# Valuation: Lecture Note Packet 2
# Relative Valuation and Private Company Valuation

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# 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,
  - 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

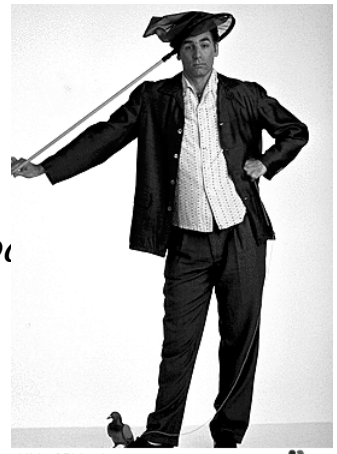
# Relative valuation is pervasive…

- Most 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 guy who lives across the hall"

*Jerry Seinfeld talking about Kramer in a Seinfeld episo*




" A little inaccuracy sometimes saves tons of explanation"

H.H. Munro

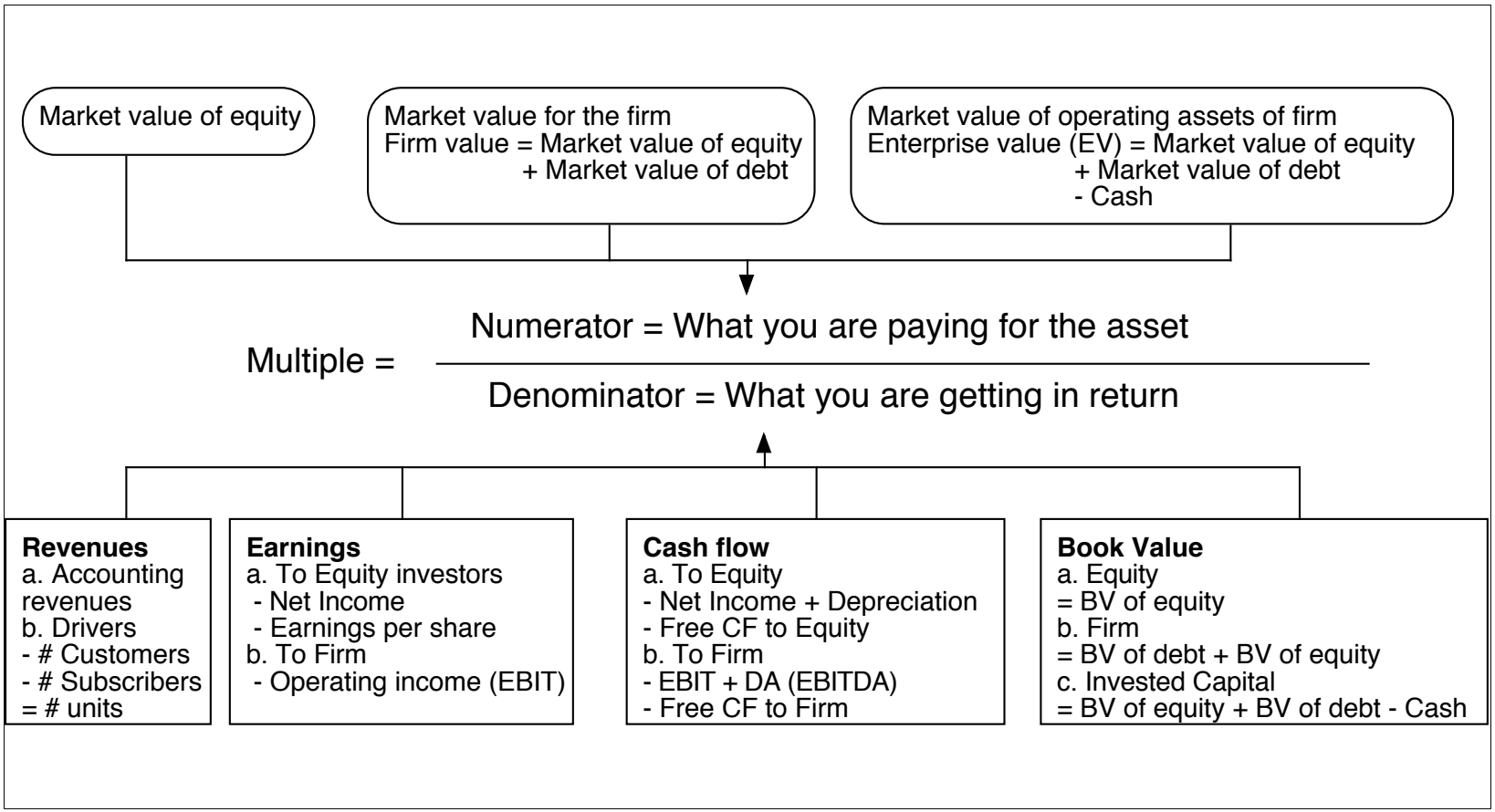
" If you are going to screw up, make sure that you have lots of company"

