It is all relative… Multiples, Comparables and Value!

Aswath Damodaran

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.

The reasons for the allure…

"If you think I'm crazy, you should see the guy who 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

Michael Richards
Photo: George Lange

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The Market Imperative….

■ Relative valuation is <u>much more likely to reflect market perceptions</u> 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 <u>significant proportion</u> of securities that are <u>under valued and over valued</u>.

■ Since portfolio managers are <u>judged</u> based upon how they perform <u>on a relative basis</u> (to the market and other money managers), relative valuation is more tailored to their needs

■ Relative valuation generally <u>requires less information</u> than discounted cash flow valuation (especially when multiples are used as screens)

So, you believe only in intrinsic value? Here's why you should still care about relative value

- Even if you are a true believer in discounted cashflow valuation, presenting your findings on a relative valuation basis will make it more likely that your findings/recommendations will reach a receptive audience.

- In some cases, relative valuation can help find weak spots in discounted cash flow valuations and fix them.

- The problem with multiples is not in their use but in their abuse. If we can find ways to frame multiples right, we should be able to use them better.

Multiples are just standardized estimates of price…

- You can standardize either the equity value of an asset or the value of the asset itself, which goes in the numerator.
- You can standardize by dividing by the
  - Earnings of the asset
    - Net income: Price/Earnings Ratio (PE) and variants (PEG and Relative PE)
    - Operating income and cash flow: EV/EBIT, EV/EBITDA
  - Book value of the asset
    - Price/Book Value of Equity (PBV)
    - Enterprise Value/ Invested Capital, Firm Value/ Book Value of Capital
    - Enterprise Value/Replacement Cost (Tobin's Q)
  - Revenues generated by the asset
    - Price/Sales per Share (PS)
    - Enterprise Value/Sales
  - Asset or Industry Specific Variable (Value/kwh, Value/ ton of steel ....)

The Four Steps to Deconstructing Multiples

- **Define the multiple**
  - In use, the same multiple can be defined in <u>different ways</u> by different users. When comparing and using multiples, estimated by someone else, it is critical that we <u>understand how the multiples have been estimated</u>

- **Describe the multiple**
  - Too many people who use a multiple have <u>no idea what its cross sectional distribution</u> 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 <u>understand the fundamentals</u> that drive each multiple, and the <u>nature of the relationship</u> between the multiple and each variable.

- **Apply the multiple**
  - Defining the <u>comparable universe</u> and <u>controlling for differences</u> 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
Consistency test

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 (though some like to use average price over last 6 months or year)

EPS:

- Time variants: EPS in most recent financial year (current), EPS in most recent four quarters (trailing), EPS expected in next fiscal year or next four quartes (both called forward) or EPS in some future year

- Primary, diluted or partially diluted

- Before or after extraordinary items

- Measured using different accounting rules (options expensed or not, pension fund income counted or not…)

PE ratios: Google and Cisco – May 2009

	Google	Cisco
Stock price	$326.60	$16.23
Primary EPS	$13.40	$1.47
Diluted EPS	$12.83	$1.23
Primary PE	24.37	11.04
Diluted PE	25.45	13.25
Market Capitalization	$102,975	$97,153
Value of Options	$1,406	$3,477
Market Value of Equity	$104,381	$100,630
Net Income before option expensing	$5,347	$8,802
Net Income after option expensing	$4,227	$8,052
Adjusted PE	24.69	12.50

1.1: PE ratio (Uniformity test)

■ Assume that you are comparing the PE ratios of a dozen technology companies, with varying numbers of management options outstanding. Which measure of PE ratio would you use in your comparison (to ensure uniformity)?

a) Price/ Primary EPS

b) Price/ Diluted EPS

c) Market Capitalization / Net Income

d) (Market Capitalization + Value of Options)/ (Net Income + Option expense)

e) None of the above

Example 2: Enterprise Value /EBITDA Multiple Consistency test

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

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

■ 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?

Example 3: Housing Value/ Rental Income (Expense)

- This is a measure used to measure whether real estate values are reasonable are not.

  Home Price/ Rental Price = Market price of house/ Annual Rental Income (if house were rented)

- The numerator reflects the market price of a house and the denominator the rent you would pay on an annual basis if you rented the same house. An alternative interpretation is that the numerator reflects what you would pay for the house today and the denominator the gross rental income you could generate from the house. According to its users, when this ratio becomes high (relative to historical benchmarks), housing prices are too high. When this ratio is low, real estate is cheap.

- Is this multiple consistently defined?

Descriptive Tests

■ What is the <u>average and standard deviation</u> for this multiple, across the universe (market)?

■ What is the <u>median</u> for this multiple?

  • The median for this multiple is often a more reliable comparison point.

■ How <u>large are the outliers</u> to the distribution, and <u>how do we deal</u> 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 <u>cannot be estimated</u>? Will ignoring these cases lead to a <u>biased estimate</u> of the multiple?

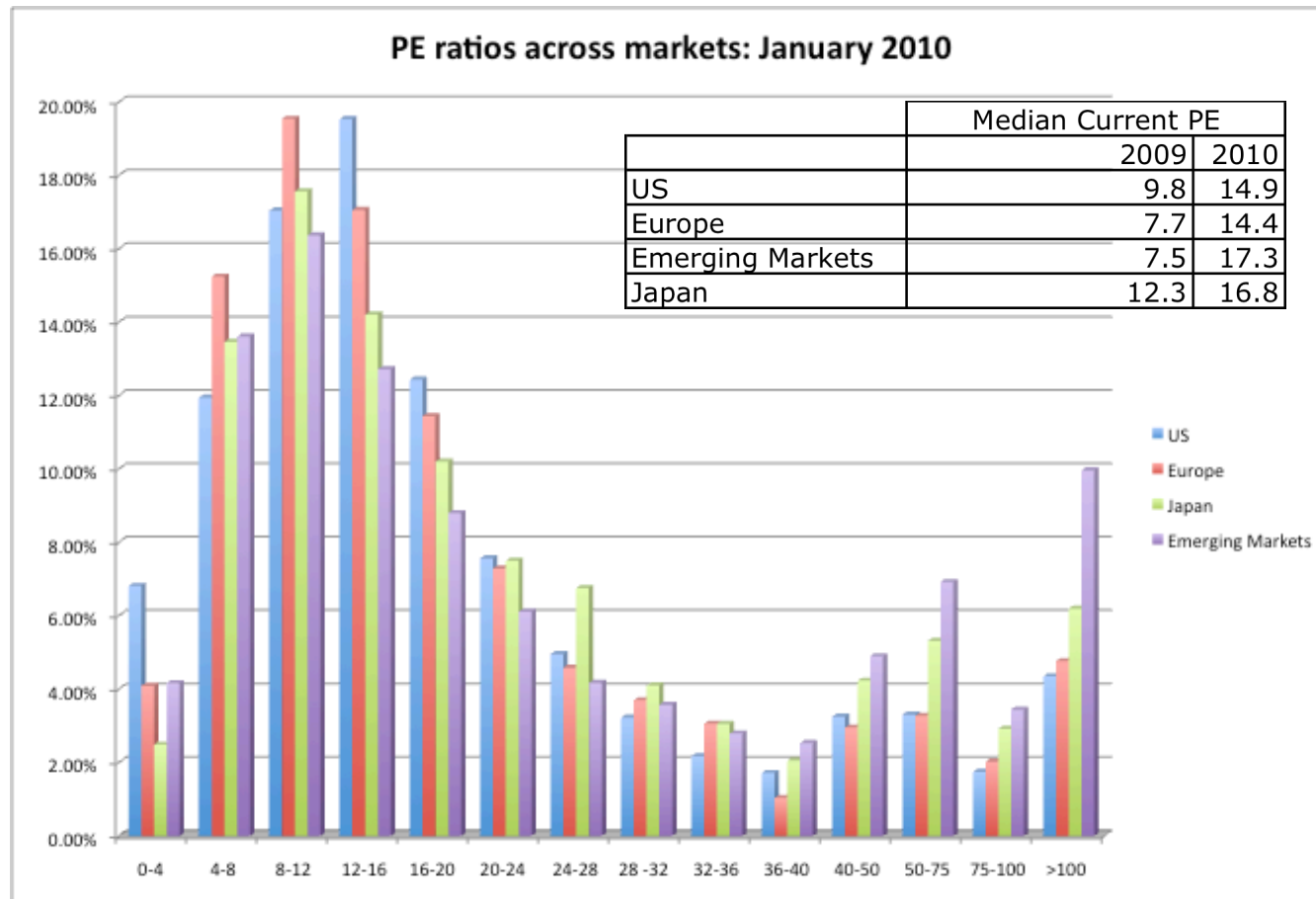# The distributional characteristics of multiples:
PE ratios in January 2010
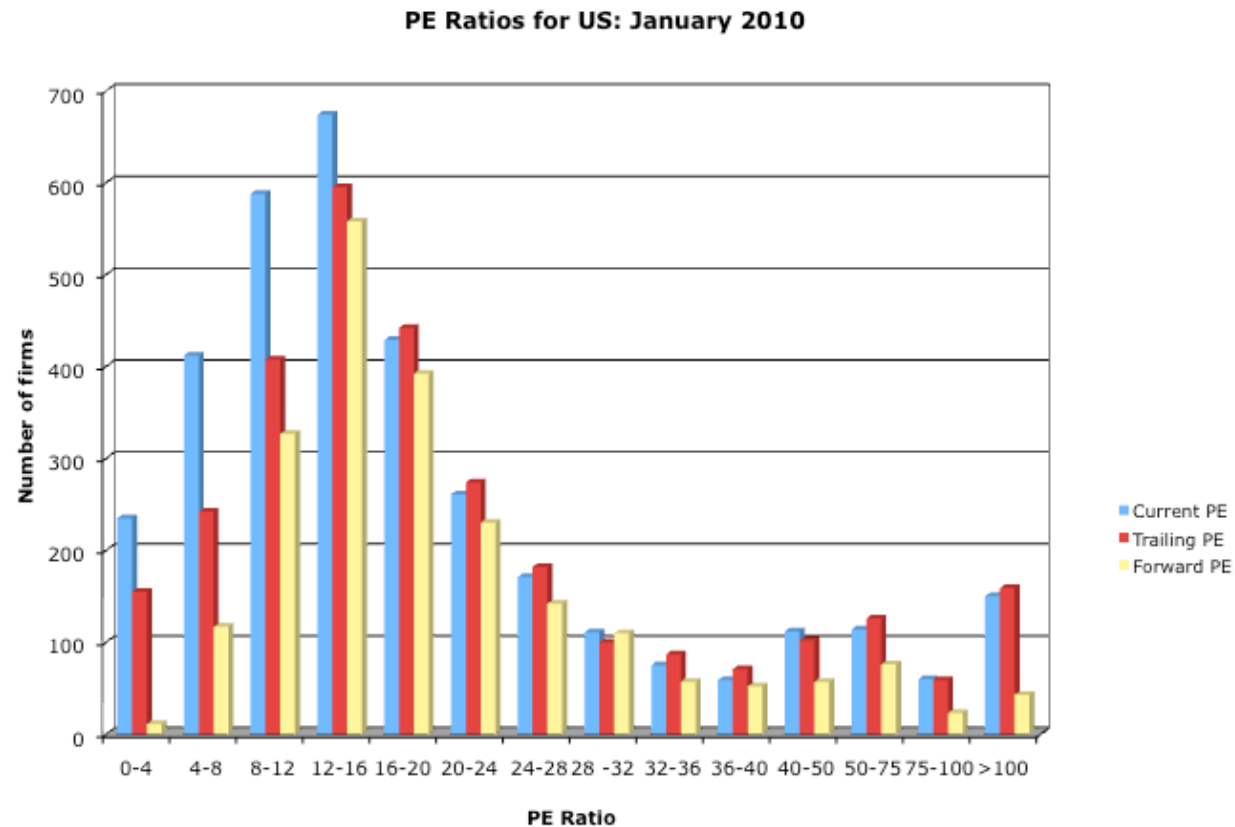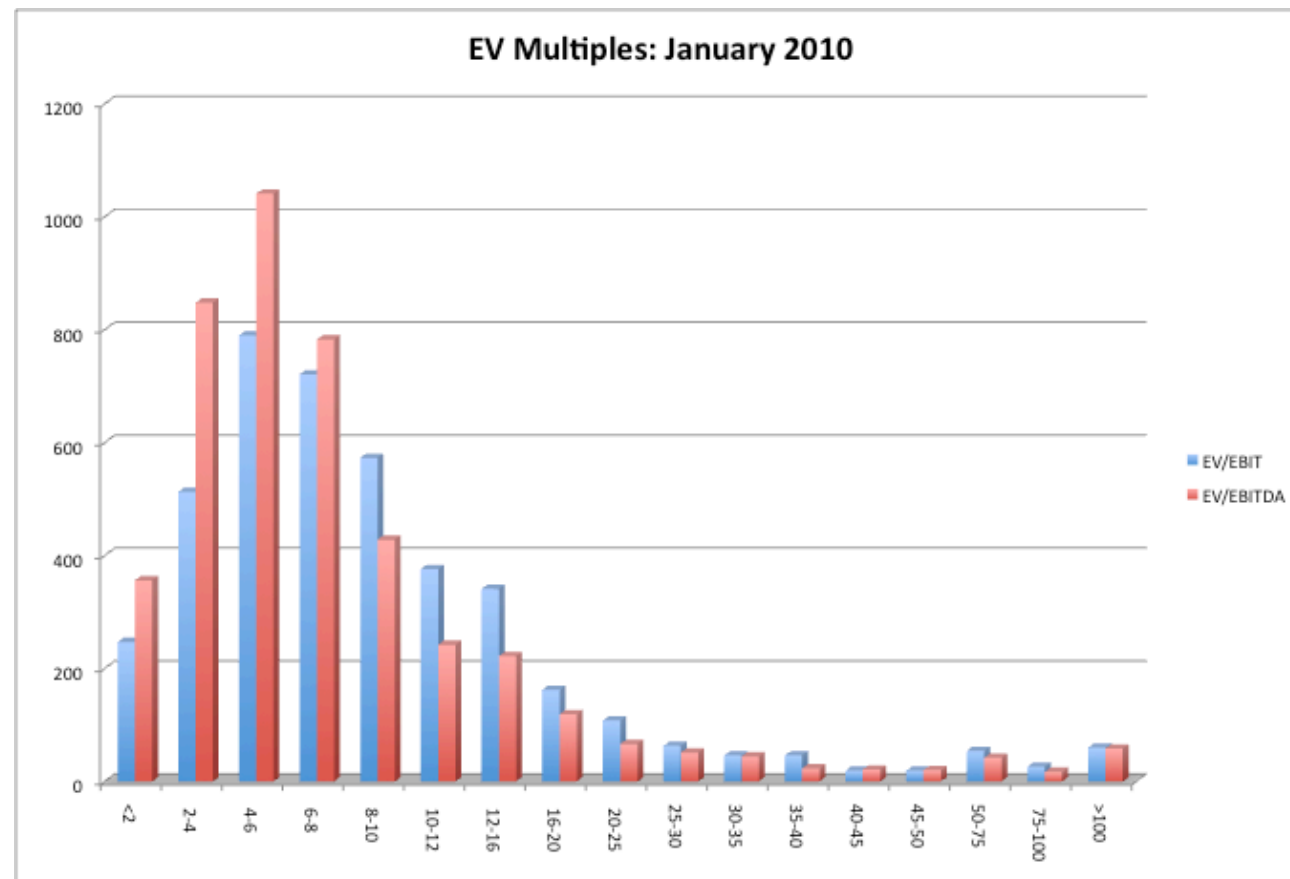
PE in 2010: Deciphering the Distribution

