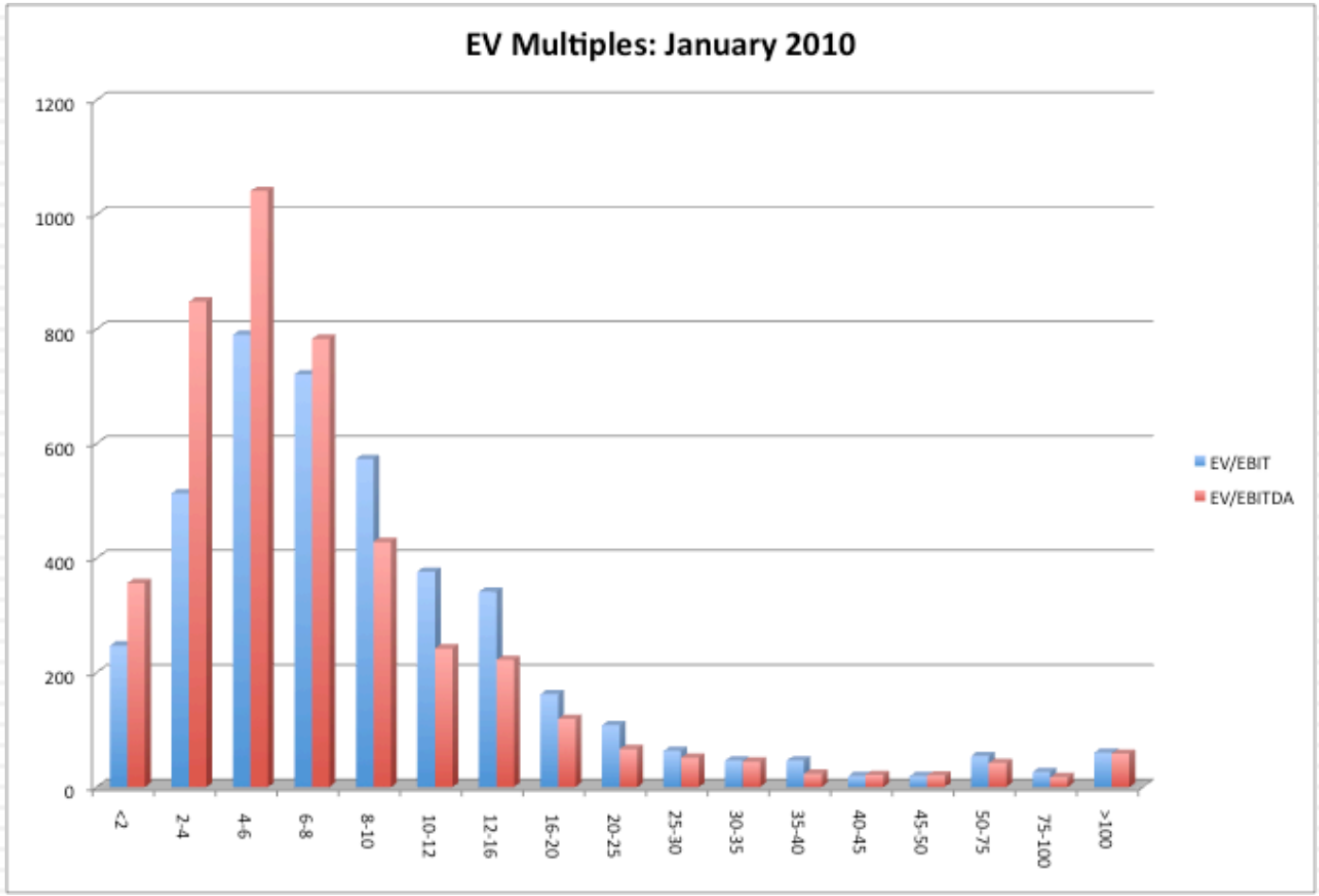
	Average	25th percenitle	Median	75th percentile
US	50.14	12.97	19.75	30.47
Europe	65.01	11.51	17.79	28.52
Japan	32.55	9.29	13.87	22.06
Aus, NZ & Canada	44.98	9.52	15.69	27.46
Emerging Markets	109.51	8.60	14.84	29.77
Global	82.11	9.57	16.00	28.36

3a. And the differences are revealing…
Price to Book Ratios across globe – January 2013



	25th percentile	Median	75th percentile
US	0.86	1.54	3.16
Europe	0.67	1.22	2.33
Japan	0.44	0.67	1.03
Aus, NZ & Canada	0.62	1.21	2.50
Emerging Markets	0.64	1.18	2.18
Global	0.63	1.16	2.23

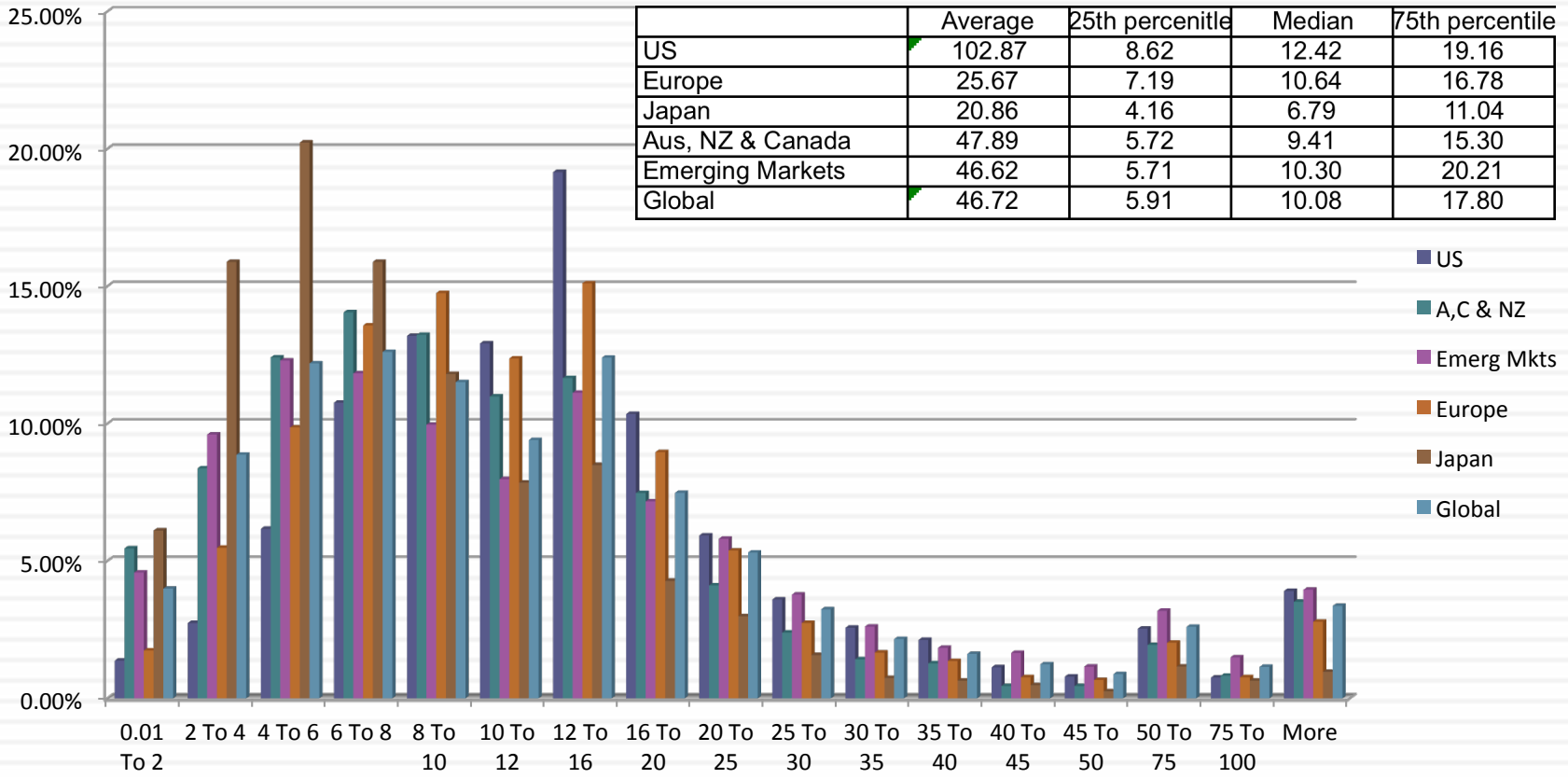
4. Simplistic rules almost always break down…6 times EBITDA was not cheap in 2010…



But it may be in 2014, unless you are in Japan or in some emerging markets…

EV/EBITDA: A Global Comparison - January 2014

	Average	25th percenitle	Median	75th percentile
US	102.87	8.62	12.42	19.16
Europe	25.67	7.19	10.64	16.78
Japan	20.86	4.16	6.79	11.04
Aus, NZ & Canada	47.89	5.72	9.41	15.30
Emerging Markets	46.62	5.71	10.30	20.21
Global	46.72	5.91	10.08	17.80



Analytical Tests

- What are the fundamentals that determine and drive these multiples?
  - Proposition 2: Embedded in every multiple are all of the variables that drive every discounted cash flow valuation - growth, risk and cash flow patterns.
- How do changes in these fundamentals change the multiple?
  - The relationship between a fundamental (like growth) and a multiple (such as PE) is almost never linear.
  - Proposition 3: It is impossible to properly compare firms on a multiple, if we do not know how fundamentals and the multiple move.

A Simple Analytical device

Equity Multiple or Firm Multiple

Equity Multiple

1. Start with an equity DCF model (a dividend or FCFE model)

$$P_0 = \frac{DPS_1}{r - g_n} \qquad P_0 = \frac{FCFE_1}{\text{Cost of equity} - g_n}$$

2. Isolate the denominator of the multiple in the model
3. Do the algebra to arrive at the equation for the multiple

Firm Multiple

1. Start with a firm DCF model (a FCFF model)

$$EV_0 = \frac{FCFF_1}{\text{Cost of capital} - g_n}$$

2. Isolate the denominator of the multiple in the model
3. Do the algebra to arrive at the equation for the multiple

I . PE Ratios

- To understand the fundamentals, start with a basic equity discounted cash flow model.
  - With the dividend discount model,

$$P_0 = \frac{DPS_1}{r - g_n}$$

  - Dividing both sides by the current earnings per share,

$$\frac{P_0}{EPS_0} = PE = \frac{\text{Payout Ratio}*(1+g_n)}{r-g_n}$$

  - If this had been a FCFE Model,

$$P_0 = \frac{FCFE_1}{r - g_n}$$

$$\frac{P_0}{EPS_0} = PE = \frac{(FCFE/Earnings)*(1+g_n)}{r-g_n}$$

Using the Fundamental Model to Estimate PE For a High Growth Firm

- The price-earnings ratio for a high growth firm can also be related to fundamentals. In the special case of the two-stage dividend discount model, this relationship can be made explicit fairly simply:

$$P_0 = \frac{EPS_0 * \text{Payout Ratio} * (1+g) * \left(1 - \frac{(1+g)^n}{(1+r)^n}\right)}{r-g} + \frac{EPS_0 * \text{Payout Ratio}_n * (1+g)^n * (1+g_n)}{(r-g_n)(1+r)^n}$$

  - For a firm that does not pay what it can afford to in dividends, substitute FCFE/Earnings for the payout ratio.