Ex-portfolio manager

# 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…



# The Four Steps to Understanding 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.

# Descriptive Tests

- What is the average and standard deviation for this multiple, across the universe (market)?
- How asymmetric is the distribution and what is the effect of this asymmetry on the moments of the distribution?
- 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, this can lead to a biased estimate.
  - Capping the outliers is another solution, though the point at which you cap is arbitrary and can skew results
- 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?

# 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.**

Equity Multiple or Firm Multiple

| Equity Multiple | Firm Multiple |
|---|---|
| 1. Start with an equity DCF model (a dividend or FCFE model) | 1. Start with a firm DCF model (a FCFF model) |
| $P_0 = \frac{DPS_1}{r - g_n}$ <br> $P_0 = \frac{FCFE_1}{\text{Cost of equity} - g_n}$ | $EV_0 = \frac{FCFF_1}{\text{Cost of capital} - g_n}$ |
| 2. Isolate the denominator of the multiple in the model | 2. Isolate the denominator of the multiple in the model |
| 3. Do the algebra to arrive at the equation for the multiple | 3. Do the algebra to arrive at the equation for the multiple |

# 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.**

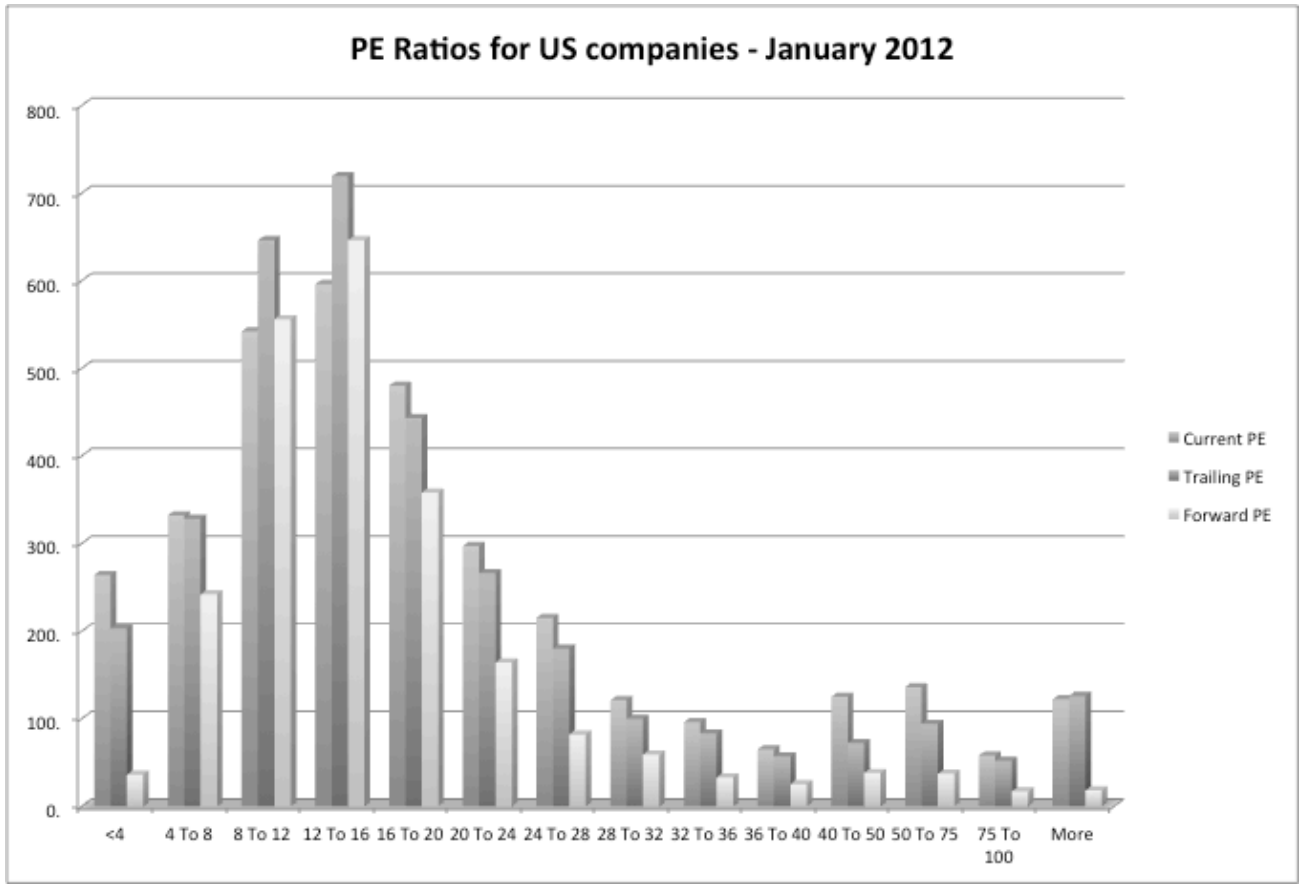
# Price Earnings Ratio: Definition

**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 (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…)

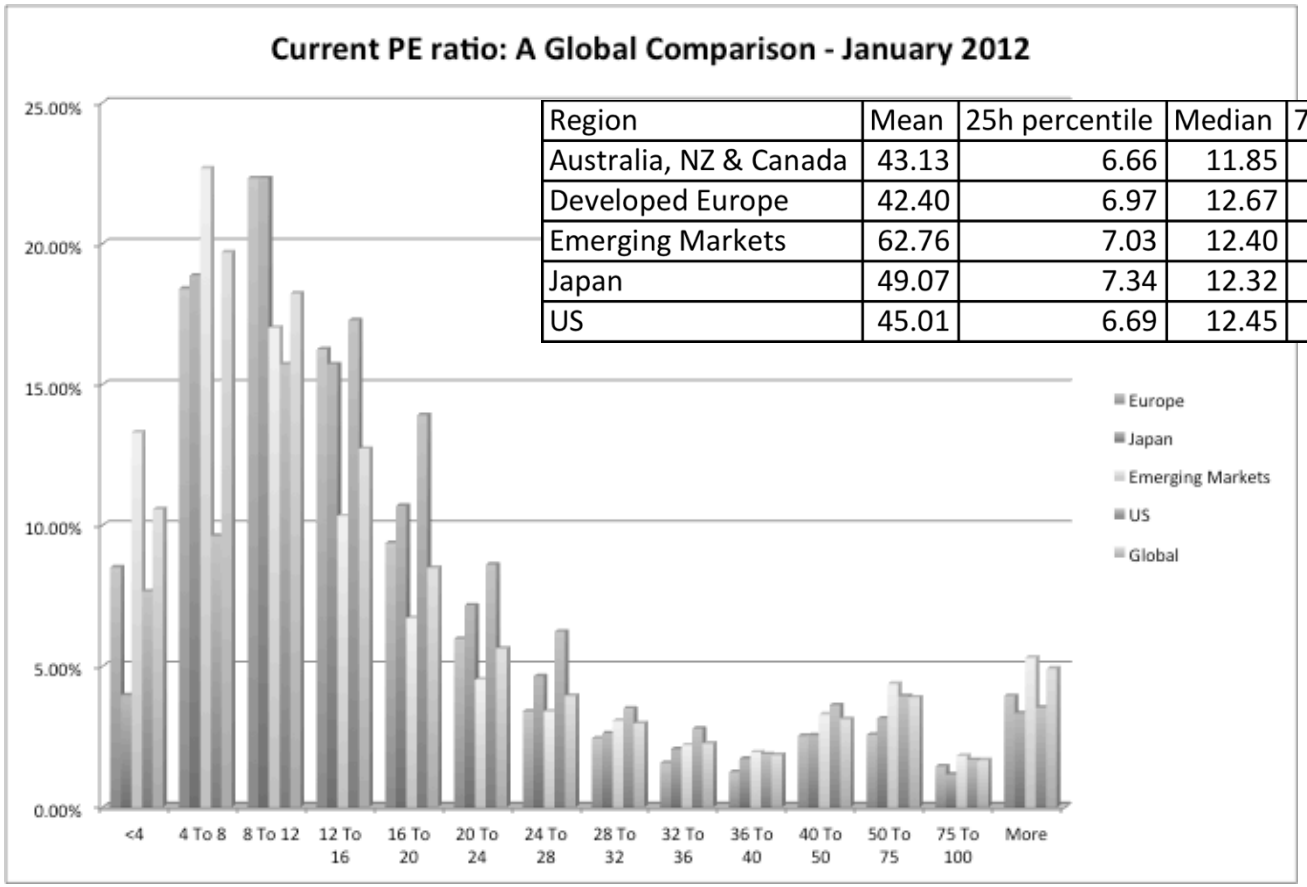
# Characteristic 1: Skewed Distributions
# PE ratios for US companies in January 2012