	January 1, 2010			January 1, 2009			January 1, 2008		
	Current PE	Trailing PE	Forward PE	Current PE	Trailing PE	Forward PE	Current PE	Trailing PE	Forward PE
Mean	29.57	39.93	24.37	18.91	17.48	20.04	45.02	32.44	32.21
Standard Error	1.34	3.62	0.81	0.98	0.91	0.87	4.64	1.96	1.47
Median	14.92	16.69	16.72	9.8	9.89	11.69	18.16	17	17.28
Standard Deviation	78.97	198.35	37.87	61.97	55.61	45.74	299.11	123.29	80.82
Kurtosis	194.36	1179.33	185.30	668.3	1073.76	174.18	1618.2	1241.97	269.8
Skewness	12.12	30.18	11.28	21.06	27.18	11.66	35.41	30.3	14.23
Maximum	1570.00	8526.00	869.00	2442.83	2475.71	933	15126.2	5713	1912.33
Count	3457	3010	2195	4010	3737	2795	4155	3944	3004
Sample Size	7036	7036	7036	6871	6871	6871	7155	7155	7155
Largest(300)	55.12	57.39	32.58	29.5	26.18	25.06			
Smallest(300)	4.72	6.78	10.28	3.00	2.76	5.74			

Not just US stocks
PE Ratios: US, Europe, Japan and Emerging Markets

PE ratios across markets: January 2010

	Median Current PE	
	2009	2010
US	9.8	14.9
Europe	7.7	14.4
Emerging Markets	7.5	17.3
Japan	12.3	16.8

Simplistic rules almost always break down…6 times EBITDA may not be cheap…

Analytical Tests

■ What are the <u>fundamentals</u> 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.

 • In fact, using a simple discounted cash flow model and basic algebra should yield the fundamentals that drive a multiple

■ How do <u>changes in these fundamentals</u> change the multiple?

 • The relationship between a fundamental (like growth) and a multiple (such as PE) is seldom linear. For example, if firm A has twice the growth rate of firm B, it will generally not trade at twice its PE ratio

 • **Proposition 3: It is impossible to properly compare firms on a multiple, if we do not know the nature of the relationship between fundamentals and the multiple.**

A simple way to identify the fundamentals that drive multiples

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 Ratio:
Understanding the Fundamentals – Stable growth firm

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

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

- Dividing both sides by the current earnings per share,

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

- <u>Bottom line</u>: For a stable growth, dividend paying firm, the PE ratio is a function of three variables – its expected growth rate in EPS, its risk (as manifested in its cost of equity) and its payout ratio (which is a function of the ROE it generates on its investments).

Extending the approach:
PE ratio 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%