- Dividing both sides by the earnings per share:

$$\frac{P_0}{EPS_0} = \frac{\text{Payout Ratio} * (1+g) * \left(1 - \frac{(1+g)^n}{(1+r)^n}\right)}{r-g} + \frac{\text{Payout Ratio}_n * (1+g)^n * (1+g_n)}{(r-g_n)(1+r)^n}$$

A Simple Example

- Assume that you have been asked to estimate the PE ratio for a firm which has the following characteristics:

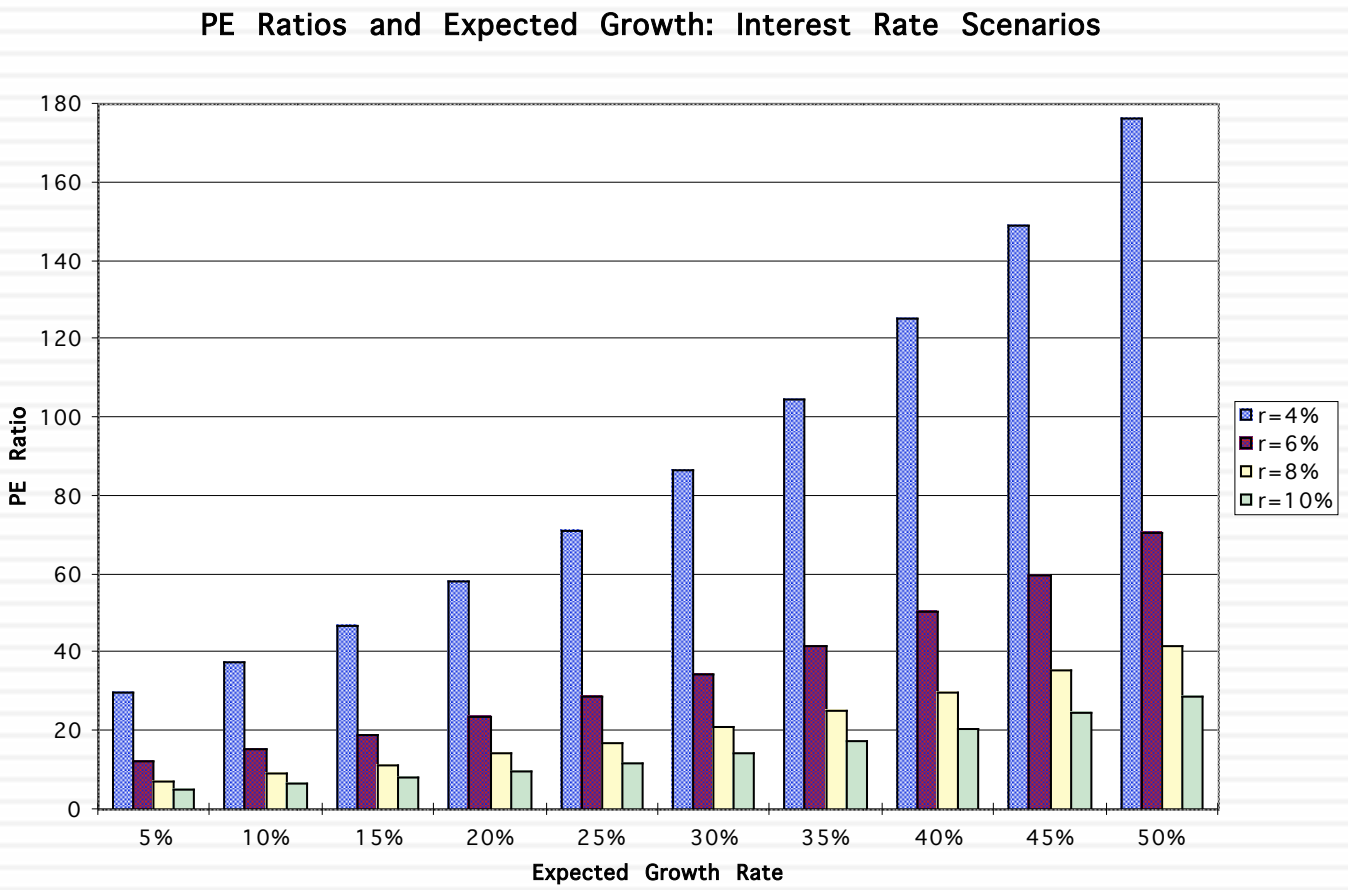
Variable	*High Growth Phase*	*Stable Growth Phase*
Expected Growth Rate	25%	8%
Payout Ratio	20%	50%
Beta	1.00	1.00
Number of years	5 years	Forever after year 5

Riskfree rate = T.Bond Rate = 6%

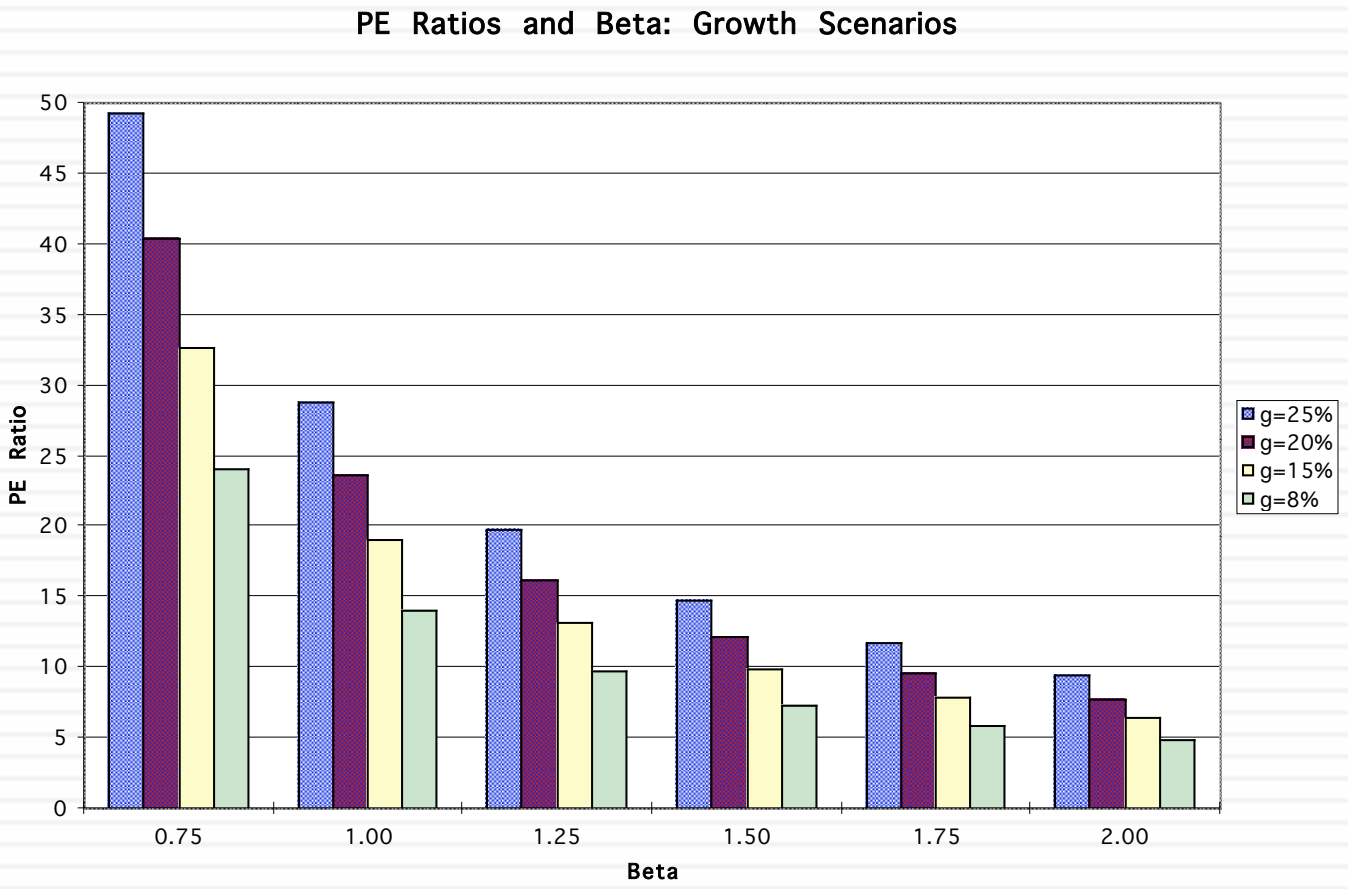
Required rate of return = 6% + 1(5.5%)= 11.5%

$$\frac{P_0}{EPS_0} = \frac{.20*(1.25)*\left(1-\frac{(1.25)^5}{(1.115)^5}\right)}{.115-.25} + \frac{.50*(1.25)^5*(1.08)}{(.115-.08)(1.115)^5} = 28.75$$