# Characteristic 2: Biased Samples
# PE ratios in January 2012

| | Current PE | Trailing PE | Forward PE |
|---|---|---|---|
| Total firms | 5891 | 5891 | 5891 |
| Number of firms with PE | 3456 | 3375 | 2311 |
| Average | 42.56 | 33.67 | 18.28 |
| Median | 15.94 | 14.56 | 13.74 |
| Minimum | 0.1 | 0.2 | 0.44 |
| 25th percentile | 10.11 | 10 | 10.34 |
| 75th percentile | 25.34 | 22.34 | 18.69 |
| Maximum | 18358 | 5083 | 780 |
| Standard deviation | 7.26 | 3.00 | 0.62 |
| Skewness | 33.40 | 21.86 | 15.98 |

# Characteristic 3: Across Markets
# PE Ratios: US, Europe, Japan and Emerging Markets – January 2012




| Region | Mean | 25h percentile | Median | 75th percentile |
|---|---|---|---|---|
| Australia, NZ & Canada | 43.13 | 6.66 | 11.85 | 22.64 |
| Developed Europe | 42.40 | 6.97 | 12.67 | 24.19 |
| Emerging Markets | 62.76 | 7.03 | 12.40 | 23.42 |
| Japan | 49.07 | 7.34 | 12.32 | 23.99 |
| US | 45.01 | 6.69 | 12.45 | 25.84 |

# PE Ratio: Understanding the Fundamentals

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

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

- Dividing both sides by the current earnings per share or forward EPS:

*Current EPS*

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

*Forward EPS*

$$\frac{P_0}{EPS_1} = PE = \frac{\text{Payout Ratio}}{r - g_n}$$

- If this had been a FCFE Model,

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

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

# PE Ratio and Fundamentals

- **Proposition: Other things held equal, higher growth firms will have higher PE ratios than lower growth firms.**
- **Proposition: Other things held equal, higher risk firms will have lower PE ratios than lower risk firms**
- **Proposition: Other things held equal, firms with lower reinvestment needs will have higher PE ratios than firms with higher reinvestment rates.**
- Of course, other things are difficult to hold equal since high growth firms, tend to have risk and high reinvestment rats.