$$PE = \frac{0.2 * (1.25) * \left(1 - \frac{(1.25)^5}{(1.115)^5}\right)}{(.115 - .25)} + \frac{0.5 * (1.25)^5 * (1.08)}{(.115 - .08)(1.115)^5} = 28.75$$
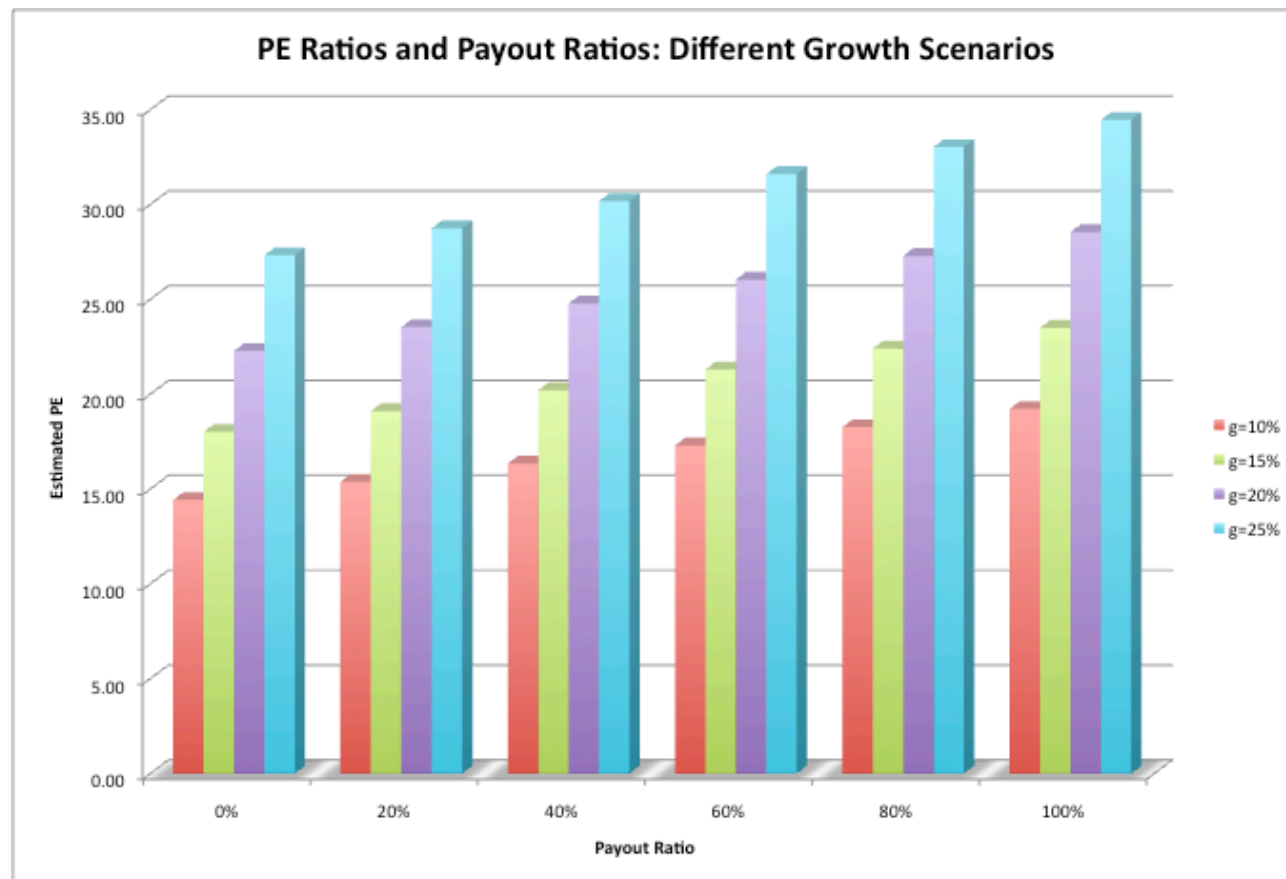
a. PE and Growth: Firm grows at x% for 5 years, 8% thereafter
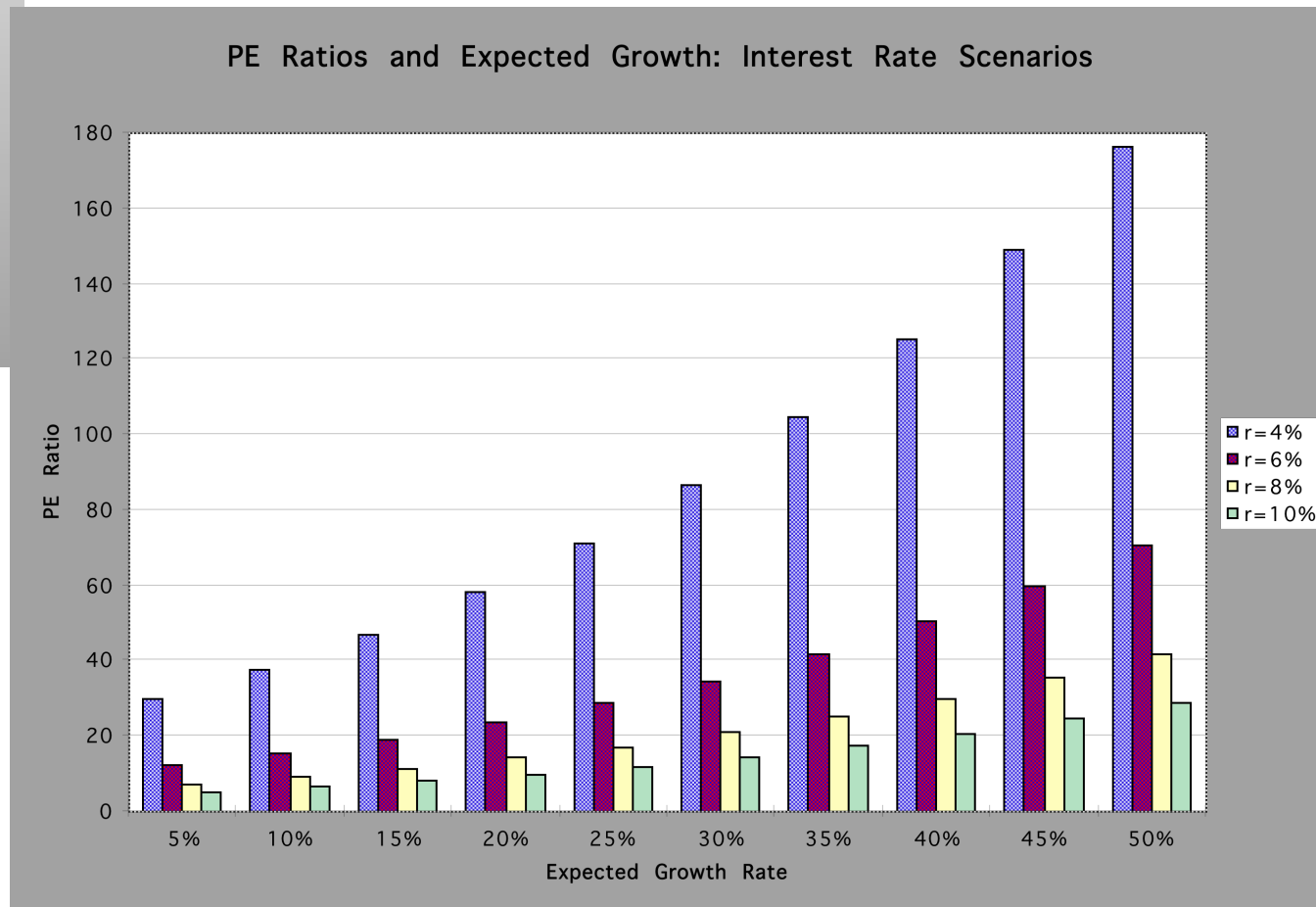
b. PE and Risk: A Follow up Example

PE Ratios and Beta: Growth Scenarios
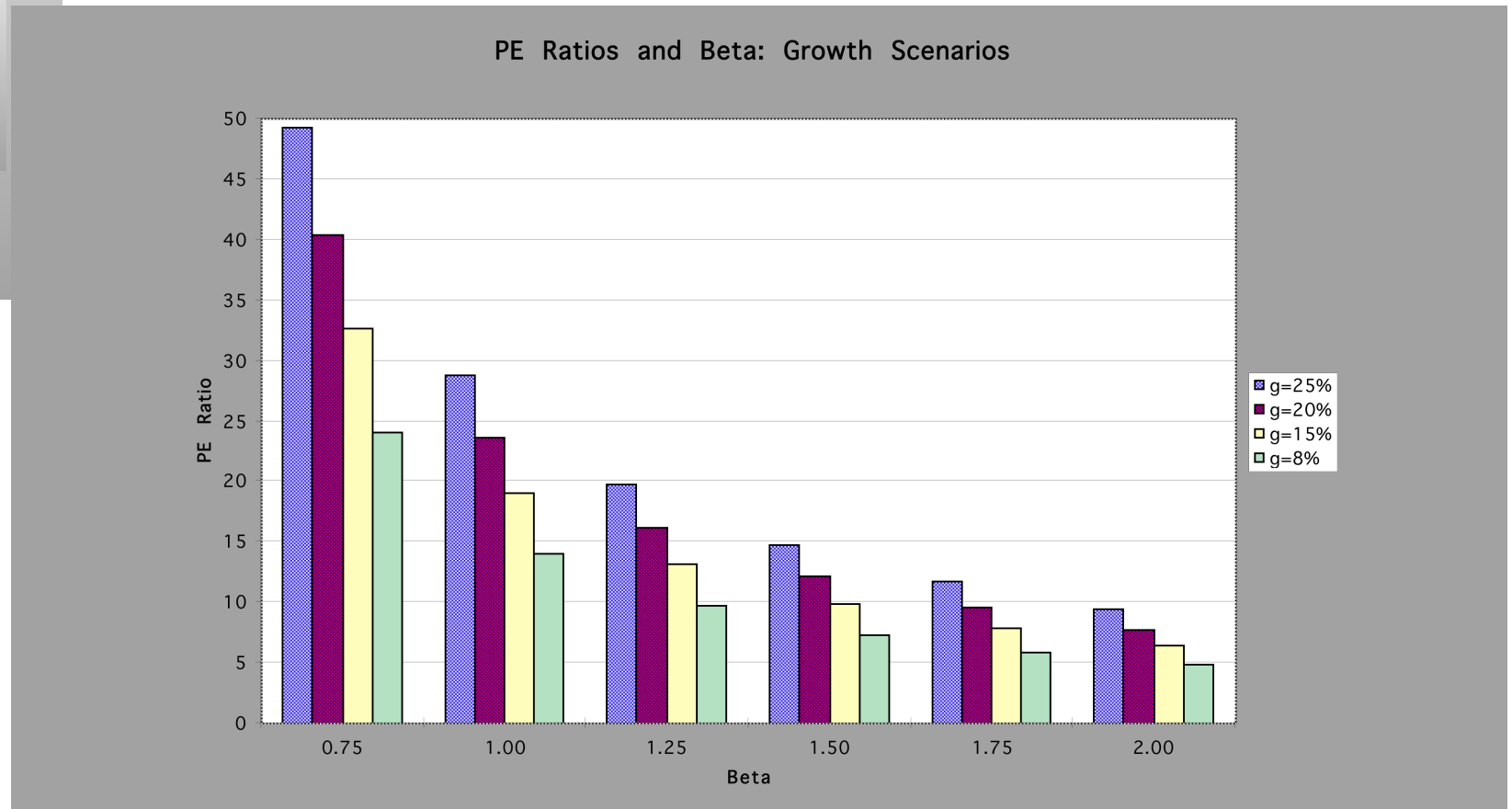
# c. PE and Payout/ ROE

The perfect under valued company…

■ If you were looking for the perfect undervalued asset, it would be one
  - With a low PE ratio (it is cheap)
  - With high expected growth in earnings
  - With low risk (and cost of equity)
  - And with high ROE

  In other words, it would be cheap with no good reason for being cheap

■ In the real world, most assets that look cheap on a multiple of earnings basis deserve to be cheap. In other words, one or more of these variables works against the company (It has low growth, high risk or a low ROE).

■ When presented with a cheap stock (low PE), here are the key questions:
  - What is the expected growth in earnings?
  - What is the risk in the stock?
  - How efficiently does this company generate its growth?