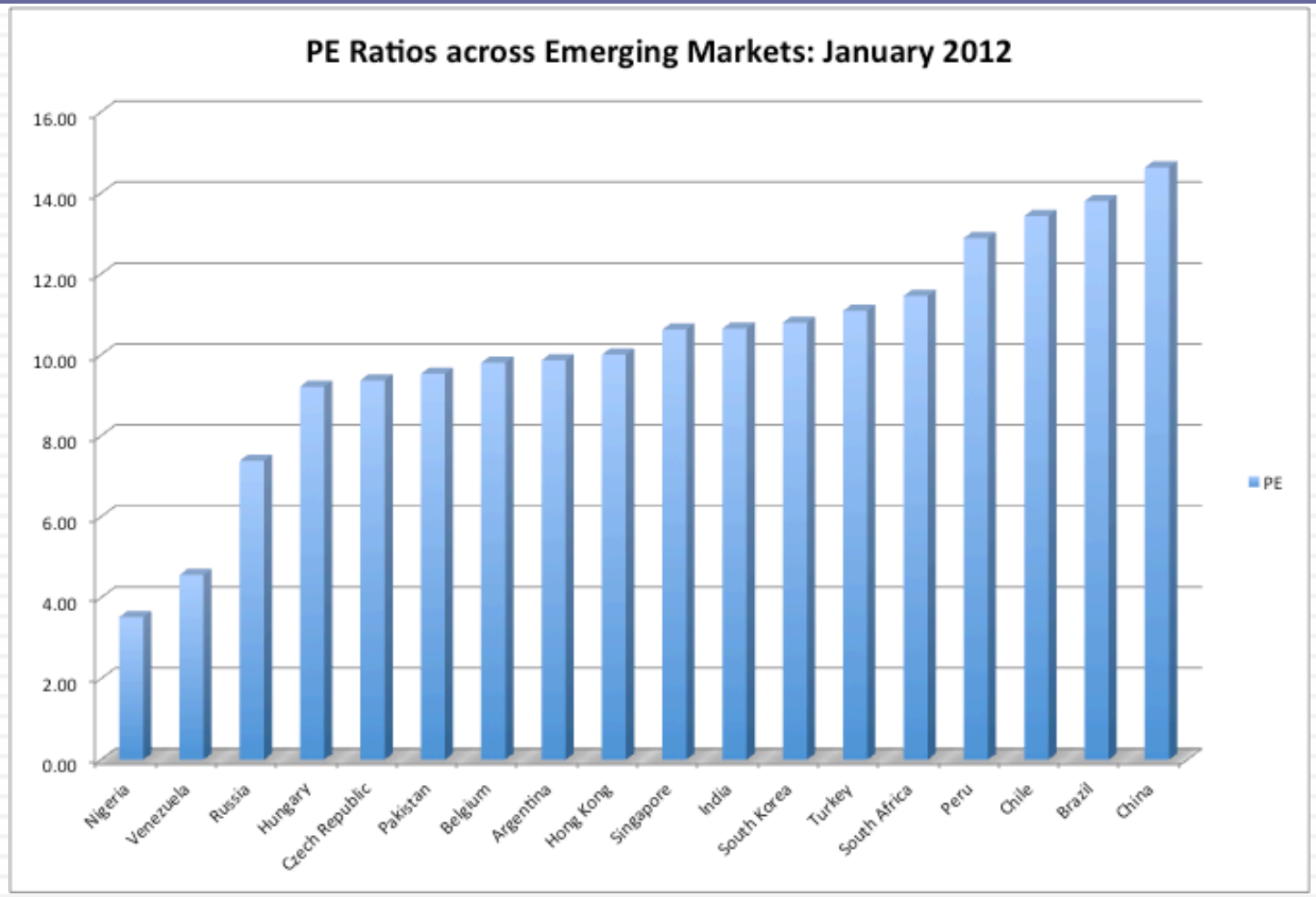
a. PE and Growth: Firm grows at x% for 5 years, 8% thereafter



b. PE and Risk: A Follow up Example



Example 1: Comparing PE ratios across Emerging Markets



Example 2: An Old Example with Emerging Markets: June 2000

Country	*PE Ratio*	*Interest Rates*	*GDP Real Growth*	*Country Risk*
Argentina	14	18.00%	2.50%	45
Brazil	21	14.00%	4.80%	35
Chile	25	9.50%	5.50%	15
Hong Kong	20	8.00%	6.00%	15
India	17	11.48%	4.20%	25
Indonesia	15	21.00%	4.00%	50
Malaysia	14	5.67%	3.00%	40
Mexico	19	11.50%	5.50%	30
Pakistan	14	19.00%	3.00%	45
Peru	15	18.00%	4.90%	50
Phillipines	15	17.00%	3.80%	45
Singapore	24	6.50%	5.20%	5
South Korea	21	10.00%	4.80%	25
Thailand	21	12.75%	5.50%	25
Turkey	12	25.00%	2.00%	35
Venezuela	20	15.00%	3.50%	45

Regression Results

- The regression of PE ratios on these variables provides the following –

PE = 16.16 - 7.94 Interest Rates

+ 154.40 Growth in GDP

- 0.1116 Country Risk

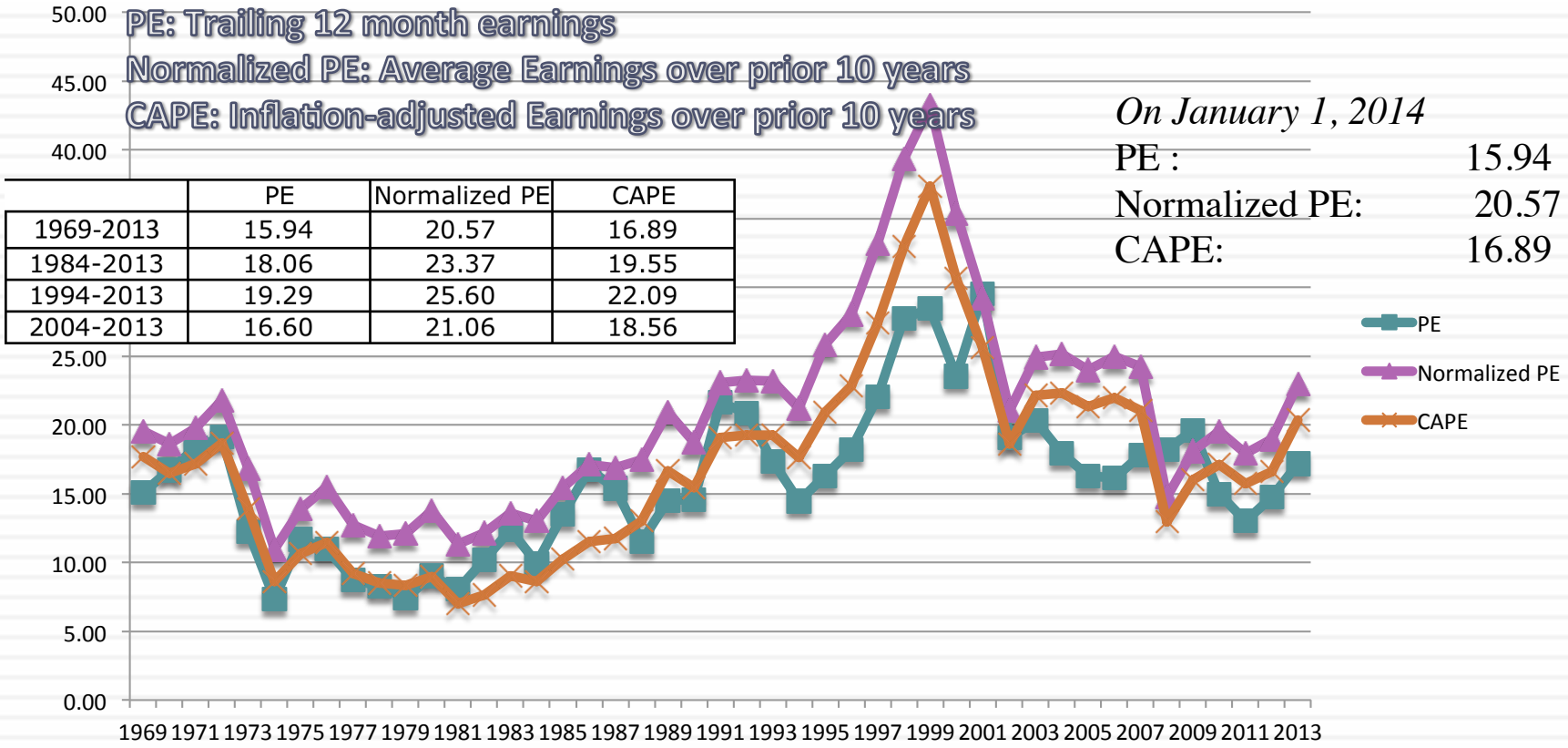
R Squared = 73%

Predicted PE Ratios

Country	*PE Ratio*	*Interest Rates*	*GDP Real Growth*	*Country Risk*	*Predicted PE*
Argentina	14	18.00%	2.50%	45	13.57
Brazil	21	14.00%	4.80%	35	18.55
Chile	25	9.50%	5.50%	15	22.22
Hong Kong	20	8.00%	6.00%	15	23.11
India	17	11.48%	4.20%	25	18.94
Indonesia	15	21.00%	4.00%	50	15.09
Malaysia	14	5.67%	3.00%	40	15.87
Mexico	19	11.50%	5.50%	30	20.39
Pakistan	14	19.00%	3.00%	45	14.26
Peru	15	18.00%	4.90%	50	16.71
Phillipines	15	17.00%	3.80%	45	15.65
Singapore	24	6.50%	5.20%	5	23.11
South Korea	21	10.00%	4.80%	25	19.98
Thailand	21	12.75%	5.50%	25	20.85
Turkey	12	25.00%	2.00%	35	13.35
Venezuela	20	15.00%	3.50%	45	15.35

Example 3: PE ratios for the S&P 500 over time

PE Ratios for the S&P 500: 1969-2013



	PE	Normalized PE	CAPE
1969-2013	15.94	20.57	16.89
1984-2013	18.06	23.37	19.55
1994-2013	19.29	25.60	22.09
2004-2013	16.60	21.06	18.56