# 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:

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

# Expanding the Model

- In this model, the PE ratio for a high growth firm is a function of growth, risk and payout, exactly the same variables that it was a function of for the stable growth firm.
- The only difference is that these inputs have to be estimated for two phases - the high growth phase and the stable growth phase.
- Expanding to more than two phases, say the three stage model, will mean that risk, growth and cash flow patterns in each stage.

# A Simple Example

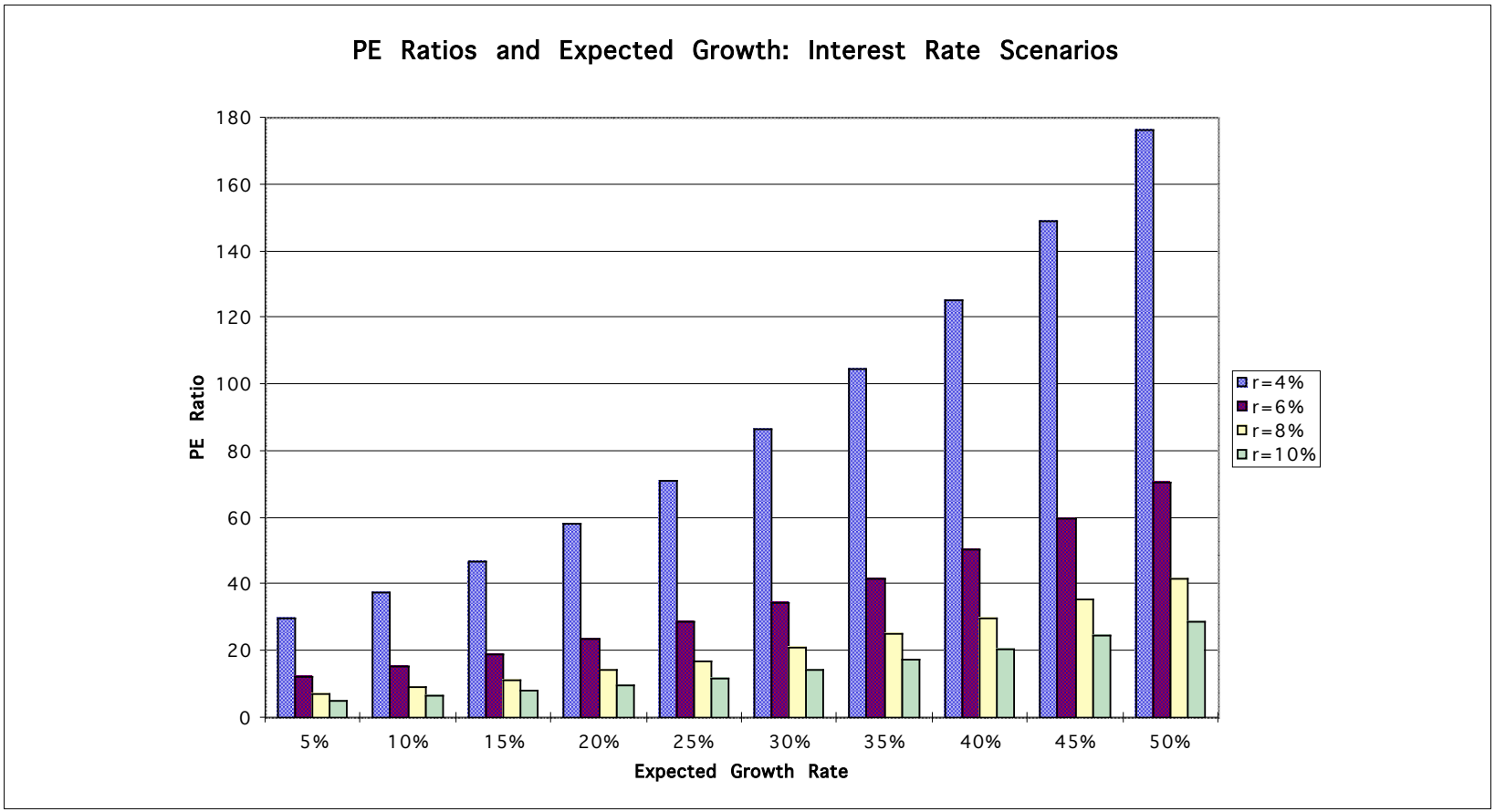
- Assume that you have been asked to estimate the PE ratio for a firm which has the following characteristics:

| 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 |

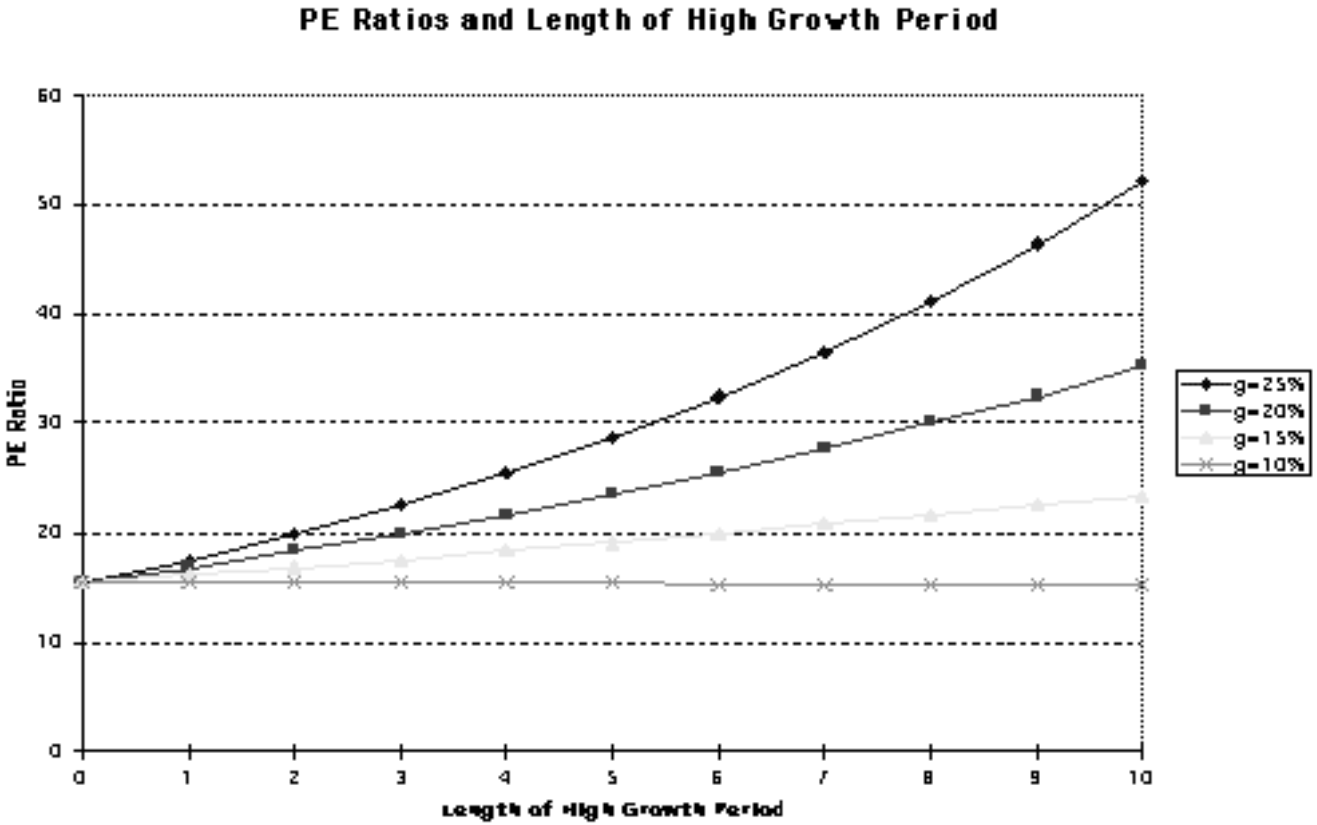
- Riskfree rate = T.Bond Rate = 6%
- Required rate of return = 6% + 1(5.5%)= 11.5%

$$PE = \frac{0.2 * (1.25) * \left(1 - \frac{(1.25)^5}{(1.115)^5}\right)}{(.115 - .25)} + \frac{0.5 * (1.25)^5 * (1.08)}{(.115 - .08)(1.115)^5} = 28.75$$