Putting the variables to the test:
1. Comparing PE ratios across time for the S&P 500

PE on S&P 500 over time: 1960- 2008
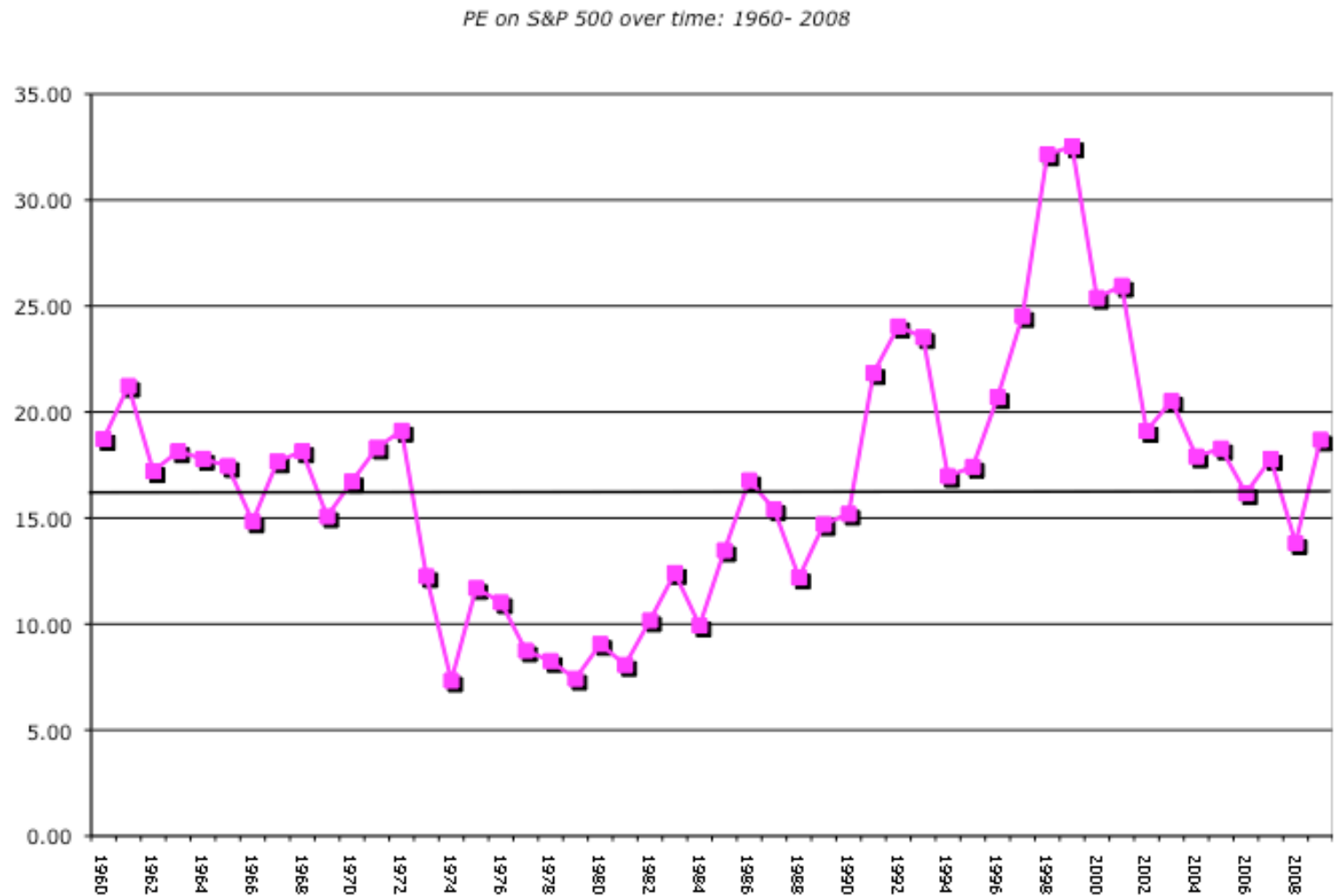
Is low (high) PE cheap (expensive)?

- 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?
  - ❑ Yes
  - ❑ No
- If you do not agree, what factors might explain the PE ratio today?

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

EP Ratios and Interest Rates: 1960- 2009
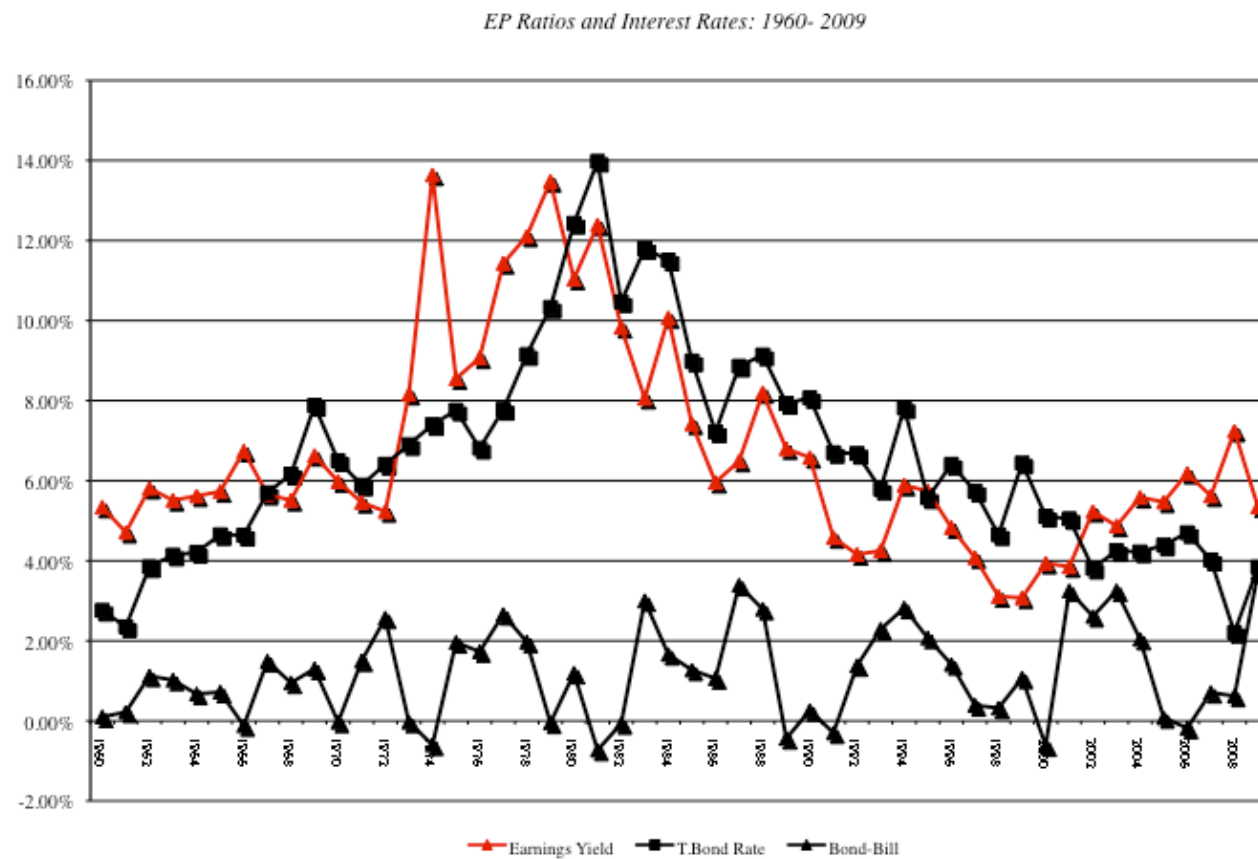
Regression Results

- There is a strong positive relationship between E/P ratios and T.Bond rates, as evidenced by the correlation of 0.69 between the two variables.

- In addition, there is evidence that the term structure also affects the PE ratio.

- In the following regression, using 1960-2009 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 = 2.66% + 0.675 T.Bond Rate - 0.313 (T.Bond Rate-T.Bill Rate)

       (3.37)   (6.41)   (-1.36)

   R squared = 47.59%

Given the treasury bond rate and treasury bill rate today, is the market under or over valued today?

Putting the variables to the test
2. Emerging Market PE Ratios: February 2010
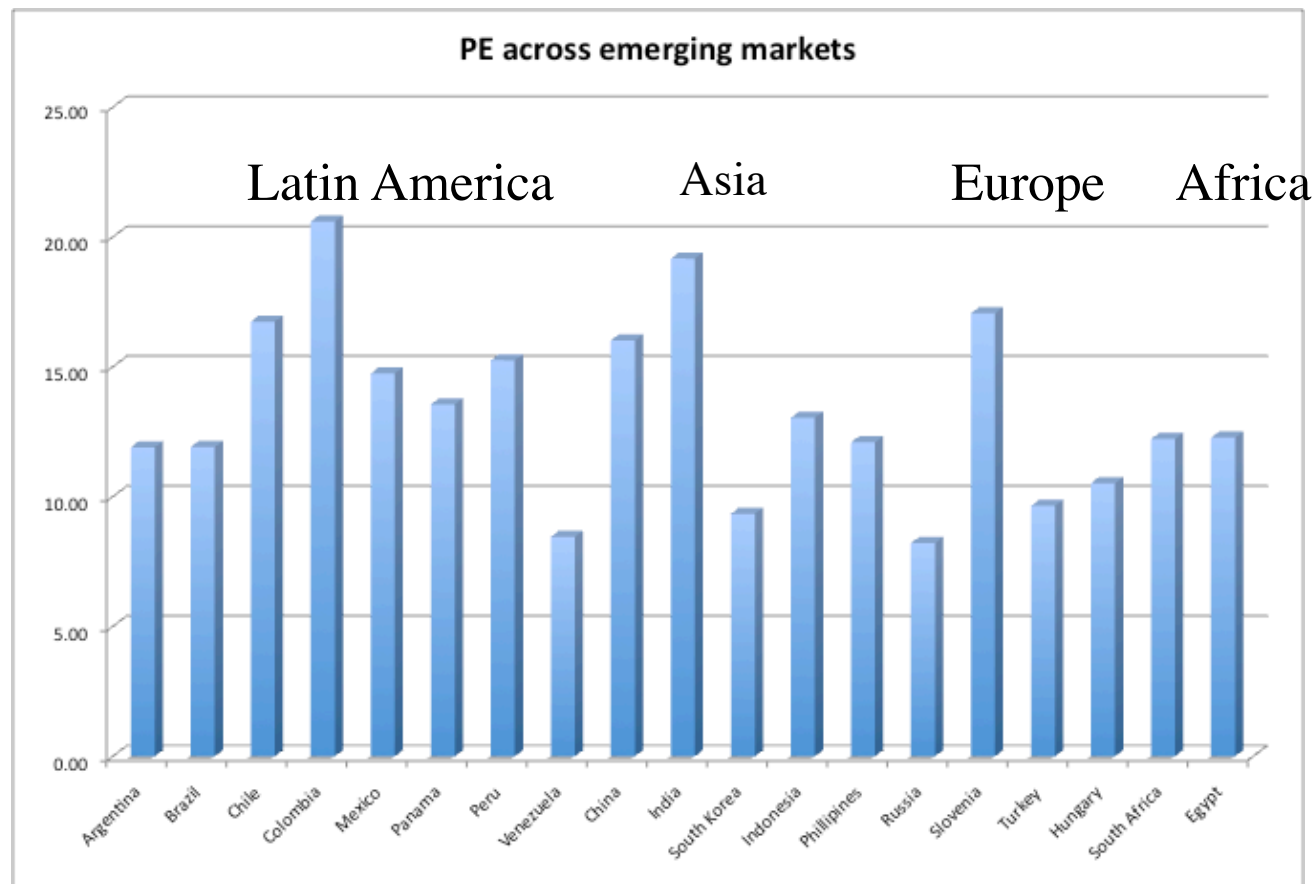
II. Price to Book Ratios –
Determinants for a stable growth firm

■ Going back to a simple dividend discount model,

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

■ Defining the return on equity (ROE) = EPS_0 / Book Value of Equity, the value of equity can be written as:

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

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

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

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

Price Book Value Ratio: Stable Growth Firm
An alternate interpretation

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

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

■ 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. In effect, firms that are expected to earn their cost of equity over time should trade at close to book value, whereas firms that expect to generate returns on equity that are higher (lower) than their costs of equity will trade at above (below) book value.