On January 1, 2014

PE : 15.94

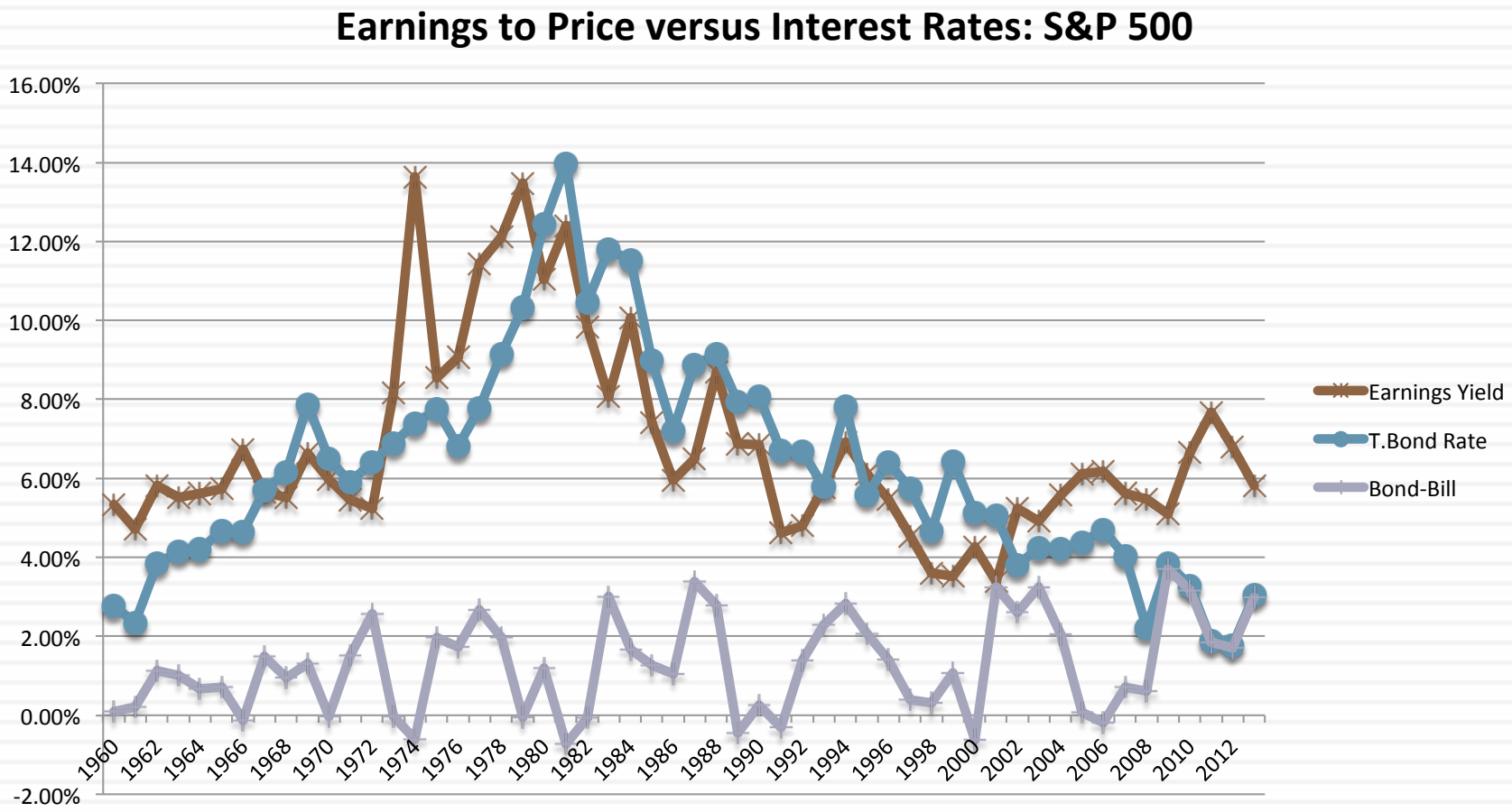
Normalized PE: 20.57

CAPE: 16.89

Is low (high) PE cheap (expensive)?

- A market strategist argues that stocks are expensive because the PE ratio today is high relative to the average PE ratio across time. Do you agree?
  a. Yes
  b. No
- If you do not agree, what factors might explain the higher PE ratio today?

E/P Ratios , T.Bond Rates and Term Structure



Regression Results

- There is a strong positive relationship between E/P ratios and T.Bond rates, as evidenced by the correlation of 0.6538 between the two variables.,
- In addition, there is evidence that the term structure also affects the PE ratio.
- In the following regression, using 1960-2013 data, we regress E/P ratios against the level of T.Bond rates and a term structure variable (T.Bond - T.Bill rate)

  E/P = 3.39% + 0.5778 T.Bond Rate – 0.1535 (T.Bond Rate-T.Bill Rate)
  (4.71) (6.12) (-0.72)

  R squared = 41.10%

- Going back to 2008, this is what the regression looked like:

  E/P = 2.56% + 0.7044 T.Bond Rate – 0.3289 (T.Bond Rate-T.Bill Rate)
  (4.71) (7.10) (1.46)

  R squared = 50.71%

  The R-squared has dropped and the T.Bond rate and the differential with the T.Bill rate have noth lost significance. How would you read this result?

II. Price to Book Ratio

- Going back to a simple dividend discount model,

$$P_0 = \frac{DPS_1}{r - g_n}$$

- Defining the return on equity (ROE) = EPS0 / Book Value of Equity, the value of equity can be written as:

$$P_0 = \frac{BV_0 * ROE * Payout\ Ratio * (1 + g_n)}{r - g_n}$$

$$\frac{P_0}{BV_0} = PBV = \frac{ROE * Payout\ Ratio * (1 + g_n)}{r - g_n}$$

- If the return on equity is based upon expected earnings in the next time period, this can be simplified to,

$$\frac{P_0}{BV_0} = PBV = \frac{ROE * Payout\ Ratio}{r - g_n}$$

Price Book Value Ratio: Stable Growth Firm Another Presentation

- This formulation can be simplified even further by relating growth to the return on equity:

$$g = (1 - \text{Payout ratio}) * ROE$$

- Substituting back into the P/BV equation,

$$\frac{P_0}{BV_0} = PBV = \frac{ROE - g_n}{r - g_n}$$

- The price-book value ratio of a stable firm is determined by the differential between the return on equity and the required rate of return on its projects.
- Building on this equation, a company that is expected to generate a ROE higher (lower than, equal to) its cost of equity should trade at a price to book ratio higher (less than, equal to) one.

Now changing to an Enterprise value multiple EV/ Book Capital

- To see the determinants of the value/book ratio, consider the simple free cash flow to the firm model:

$$V_0 = \frac{FCFF_1}{WACC - g}$$

- Dividing both sides by the book value, we get:

$$\frac{V_0}{BV} = \frac{FCFF_1/BV}{WACC-g}$$

- If we replace, FCFF = EBIT(1-t) - (g/ROC) EBIT(1-t),we get:

$$\frac{V_0}{BV} = \frac{ROC - g}{WACC-g}$$

III. EV to EBITDA - Determinants

- The value of the operating assets of a firm can be written as:

$$EV_0 = \frac{FCFF_1}{WACC - g}$$

- Now the value of the firm can be rewritten as

$$EV = \frac{EBITDA\,(1-t) + Depr\,(t) - Cex - \Delta\,Working\ Capital}{WACC - g}$$

- Dividing both sides of the equation by EBITDA,

$$\frac{EV}{EBITDA} = \frac{(1-t)}{WACC - g} + \frac{Depr\,(t)/EBITDA}{WACC - g} - \frac{CEx/EBITDA}{WACC - g} - \frac{\Delta\,Working\ Capital/EBITDA}{WACC - g}$$

- The determinants of EV/EBITDA are:
  - The cost of capital
  - Expected growth rate
  - Tax rate
  - Reinvestment rate (or ROC)

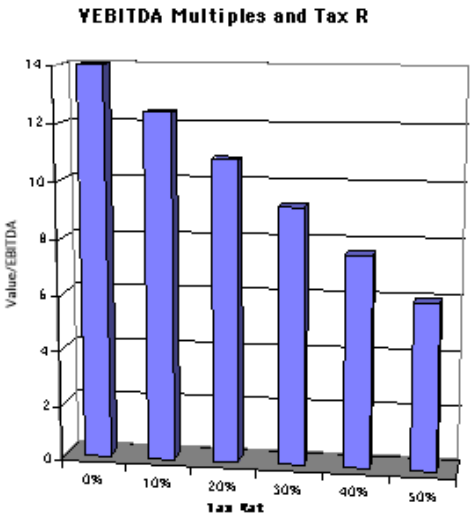
A Simple Example

- Consider a firm with the following characteristics:
  - Tax Rate = 36%
  - Capital Expenditures/EBITDA = 30%
  - Depreciation/EBITDA = 20%
  - Cost of Capital = 10%
  - The firm has no working capital requirements
  - The firm is in stable growth and is expected to grow 5% a year forever.
- In this case, the Value/EBITDA multiple for this firm can be estimated as follows:

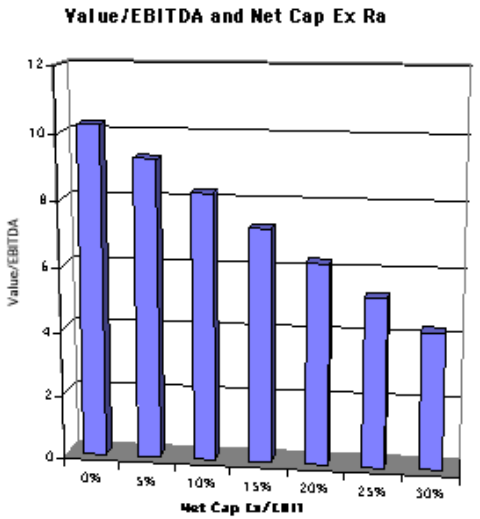
$$\frac{\text{Value}}{\text{EBITDA}} = \frac{(1-.36)}{.10-.05} + \frac{(0.2)(.36)}{.10-.05} - \frac{0.3}{.10-.05} - \frac{0}{.10-.05} = 8.24$$

The Determinants of EV/EBITDA

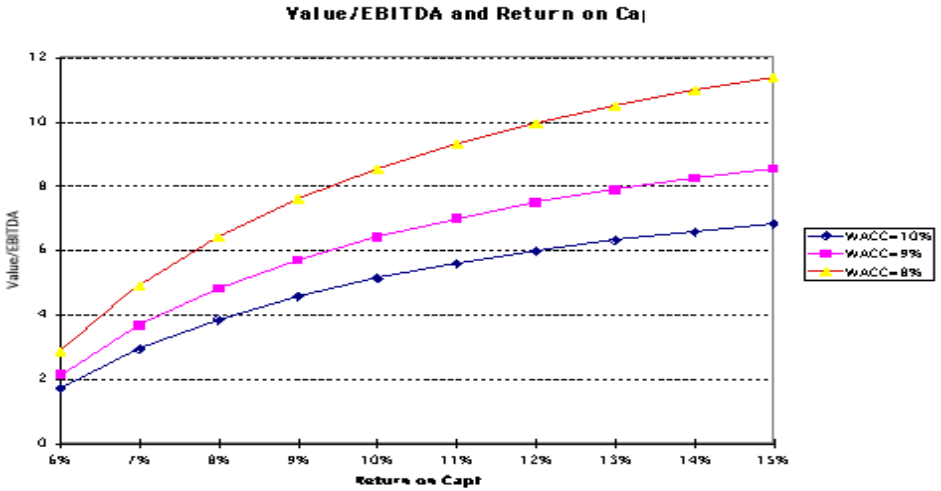
Tax Rates



Reinvestment Needs



Excess Returns



IV. EV/Sales Ratio

- If pre-tax operating margins are used, the appropriate value estimate is that of the firm. In particular, if one makes the replaces the FCFF with the expanded version:
  - Free Cash Flow to the Firm = EBIT (1 - tax rate) (1 - Reinvestment Rate)

$$\frac{\text{Value}}{\text{Sales}_0} = \text{After-tax Oper. Margin} * \left[\frac{(1\text{-RIR}_{\text{growth}})(1+g)*\left(1-\frac{(1+g)^n}{(1+\text{WACC})^n}\right)}{\text{WACC-g}} + \frac{(1\text{-RIR}_{\text{stable}})(1+g)^n*(1+g_n)}{(\text{WACC-g}_n)(1+\text{WACC})^n} \right]$$

g = Growth rate in after-tax operating income for the first n years

gn = Growth rate in after-tax operating income after n years forever (Stable growth rate)