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

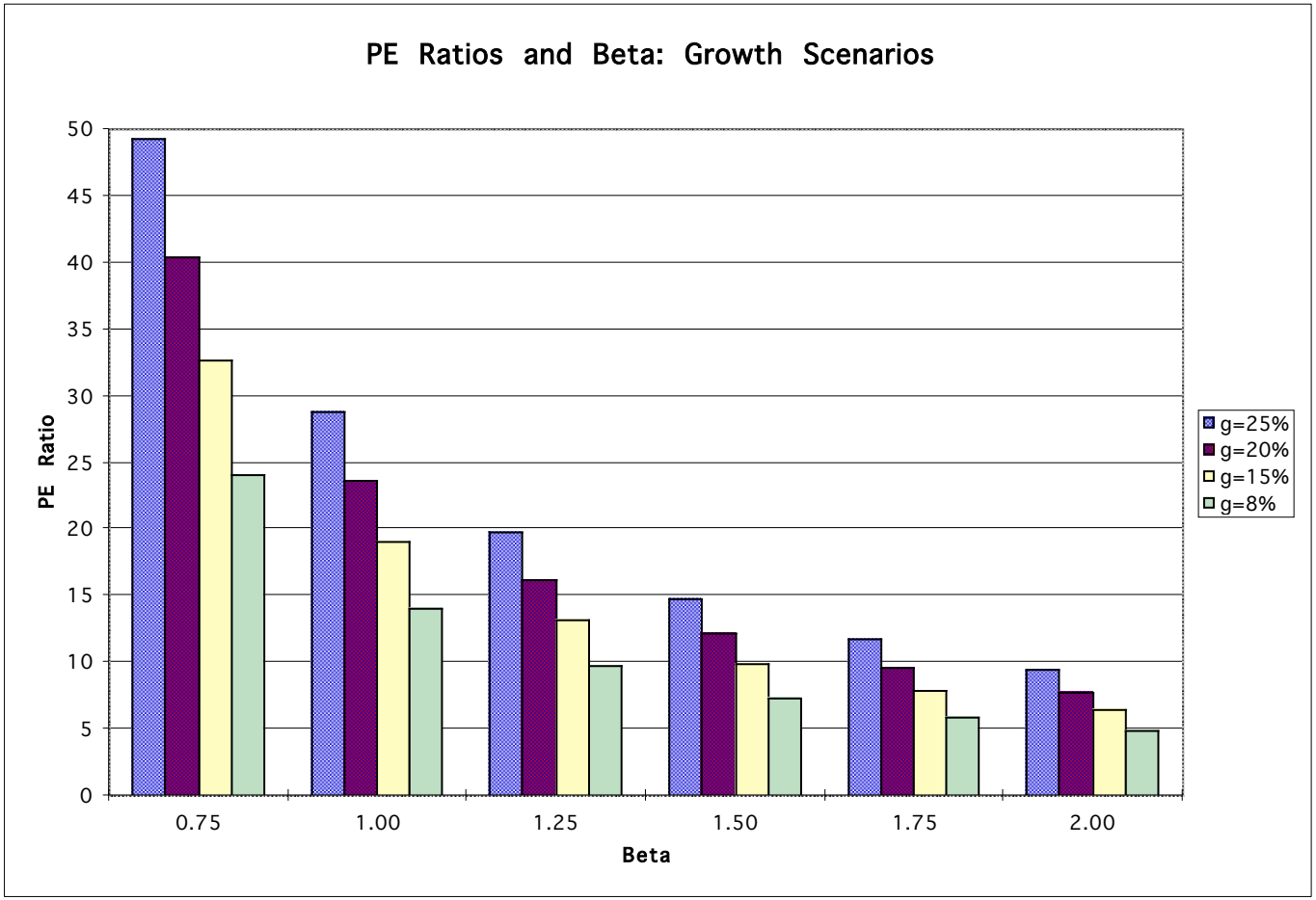


# PE Ratios and Length of High Growth: 25% growth for n years; 8% thereafter