It's all about finding mismatches: Price to Book versus Return on Equity

MV/BV

Overvalued
Low ROE
High MV/BV

High ROE
High MV/BV

ROE-r

Low ROE
Low MV/BV

Undervalued
High ROE
Low MV/BV
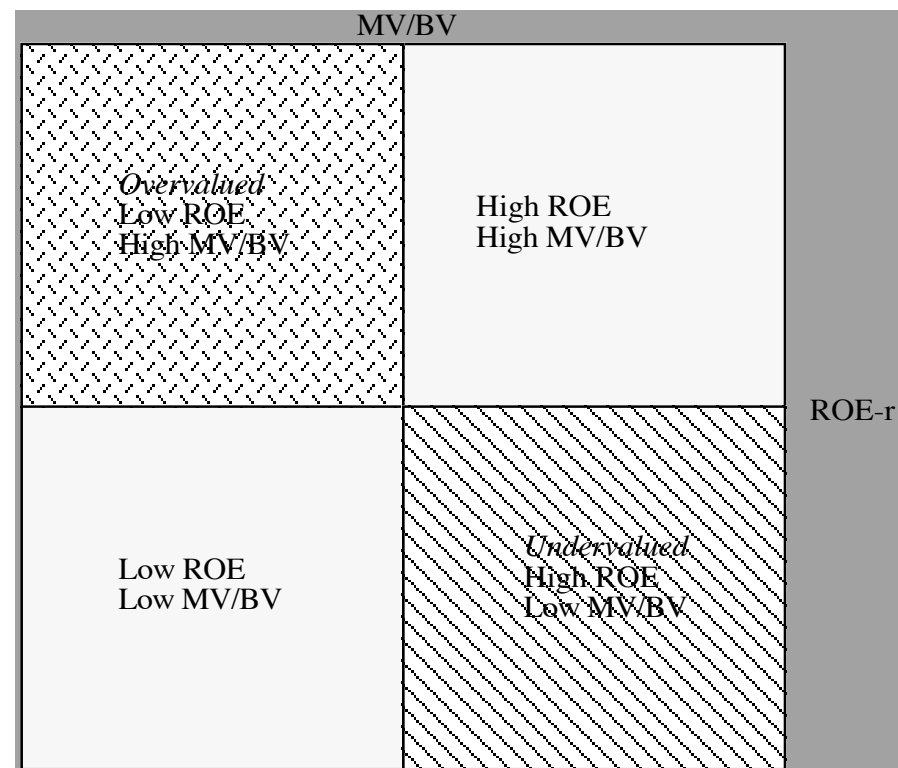
Price to Book vs ROE: Largest Market Cap Firms in the United States: January 2010
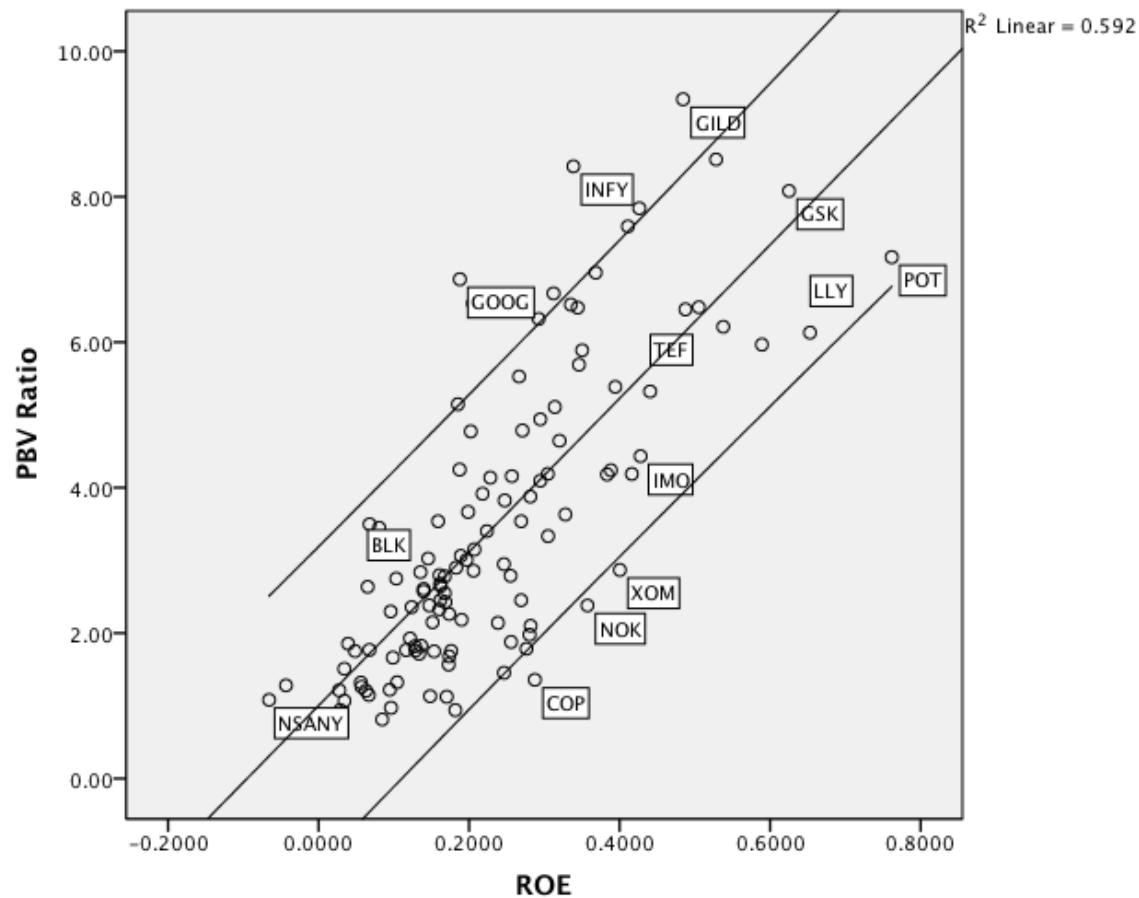
Bringing in growth into the picture…
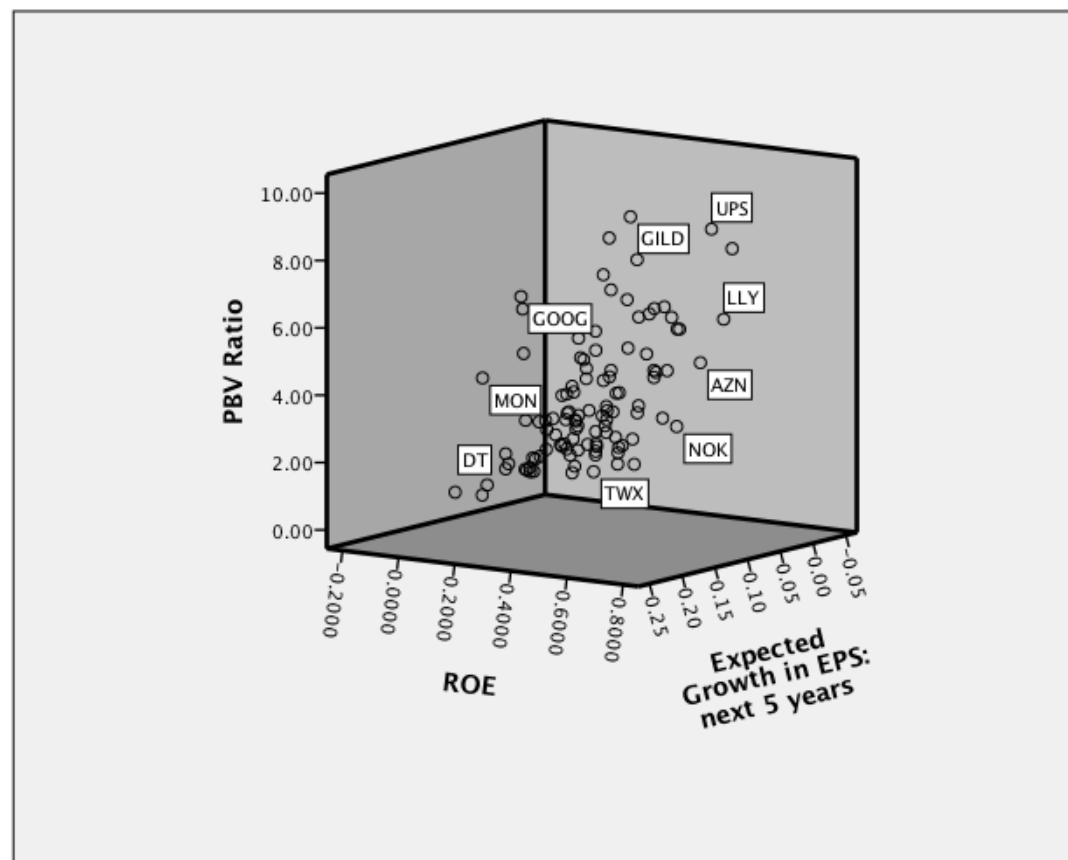
Or risk…
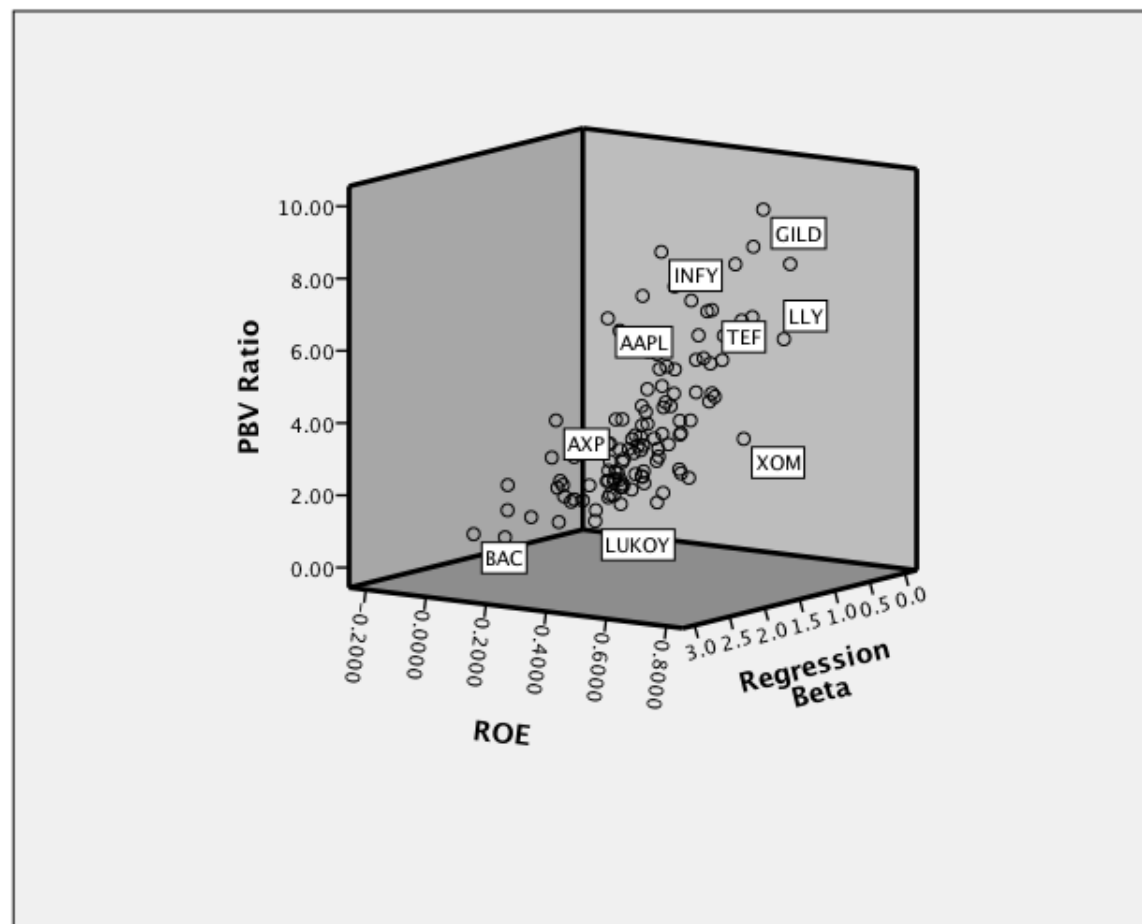
III. From Equity to Enterprise Value