$\text{RIR}_{\text{Growth, Stable}}$ = Reinvestment rate in high growth and stable periods

WACC = Weighted average cost of capital

The value of a brand name

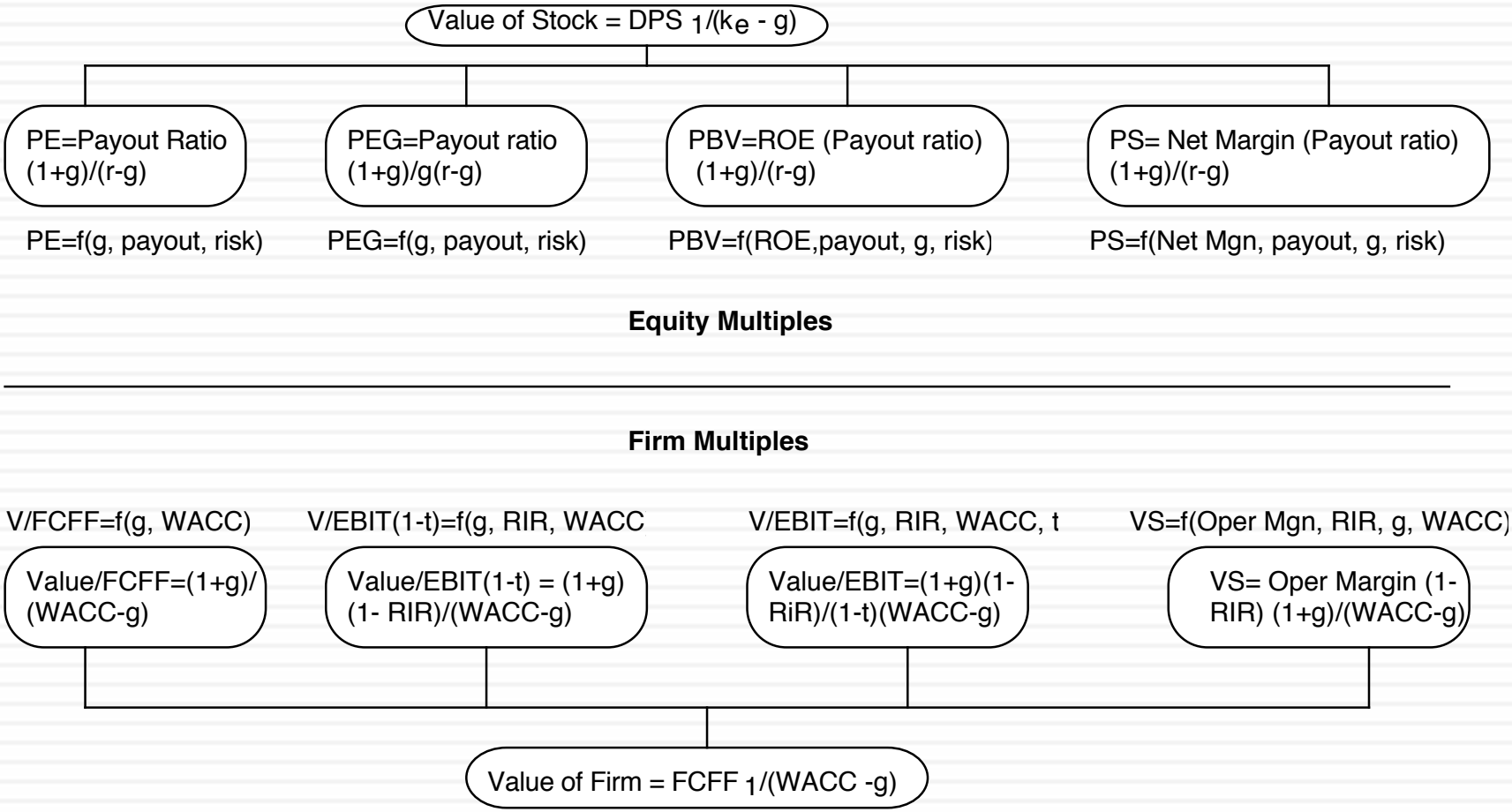
- One of the critiques of traditional valuation is that is fails to consider the value of brand names and other intangibles.
- The approaches used by analysts to value brand names are often ad-hoc and may significantly overstate or understate their value.
- One of the benefits of having a well-known and respected brand name is that firms can charge higher prices for the same products, leading to higher profit margins and hence to higher price-sales ratios and firm value. The larger the price premium that a firm can charge, the greater is the value of the brand name.
- In general, the value of a brand name can be written as:
  - Value of brand name $=\{(V/S)_b-(V/S)_g\}^*$ Sales
  - $(V/S)_b$ = Value of Firm/Sales ratio with the benefit of the brand name
  - $(V/S)_g$ = Value of Firm/Sales ratio of the firm with the generic product

Valuing Brand Name

	Coca Cola	*With Cott Margins*
Current Revenues =	$21,962.00	$21,962.00
Length of high-growth period	10	10
Reinvestment Rate =	50%	50%
Operating Margin (after-tax)	15.57%	5.28%
Sales/Capital (Turnover ratio)	1.34	1.34
Return on capital (after-tax)	20.84%	7.06%
Growth rate during period (g) =	10.42%	3.53%
Cost of Capital during period =	7.65%	7.65%
Stable Growth Period		
Growth rate in steady state =	4.00%	4.00%
Return on capital =	7.65%	7.65%
Reinvestment Rate =	52.28%	52.28%
Cost of Capital =	7.65%	7.65%
Value of Firm =	$79,611.25	$15,371.24

Value of brand name = $79,611 -$15,371 = $64,240 million

The Determinants of Multiples…



Application Tests

- Given the firm that we are valuing, what is a "comparable" firm?
  - While traditional analysis is built on the premise that firms in the same sector are comparable firms, valuation theory would suggest that a comparable firm is one which is similar to the one being analyzed in terms of fundamentals.
  - Proposition 4: There is no reason why a firm cannot be compared with another firm in a very different business, if the two firms have the same risk, growth and cash flow characteristics.
- Given the comparable firms, how do we adjust for differences across firms on the fundamentals?
  - Proposition 5: It is impossible to find an exactly identical firm to the one you are valuing.

Valuing one company relative to others… Relative valuation with comparables

- Ideally, you would like to find lots of publicly traded firms that look just like your firm, in terms of fundamentals, and compare the pricing of your firm to the pricing of these other publicly traded firms. Since, they are all just like your firm, there will be no need to control for differences.
- In practice, it is very difficult (and perhaps impossible) to find firms that share the same risk, growth and cash flow characteristics of your firm. Even if you are able to find such firms, they will very few in number. The trade off then becomes:

Techniques for comparing across firms

1. Direct comparisons: If the comparable firms are "just like" your firm, you can compare multiples directly across the firms and conclude that your firm is expensive (cheap) if it trades at a multiple higher (lower) than the other firms.
2. Story telling: If there is a key dimension on which the firms vary, you can tell a story based upon your understanding of how value varies on that dimension.

   An example: This company trades at 12 times earnings, whereas the rest of the sector trades at 10 times earnings, but I think it is cheap because it has a much higher growth rate than the rest of the sector.
3. Modified multiple: You can modify the multiple to incorporate the dimension on which there are differences across firms.
4. Statistical techniques: If your firms vary on more than one dimension, you can try using multiple regressions (or variants thereof) to arrive at a "controlled" estimate for your firm.

Example 1: Let's try some story telling Comparing PE ratios across firms in a sector

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%

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?

Example 2: Fact-based story telling
Comparing PE Ratios across a Sector: PE

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

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?

- 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.
- Bottom line: Just because a company trades at a low PE ratio does not make it cheap.

Example 3: An Eyeballing Exercise with P/BV Ratios 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%

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.

How about this mechanism?

- 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).

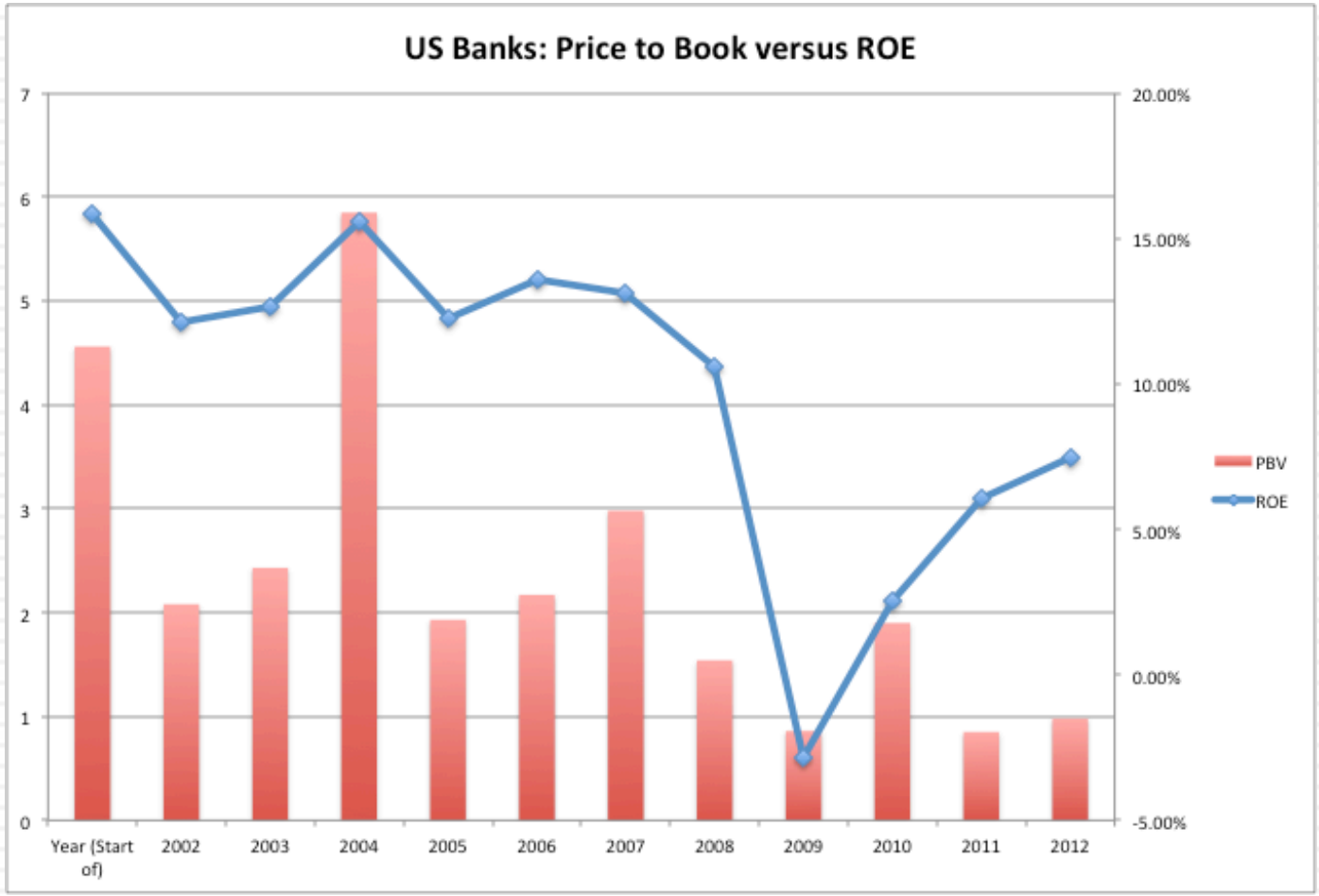
PBV =	2.27	+	3.63 ROE	-	2.68 Std dev
	(5.56)		(3.32)		(2.33)

R squared of regression = 79%

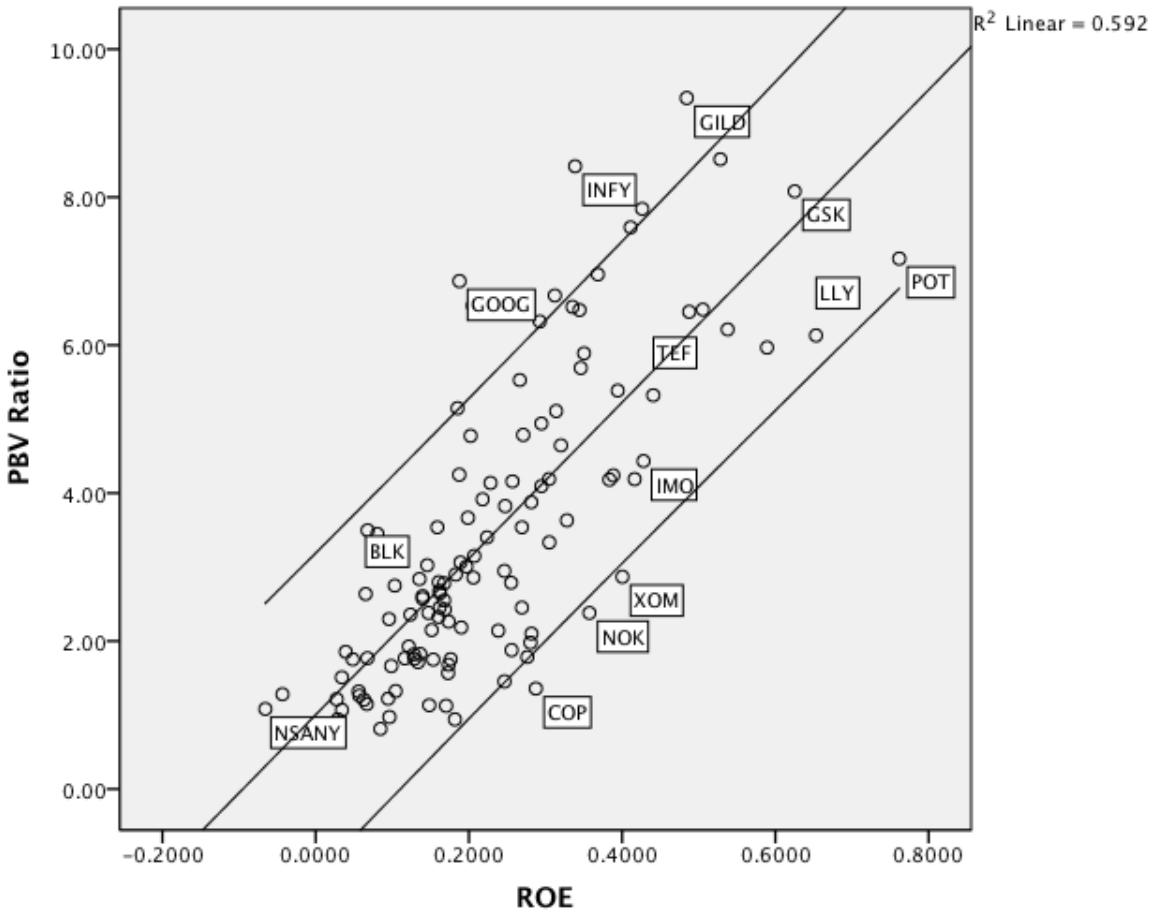
And these predictions?

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%

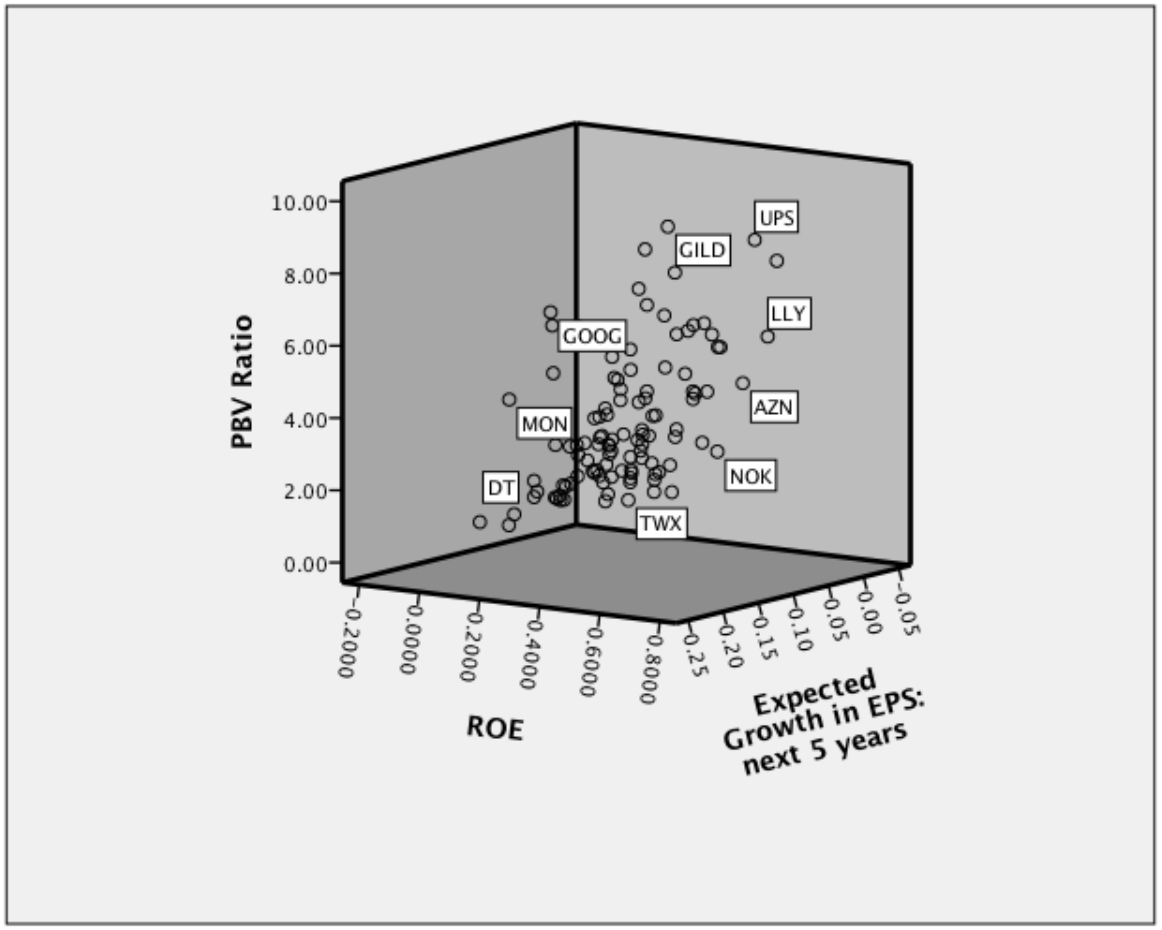
A follow up on US Banks



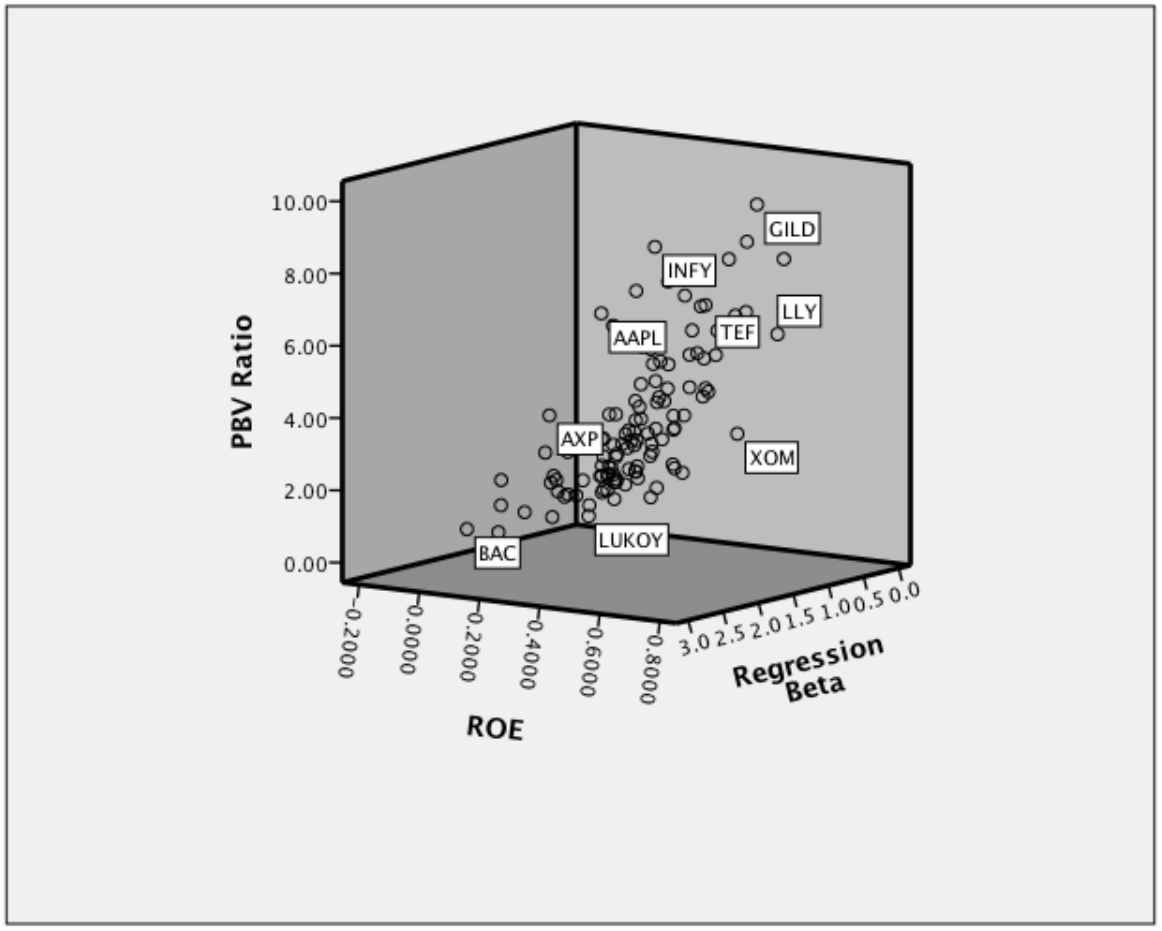
Example 4: A larger sample
Price to Book versus ROE: Largest firms in the US: January 2010



Missing growth?