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

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

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

- The numerator can be written as follows:

FCFF = EBIT $(1-t)$ - $(Cex - Depr)$ - Δ Working Capital

= (EBITDA - Depr) $(1-t)$ - $(Cex - Depr)$ - Δ Working Capital

= EBITDA $(1-t)$ + Depr (t) - Cex - Δ Working Capital

From Firm Value to EBITDA Multiples

■ 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,

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

■ Since Reinvestment = (CEx – Depreciation + Δ Working Capital), the determinants of EV/EBITDA are:
  • The cost of capital
  • Expected growth rate
  • Tax rate
  • Reinvestment rate (or ROC)

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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.

Calculating Value/EBITDA Multiple

■ 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

YEBITDA Multiples and Tax R

Tax
Rates

Reinvestment
Needs

Value/EBITDA and Net Cap Ex Ra

Value/EBITDA and Return on Ca
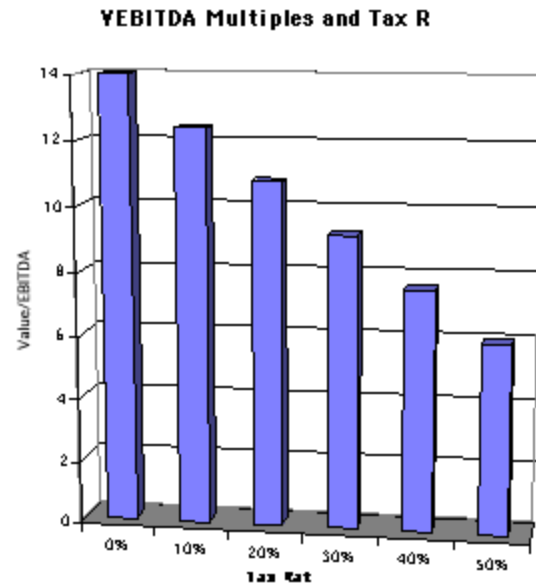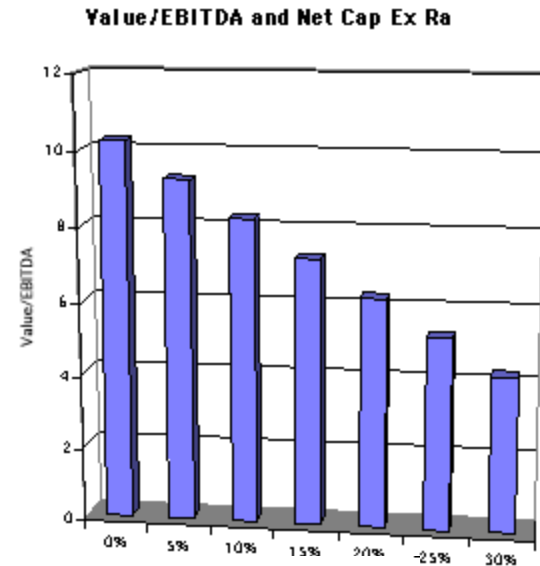
Excess
Returns
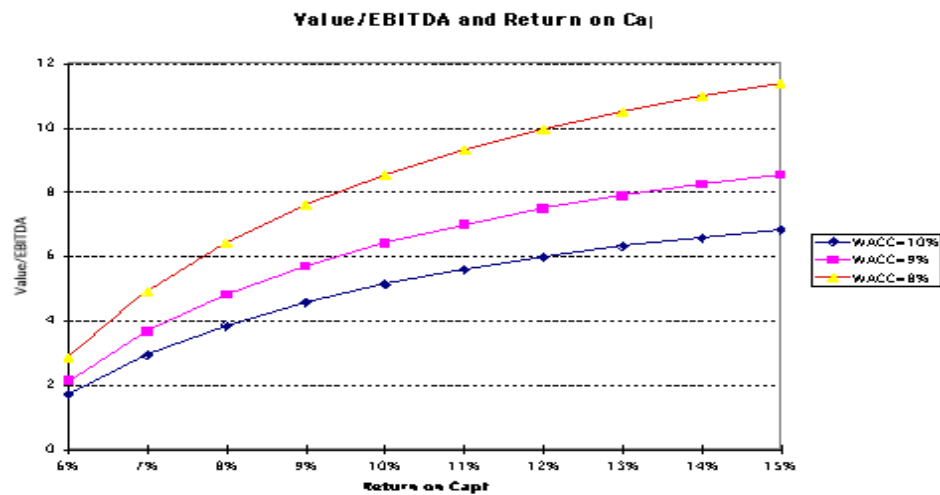
The Determinants of Multiples…

$$\text{Value of Stock} = DPS_1/(k_e - g)$$

PE=Payout Ratio $(1+g)/(r-g)$	PEG=Payout ratio $(1+g)/g(r-g)$	PBV=ROE (Payout ratio) $(1+g)/(r-g)$	PS= Net Margin (Payout ratio) $(1+g)/(r-g)$
PE=f(g, payout, risk)	PEG=f(g, payout, risk)	PBV=f(ROE,payout, g, risk)	PS=f(Net Mgn, payout, g, risk)

Equity Multiples

Firm Multiples

V/FCFF=f(g, WACC)   V/EBIT(1-t)=f(g, RIR, WACC   V/EBIT=f(g, RIR, WACC, t   VS=f(Oper Mgn, RIR, g, WACC)

Value/FCFF=$(1+g)/$ (WACC-g)	Value/EBIT(1-t) = $(1+g)$ (1- RIR)/(WACC-g)	Value/EBIT=$(1+g)(1-$ RiR)/(1-t)(WACC-g)	VS= Oper Margin (1- RIR) $(1+g)/$(WACC-g)

$$\text{Value of Firm} = FCFF_1/(WACC - g)$$

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.**

Comparable firms: Approaches

■ 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 be very few in number. The trade off then becomes:

Small sample of
firms that are
"just like" your
firm

Large sample
of firms that are
similar in some
dimensions but
different on
others

Techniques for comparing across firms

- <u>Direct comparisons</u>: 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.

- <u>Story telling</u>: 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.

- <u>Modified multiple</u>: You can modify the multiple to incorporate the dimension on which there are differences across firms.
    - An example: When comparing the PE ratios of technology firms with different growth rates, you can divide the PE ratio by the expected growth rate to arrive at a PEG ratio.

- <u>Statistical techniques</u>: 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.

I. Direct Comparisons

■ Assuming that you want to find firms that are exactly like your firm, which of the following variables would you try to make comparable?

a) Industry, sector or subsector

b) Market capitalization

c) Expected growth rate

d) Return on invested capital

e) Debt ratio

f) Beta

g) Expected length of growth period

II. Story telling..

■ Based upon the following information on two stocks, which one would you classify as cheap?

	A	B
PE Ratio	8.00	12.00
Expected Growth rate	8.00%	4.00%
Beta	0.80	1.20

■ Based upon the following information on two stocks, which one would you classify as cheap?

	C	D
PE Ratio	8.00	12.00
Expected Growth rate	4.00%	8.00%
Beta	1.20	0.80

III. Modified Multiples
The case of PEG ratios

■ The PEG ratio is the ratio of price earnings to expected growth in earnings per share.

$$PEG = PE / Expected\ Growth\ Rate\ in\ Earnings$$

■ Proponents of this ratio argue that it controls for differences in growth and allows you to therefore compare the pricing of companies with very different expected growth rates. For instance, assume that you are comparing the two stocks C and D from the last page:

	C	D
PE Ratio	8.00	12.00
Expected Growth rate	4.00%	8.00%
Beta	1.20	0.80
PEG Ratio	2.00	1.50

The PEG ratio for D is much lower than the PEG ratio for C, leading to the conclusion that D is under valued.