PBV, ROE and Risk: Large Cap US firms



al

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

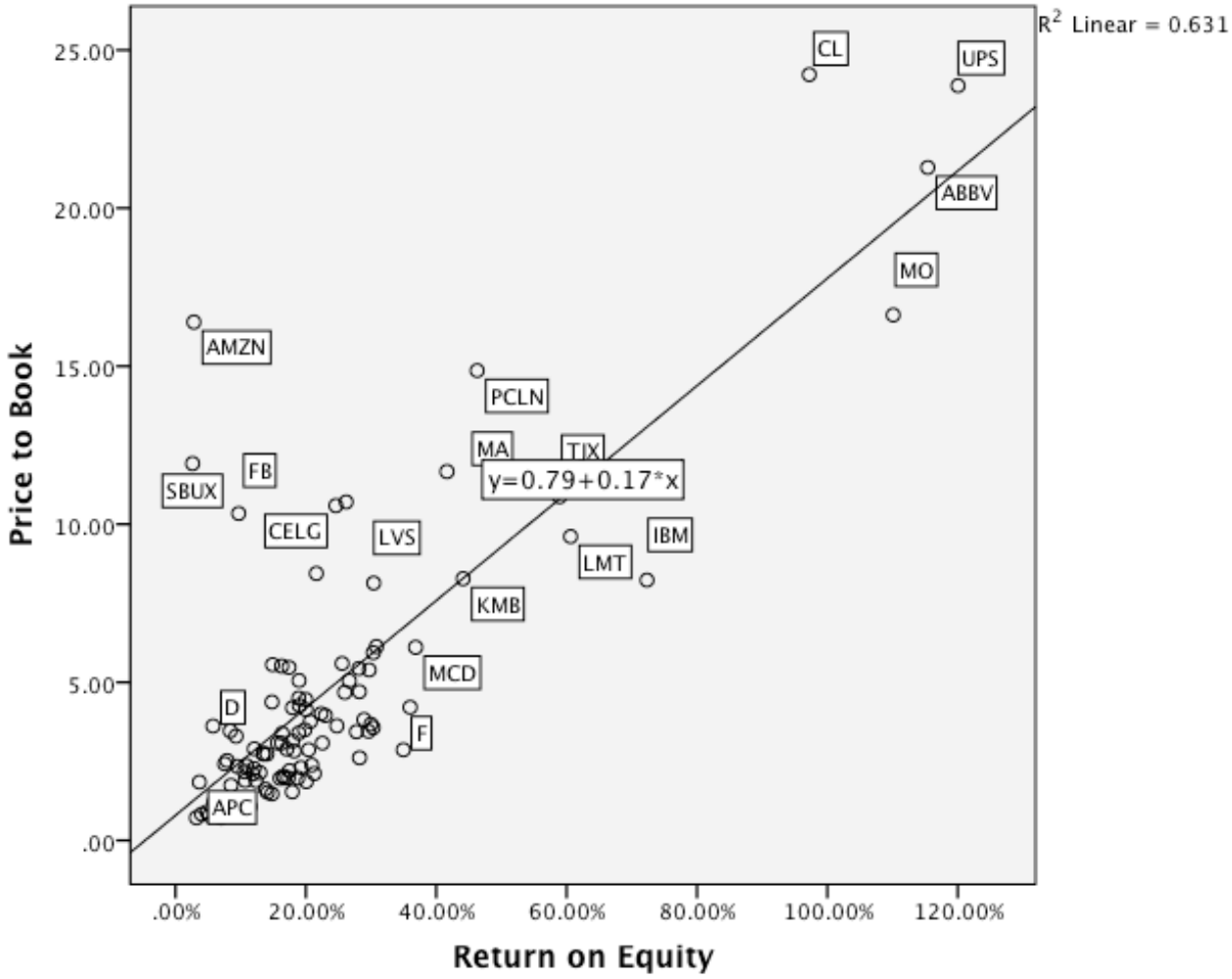
a. Predictors: (Constant), ROE, Expected Growth in EPS: next 5 years, Regression Beta

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

Updated PBV Ratios – Largest Market Cap US companies Updated to January 2014



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

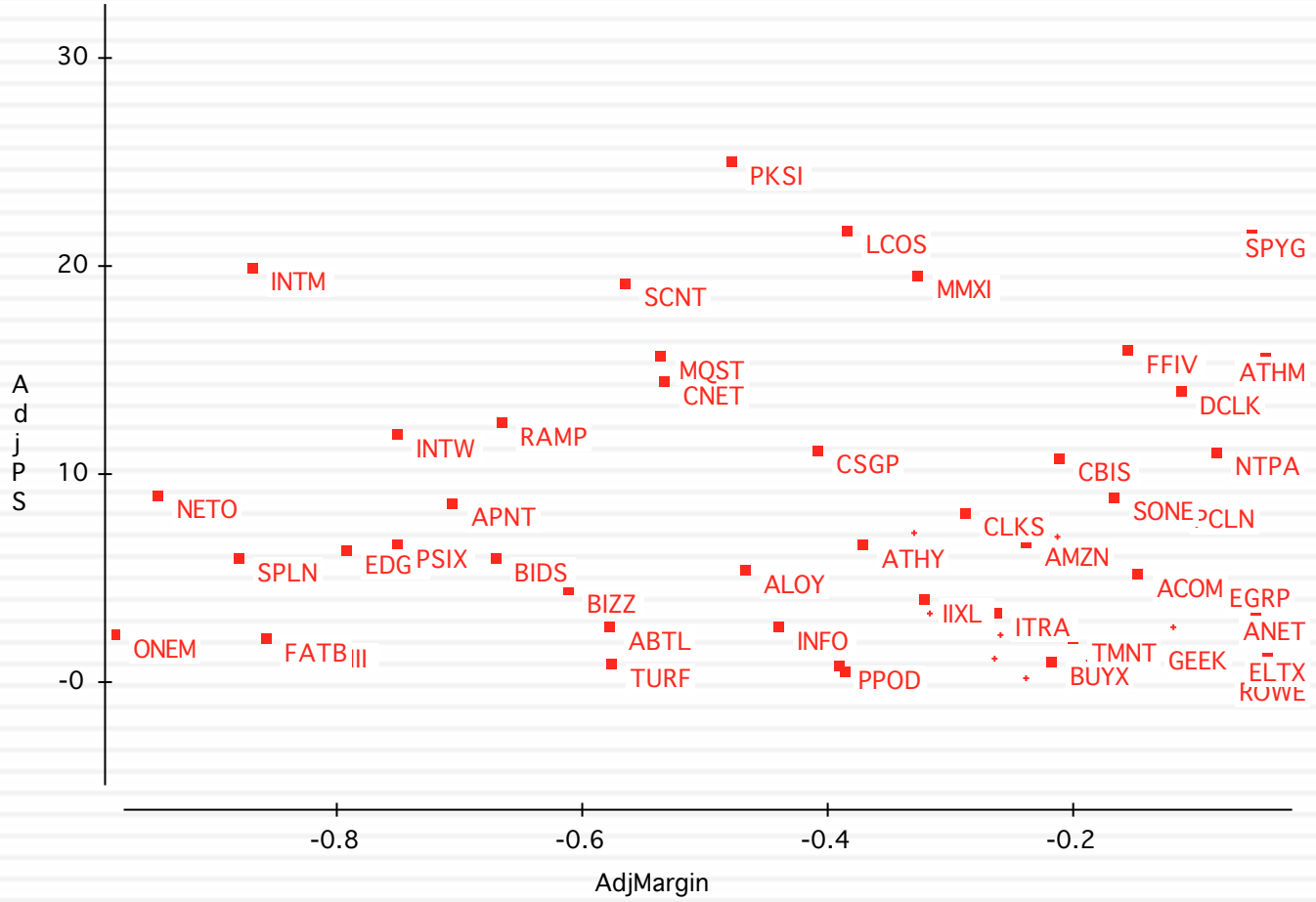
Company Name	Value	EBITDA	Value/EBITDA
KLLM Trans. Svcs.	$ 114.32	$ 48.81	2.34
Ryder System	$ 5,158.04	$ 1,838.26	2.81
Rollins Truck Leasing	$ 1,368.35	$ 447.67	3.06
Cannon Express Inc.	$ 83.57	$ 27.05	3.09
Hunt (J.B.)	$ 982.67	$ 310.22	3.17
Yellow Corp.	$ 931.47	$ 292.82	3.18
Roadway Express	$ 554.96	$ 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**

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?

Example 6: Desperation Time
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.

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)

(0.66) (2.63) (3.49)

R squared = 31.8%

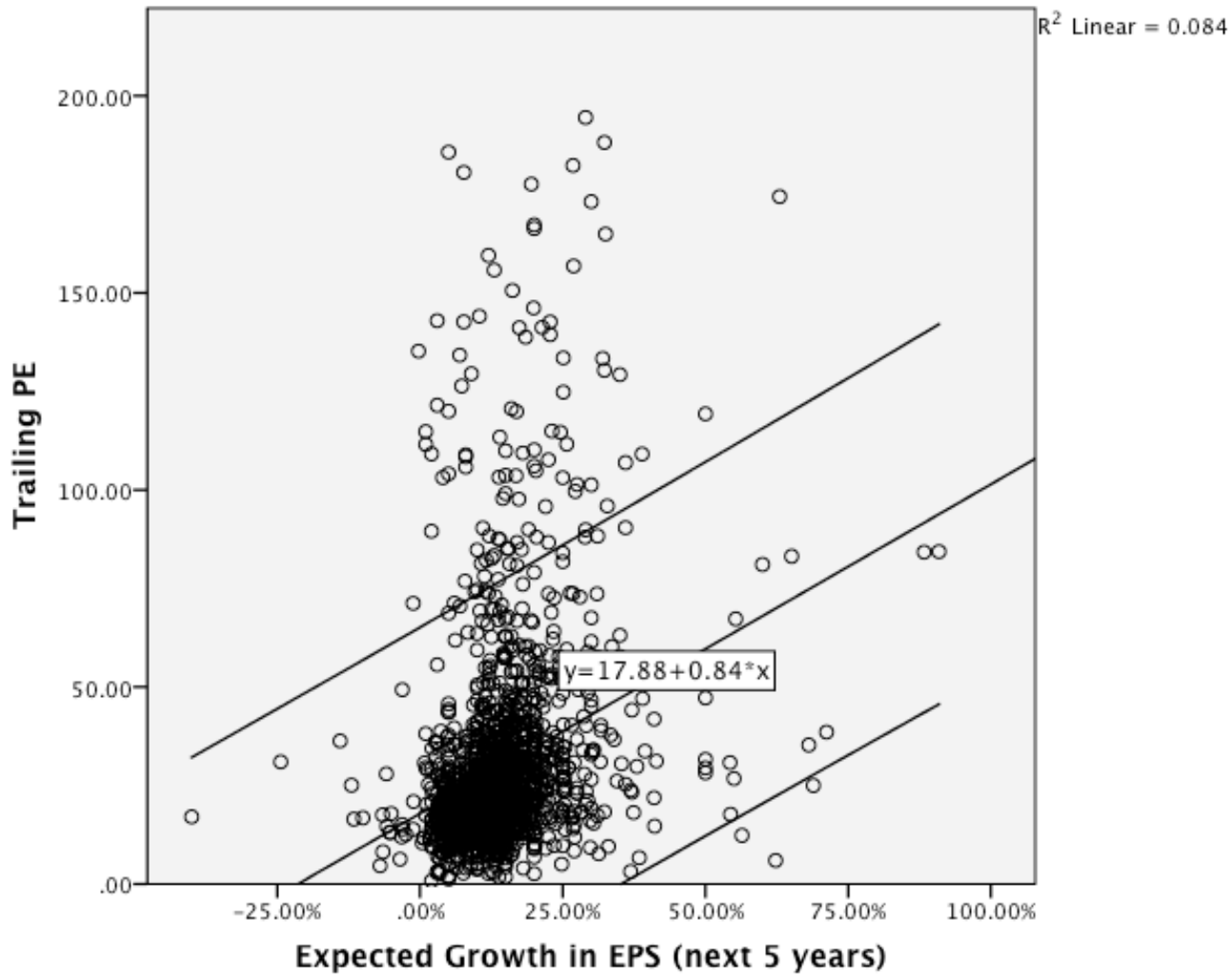
- Predicted PS = 30.61 - 2.77(7.1039) + 6.42(1.9946) + 5.11 (.3069) = 30.42
- Actual PS = 25.63

Stock is undervalued, relative to other internet stocks.

Relative valuation 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 2014



PE Ratio: Standard Regression for US stocks - January 2014

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.580[a]	.336	.335	1562.73006

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

The regression is run with growth and payout entered as decimals, i.e., 25% is entered as 0.25)

Model		Unstandardized Coefficients		t	Sig.
		B	Std. Error		
1	(Constant)	4.199	1.255	3.346	.001
	Regression Beta	-2.864	.977	-2.932	.003
	Expected Growth in EPS (next 5 years)	149.0	5.56	26.819	.000
	Payout Ratio	13.39	.70	18.502	.000

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 Multicollinearity Problem

Correlations

		Regression Beta	Expected Growth in EPS (next 5 years)	Payout Ratio	Trailing PE
Regression Beta	Pearson Correlation	1	.100**	-.008	.082**
	Sig. (2-tailed)		.000	.656	.000
	N	5137	2385	2916	2847
Expected Growth in EPS (next 5 years)	Pearson Correlation	.100**	1	.028	.290**
	Sig. (2-tailed)	.000		.224	.000
	N	2385	2501	1935	1884
Payout Ratio	Pearson Correlation	-.008	.028	1	.232**
	Sig. (2-tailed)	.656	.224		.000
	N	2916	1935	3186	3098
Trailing PE	Pearson Correlation	.082**	.290**	.232**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	2847	1884	3098	3098

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

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 = 4.20 -2.86 Beta + 149.0 Growth + 13.39 (Payout)
- Disney is actually trading at 20 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-14	1.49	4.96%
Jan-13	0.577	5.78%
Jan-12	0.408	6.04%
Jan-11	0.836	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%

PE ratio regressions across markets

Region	Regression – January 2014	R^2
US	PE = 4.20 + 149.0 g_{EPS} + 13.40 Payout - 2.86 Beta	33.6%
Europe	PE = 11.51 + 41.73 g_{EPS} + 14.36 Payout - 1.75 Beta	37.7%
Japan	PE = 11.01+ 17.30 g_{EPS} + 31.22 Payout	16.9%
Emerging Markets	PE = 8.52 + 56.2 g_{EPS} + 10.04 Payout - 1.43 Beta	20.0%
Global	PE = 11.79 + 50.39 g_{EPS} + 15.86 Payout - 1.01 Beta - 61.15 ERP	33.1%

g_{EPS}=Expected Growth: Expected growth in EPS or 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
ERP: Equity Risk Premium (total) for country in which company is incorporated

II. Price to Book Ratio
Fundamentals hold in every market: - January 2014

Region	Regression – January 2013	R^2
US	PBV= 1.81 + 9.30 g_{EPS} - 0.82 Beta + 7.0 ROE	36.1%
Europe	PBV= 2.08 + 21.79 g_{EPS} - 0.49 Beta + 7.93 ROE	41.8%
Japan	PBV= 1.38 + 1.62 g_{EPS} -0.45 Beta + 6.35 ROE	22.7%
Emerging Markets	PBV= 0.88 + 4.11 g_{EPS} - 0.66 Beta + 0.49 Payout + 8.36 ROE	38.6%
Global	PBV= 1.14 + 3.62 g_{EPS} - 0.55 Beta + 0.52 Payout + 11.19 ROE -6.79 ERP	47.6%

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.
ERP: Equity Risk Premium (total) for country in which company is incorporated

III. EV/EBITDA – January 2013

Region	Regression – January 2011	R squared
United States	EV/EBITDA= 25.31 + 41.45 g - 20.32 DFR - 28.03 Tax Rate	16.5%
Europe	EV/EBITDA= 15.91 + 29.33 g - 7.53 DFR - 7.53 Tax Rate	21.0%
Japan	EEV/EBITDA= 10.14 + 45.06 g - 14.53 DFR - 18.40 Tax Rate	21.4%
Emerging Markets	EV/EBITDA= 17.99 + 52.73 g - 5.78 DFR - 34.12 Tax Rate	24.6%
Global	EV/EBITDA= 18.96 + 51.12 g - 4.54 DFR - 11.52 Tax Rate -76.14 ERP	20.1%

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
ERP: Equity Risk Premium of country in which company is incorporared

IV. EV/Sales Regressions across markets…

Region	Regression – January 2011	R Squared
United States	EV/Sales = 0.78 + 5.24 g+ 7.12 Operating Margin + 5.39 DFR- 0.67 Tax rate	24.1%
Europe	EV/Sales = 0.22 + 7.54 g+ 9.99 Operating Margin + 4.66 DFR- 1.76 Tax rate	29.6%
Japan	EV/Sales = 1.11 - 7.64 g+ 9.43 Operating Margin +3.84 DFR- 2.62 Tax rate	25.5%
Emerging Markets	EV/Sales = 1.96 + 5.62 g+ 4.00 Operating Margin + 1.52 DFR- 2.51 Tax rate	11.0%
Global	EV/EBITDA= 18.96 + 51.12 g - 4.54 DFR - 11.52 Tax Rate -76.14 ERP	20.1%

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

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.

Choosing Between the Multiples

- As presented in this section, there are dozens of multiples that can be potentially used to value an individual firm.
- In addition, relative valuation can be relative to a sector (or comparable firms) or to the entire market (using the regressions, for instance)
- Since there can be only one final estimate of value, there are three choices at this stage:
  - Use a simple average of the valuations obtained using a number of different multiples
  - Use a weighted average of the valuations obtained using a nmber of different multiples
  - Choose one of the multiples and base your valuation on that multiple

Picking one Multiple

- This is usually the best way to approach this issue. While a range of values can be obtained from a number of multiples, the "best estimate" value is obtained using one multiple.
- The multiple that is used can be chosen in one of two ways:
  - Use the multiple that best fits your objective. Thus, if you want the company to be undervalued, you pick the multiple that yields the highest value.
  - Use the multiple that has the highest R-squared in the sector when regressed against fundamentals. Thus, if you have tried PE, PBV, PS, etc. and run regressions of these multiples against fundamentals, use the multiple that works best at explaining differences across firms in that sector.
  - Use the multiple that seems to make the most sense for that sector, given how value is measured and created.

A More Intuitive Approach

- Managers in every sector tend to focus on specific variables when analyzing strategy and performance. The multiple used will generally reflect this focus. Consider three examples.
  - In retailing: The focus is usually on same store sales (turnover) and profit margins. Not surprisingly, the revenue multiple is most common in this sector.
  - In financial services: The emphasis is usually on return on equity. Book Equity is often viewed as a scarce resource, since capital ratios are based upon it. Price to book ratios dominate.
  - In technology: Growth is usually the dominant theme. PEG ratios were invented in this sector.

Conventional usage…

Sector	Multiple Used	Rationale
Cyclical Manufacturing	PE, Relative PE	Often with normalized earnings
Growth firms	PEG ratio	Big differences in growth rates
Young growth firms w/ losses	Revenue Multiples	What choice do you have?
Infrastructure	EV/EBITDA	Early losses, big DA
REIT	P/CFE (where CFE = Net income + Depreciation)	Big depreciation charges on real estate
Financial Services	Price/ Book equity	Marked to market?
Retailing	Revenue multiples	Margins equalize sooner or later

Relative versus Intrinsic Value

- If you do intrinsic value right, you will bring in a company's risk, cash flow and growth characteristics into the inputs, preserve internal consistency and derive intrinsic value. If you do relative value right, you will find the right set of comparables, control well for differences in risk, cash flow and growth characteristics. Assume you value the same company doing both DCF and relative valuation correctly, should you get the same value?
  - Yes
  - No
- If not, how would you explain the difference?
- If the numbers are different, which value would you use?
  - Intrinsic value
  - Relative value
  - A composite of the two values
  - The higher of the two values
  - The lower of the two values
  - Depends on what my valuation "mission" is.

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