If we come to this conclusion, what is the implicit assumption we are making about the relationship between PE and expected growth rates?

Example
PEG Ratios: The Beverage Sector

Company Name	Trailing PE	Growth	Std Dev	PEG
Coca-Cola Bottling	29.18	9.50%	20.58%	3.07
Molson Inc. Ltd. 'A'	43.65	15.50%	21.88%	2.82
Anheuser-Busch	24.31	11.00%	22.92%	2.21
Corby Distilleries Ltd.	16.24	7.50%	23.66%	2.16
Chalone Wine Group Ltd.	21.76	14.00%	24.08%	1.55
Andres Wines Ltd. 'A'	8.96	3.50%	24.70%	2.56
Todhunter Int'l	8.94	3.00%	25.74%	2.98
Brown-Forman 'B'	10.07	11.50%	29.43%	0.88
Coors (Adolph) 'B'	23.02	10.00%	29.52%	2.30
PepsiCo, Inc.	33.00	10.50%	31.35%	3.14
Coca-Cola	44.33	19.00%	35.51%	2.33
Boston Beer 'A'	10.59	17.13%	39.58%	0.62
Whitman Corp.	25.19	11.50%	44.26%	2.19
Mondavi (Robert) 'A'	16.47	14.00%	45.84%	1.18
Coca-Cola Enterprises	37.14	27.00%	51.34%	1.38
Hansen Natural Corp	9.70	17.00%	62.45%	0.57
Average	**22.66**	**0.13**	**0.33**	**2.00**

Hansen looks really cheap on a PEG ratio basis… What might we be missing?

IV. Comparing PE Ratios across a Sector: Regression based approach

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	prob
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.

Example 2: Return to PEG Ratios: The Beverage Sector

Company Name	Trailing PE	Growth	Std Dev	PEG
Coca-Cola Bottling	29.18	9.50%	20.58%	3.07
Molson Inc. Ltd. 'A'	43.65	15.50%	21.88%	2.82
Anheuser-Busch	24.31	11.00%	22.92%	2.21
Corby Distilleries Ltd.	16.24	7.50%	23.66%	2.16
Chalone Wine Group Ltd.	21.76	14.00%	24.08%	1.55
Andres Wines Ltd. 'A'	8.96	3.50%	24.70%	2.56
Todhunter Int'l	8.94	3.00%	25.74%	2.98
Brown-Forman 'B'	10.07	11.50%	29.43%	0.88
Coors (Adolph) 'B'	23.02	10.00%	29.52%	2.30
PepsiCo, Inc.	33.00	10.50%	31.35%	3.14
Coca-Cola	44.33	19.00%	35.51%	2.33
Boston Beer 'A'	10.59	17.13%	39.58%	0.62
Whitman Corp.	25.19	11.50%	44.26%	2.19
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Coca-Cola Enterprises	37.14	27.00%	51.34%	1.38
Hansen Natural Corp	9.70	17.00%	62.45%	0.57
Average	**22.66**	**0.13**	**0.33**	**2.00**

Analyzing PE/Growth

■ Given that the PEG ratio is still determined by the expected growth rates, risk and cash flow patterns, it is necessary that we control for differences in these variables.

■ Regressing PEG against risk and a measure of the growth dispersion, we get:

PEG = 3.61 -.0286 (Expected Growth) - .0375 (Std Deviation in Prices)

R Squared = 44.75%

■ In other words,
  - PEG ratios will be lower for high growth companies
  - PEG ratios will be lower for high risk companies

■ We also ran the regression using the deviation of the actual growth rate from the industry-average growth rate as the independent variable, with mixed results.

Estimating the PEG Ratio for Hansen

■ Applying this regression to Hansen, the predicted PEG ratio for the firm can be estimated using Hansen's measures for the independent variables:

- Expected Growth Rate = 17.00%
- Standard Deviation in Stock Prices = 62.45%

■ Plugging in,

Expected PEG Ratio for Hansen = 3.61 - .0286 (17) - .0375 (62.45)

$$= 0.78$$

■ With its actual PEG ratio of 0.57, Hansen looks undervalued, notwithstanding its high risk.

Example 3:
PBV & ROE: European Banks - 2010

Bloomberg symbol	Name	PBV Ratio	Return on Equity	Standard Deviation
HVM GR Equity	BAYERISCHE HYPO-UND VEREINSB	0.80	-1.66%	49.06%
CBK GR Equity	COMMERZBANK AG	1.09	-6.72%	36.21%
DBK GR Equity	DEUTSCHE BANK AG -REG	1.23	1.32%	35.79%
BIN IM Equity	BANCA INTESA SPA	1.66	1.56%	34.14%
BNP FP Equity	BNP PARIBAS	1.72	12.46%	31.03%
SAN SM Equity	BANCO SANTANDER CENTRAL HISP	1.86	11.06%	28.36%
SPI IM Equity	SANPAOLO IMI SPA	1.96	8.55%	26.64%
BBVA SM Equity	BANCO BILBAO VIZCAYA ARGENTA	1.98	11.17%	18.62%
GLE FP Equity	SOCIETE GENERALE	2.04	9.71%	22.55%
RBS LN Equity	ROYAL BANK OF SCOTLAND GROUP	2.09	20.22%	18.35%
HBOS LN Equity	HBOS PLC	2.15	22.45%	21.95%
BARC LN Equity	BARCLAYS PLC	2.23	21.16%	20.73%
UC IM Equity	UNICREDITO ITALIANO SPA	2.30	14.86%	13.79%
KBL LX Equity	KREDIETBANK SA LUXEMBOURGEOI	2.46	17.74%	12.38%
EBS AV Equity	ERSTE BANK DER OESTER SPARK	2.53	10.28%	21.91%
STAN LN Equity	STANDARD CHARTERED PLC	2.59	20.18%	19.93%
HSBA LN Equity	HSBC HOLDINGS PLC	2.94	18.50%	19.66%
LLOY LN Equity	LLOYDS TSB GROUP PLC	3.33	32.84%	18.66%

Exploring the relationship between Price to Book and ROE

■ 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%

Estimating predicted Price to Book ratios

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%

Example 4. Nothing's working!!! Internet Stocks in early 2000
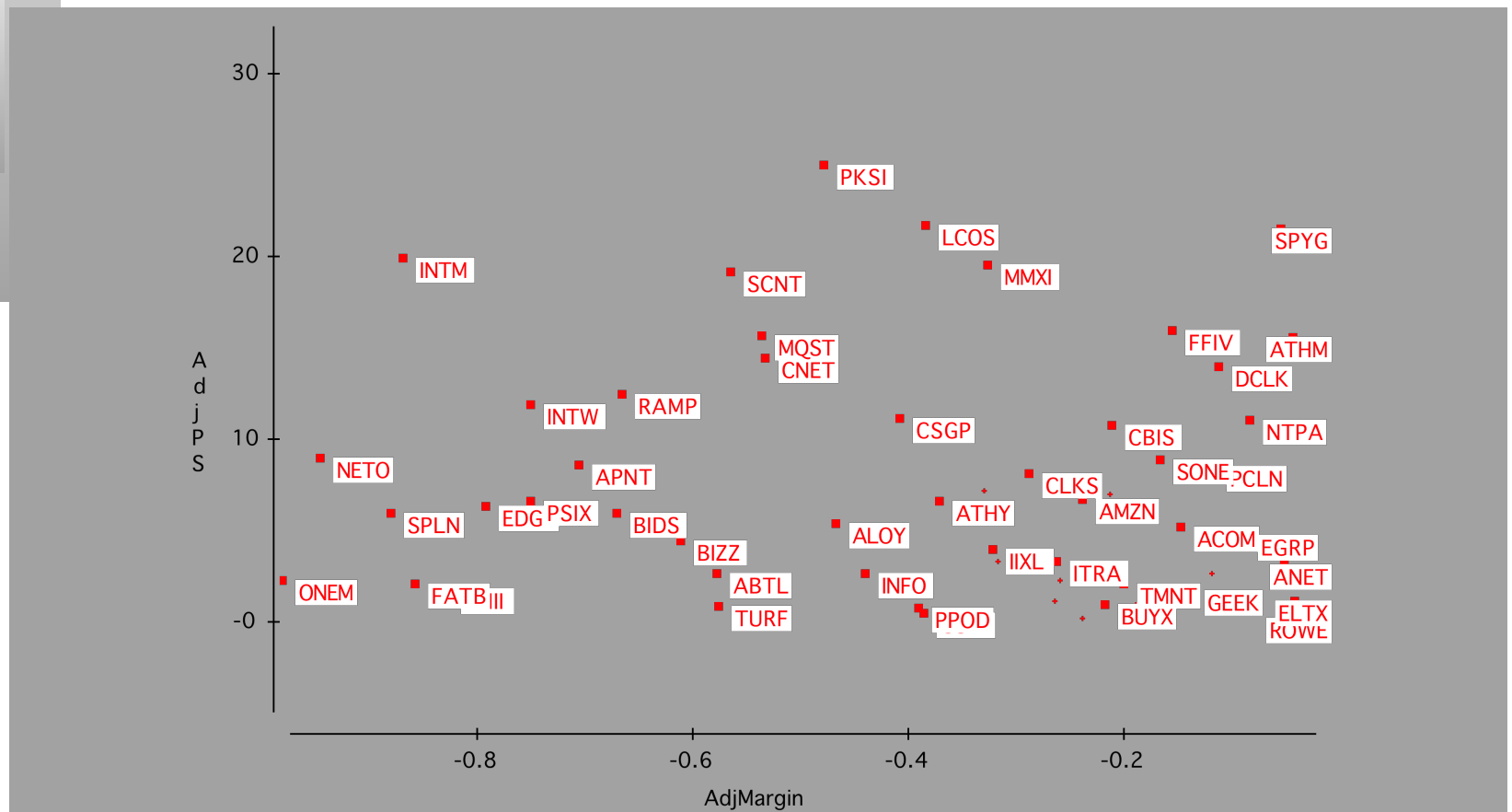
PS Ratios and Margins are not highly correlated

- Regressing PS ratios against current margins yields the following

  PS = 81.36   - 7.54(Net Margin) $R^2 = 0.04$

        (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)

$\quad$ (0.66) $\qquad$ (2.63) $\quad$ (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

■ Global Crossing lost $1.9 billion in 2001 and is expected to continue to lose money for the next 3 years. In a discounted cashflow valuation (see notes on DCF valuation) of Global Crossing, we estimated an expected EBITDA for Global Crossing in five years of $ 1,371 million.

■ The average enterprise value/ EBITDA multiple for healthy telecomm firms is 7.2 currently.

■ Applying this multiple to Global Crossing's EBITDA in year 5, yields a value in year 5 of

  • Enterprise Value in year 5 = 1371 * 7.2 = $9,871 million
  • Enterprise Value today = $ 9,871 million/ 1.138^5 = $5,172 million

  (The cost of capital for Global Crossing is 13.80%)

  • The probability that Global Crossing will not make it as a going concern is 77%.
  • Expected Enterprise value today = 0.23 (5172) = $1,190 million

Can you do this?

■ Assume that you are valuing a private internet company with revenues of $ 10 million, a revenue growth rate of 40% and a cash balance that is 5% of value for an initial public offering. Can you use the pricing of publicly traded stocks to value the internet companies?

a) Yes

b) No

■ Would your answer be different if you were valuing the company for a venture capitalist?

■ Would your answer change if you were valuing the company for sale in a private transaction?

Relative valuation with private businesses

■ With private company valuations, you have two choices for comparables.

- You can obtain private company transaction values and use them to estimate the value of your firm. Thus, if private medical practices typically sell for three times overall billing revenues, your firm would be valued at roughly the same number.

  Advantages: Since these are private company transactions, the values already reflect the liquidity and lack of diversification concerns that tend to depress private company values.

  Disadvantage: The data on private company transactions has far more contamination from transactions not being arms length or timely. It is also far more difficult to obtain other relevant data from the transaction.

- You can obtain a value from public companies and then adjust that value for illiquidity and lack of diversification considerations, if necessary.

  Advantage: The data is likely to be cleaner and there is much more of it.

  Disadvantage: The "adjusting" of public multiples is often arbitrary and can lead to biased values.

How much is the private company discount?

Private versus Public Acquisitions
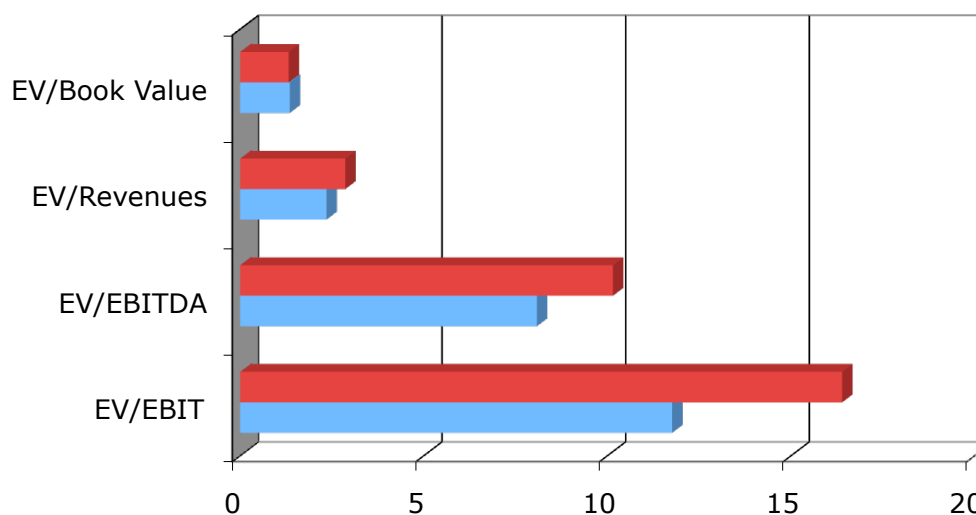

	EV/EBIT	EV/EBITDA	EV/Revenues	EV/Book Value
■ Publicly traded companies	16.39	10.15	2.86	1.32
■ Private companies	11.76	8.08	2.35	1.35

■ Publicly traded companies ■ Private companies

Comparisons to the entire market: Why not?

■ If you can control for differences in risk, growth and cash flows, you can expand your list of comparable firms significantly. In fact, there is no reason why you cannot bring every firm in the market into your comparable firm list.

■ The simplest way of controlling for differences is with a multiple regression, with the multiple (PE, EV/EBITDA etc) as the dependent variable, and proxies for risk, growth and payout forming the independent variables.

■ When you make this comparison, you are estimating the value of your compay relative to the entire market (rather than just a sector).

PE versus Expected EPS Growth: January 2010
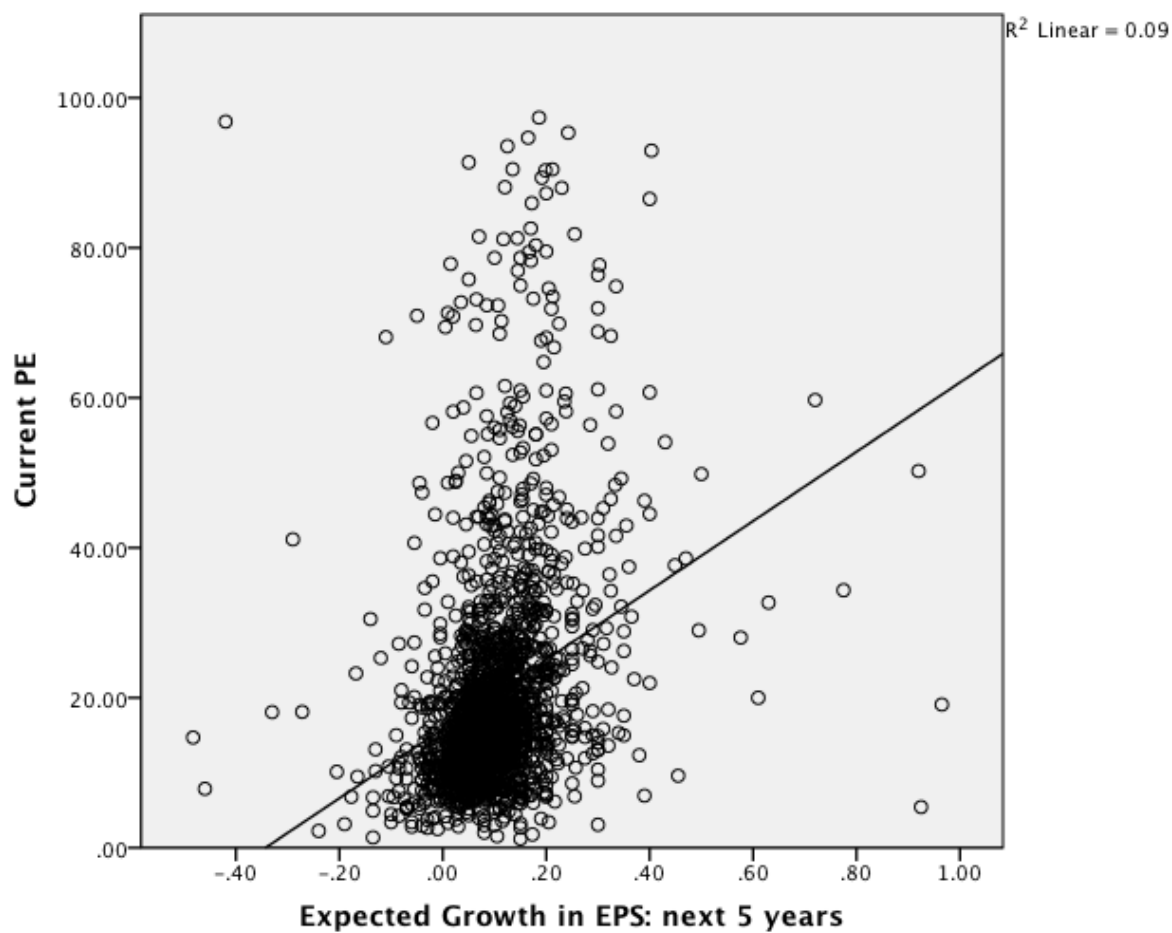
PE Ratio: Standard Regression for US stocks - January 2010

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.383[a]	.147	.145	931.78811

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

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	11.955	.772		15.478	.000
	Expected Growth in EPS: next 5 years	54.996	3.896	.333	14.115	.000
	Payout Ratio	-2.661	.612	-.102	-4.349	.000
	Regression Beta	3.162	.481	.154	6.572	.000

a. Dependent Variable: Current PE

b. Weighted Least Squares Regression – Weighted by Market Cap

The value of growth

Time Period	PE Value of extra 1% of growth	Equity Risk Premium
January 2010	0.550	4.36%
January 2009	0.780	6.43%
January 2008	1.427	4.37%
January 2007	1.178	4.16%
January 2006	1.131	4.07%
January 2005	0.914	3.65%
January 2004	0.812	3.69%
July 2003	1.228	3.88%
January 2003	2.621	4.10%
July 2002	0.859	4.35%
January 2002	1.003	3.62%
July 2001	1.251	3.05%
January 2001	1.457	2.75%
July 2000	1.761	2.20%
January 2000	2.105	2.05%

The value of growth is in terms of additional PE…

Fundamentals hold in every market: PE regressions across markets…

Region	Regression – January 2010	R squared
Europe	PE = 14.52 + 1.25 Beta + 40.71 Expected growth rate	14.9%
Japan	PE = 15.02 + 4.36 Beta + 0.62 Payout + 35.23 Expected growth	17.5%
Emerging Markets	PE = 20.07 – 2.09 Beta – 2.49 Payout + 37.91 Expected growth rate	12.8%

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 don't control for fundamental differences in risk, cashflows and growth across firms when comparing how they are priced, your valuation conclusions will reflect your flawed judgments rather than market misvaluations.

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 number 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 <u>best fits your objective</u>. Thus, if you want the company to be undervalued, you pick the multiple that yields the highest value.

- Use the multiple that <u>has the highest R-squared</u> 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 <u>make the most sense</u> 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?

    a) Yes

    b) No

■ If not, how would you explain the difference?

■ If the numbers are different, which value would you use?

    a) Intrinsic value

    b) Relative value

    c) A composite of the two values

    d) The higher of the two values

    e) The lower of the two values

    f) Depends on what my valuation "mission" is.

Mission Effect: Intrinsic or Relative Value

If your valuation mission is	Appropriate value
Valuing a company (business) as a long term investment for your portfolio	a) Intrinsic value b) Relative value
Valuing a company (business) as a short term investment for your portfolio	a) Intrinsic value b) Relative value
Valuing a private company (business) for sale in a transaction	a) Intrinsic value b) Relative value
Valuing a company (business) for an initial public offering	a) Intrinsic value b) Relative value
Valuing a company for "tax" purposes	a) Intrinsic value b) Relative value
Estimating a fair value for an asset or company for accounting purposes	a) Intrinsic value b) Relative value