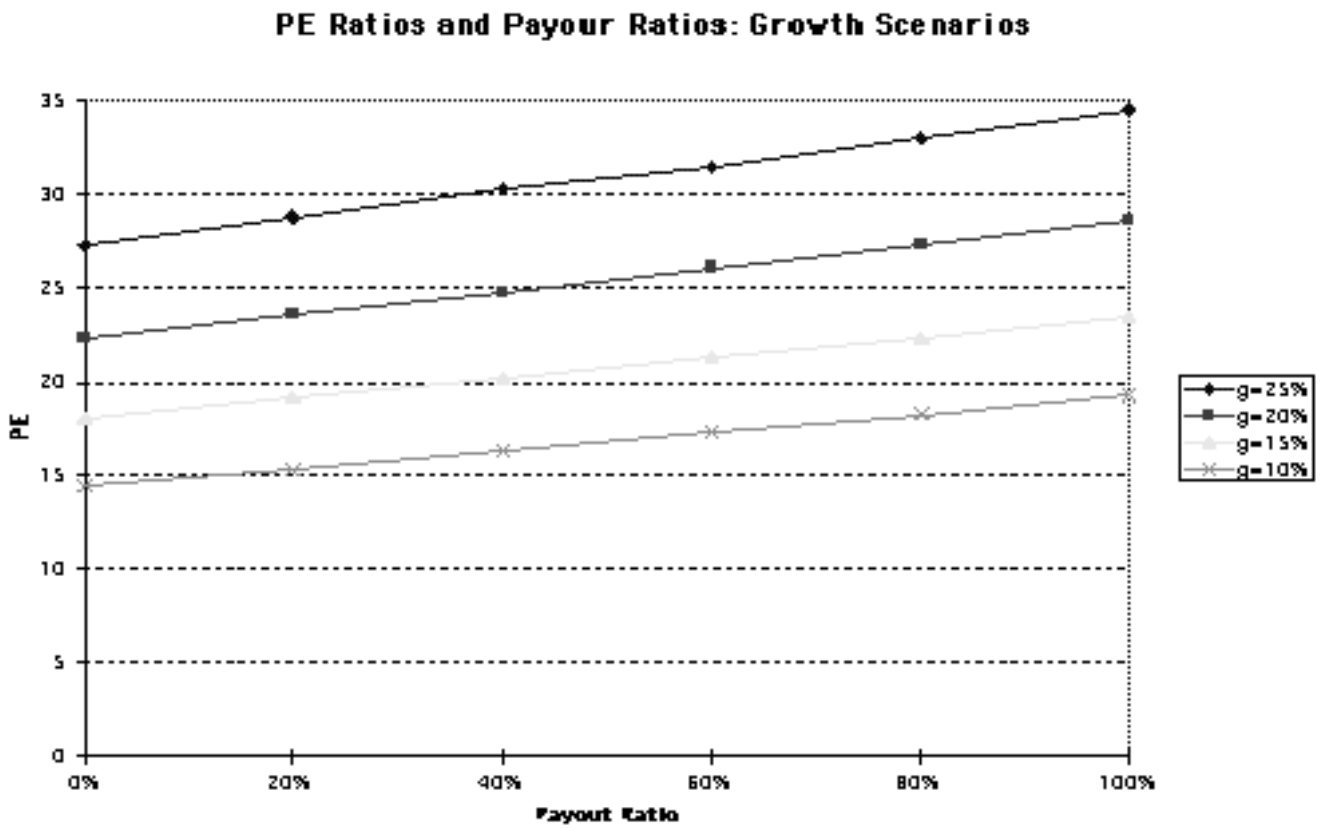


# PE and Risk: Effects of Changing Betas on PE Ratio:

Firm with x% growth for 5 years; 8% thereafter



# PE and Payout/ ROE

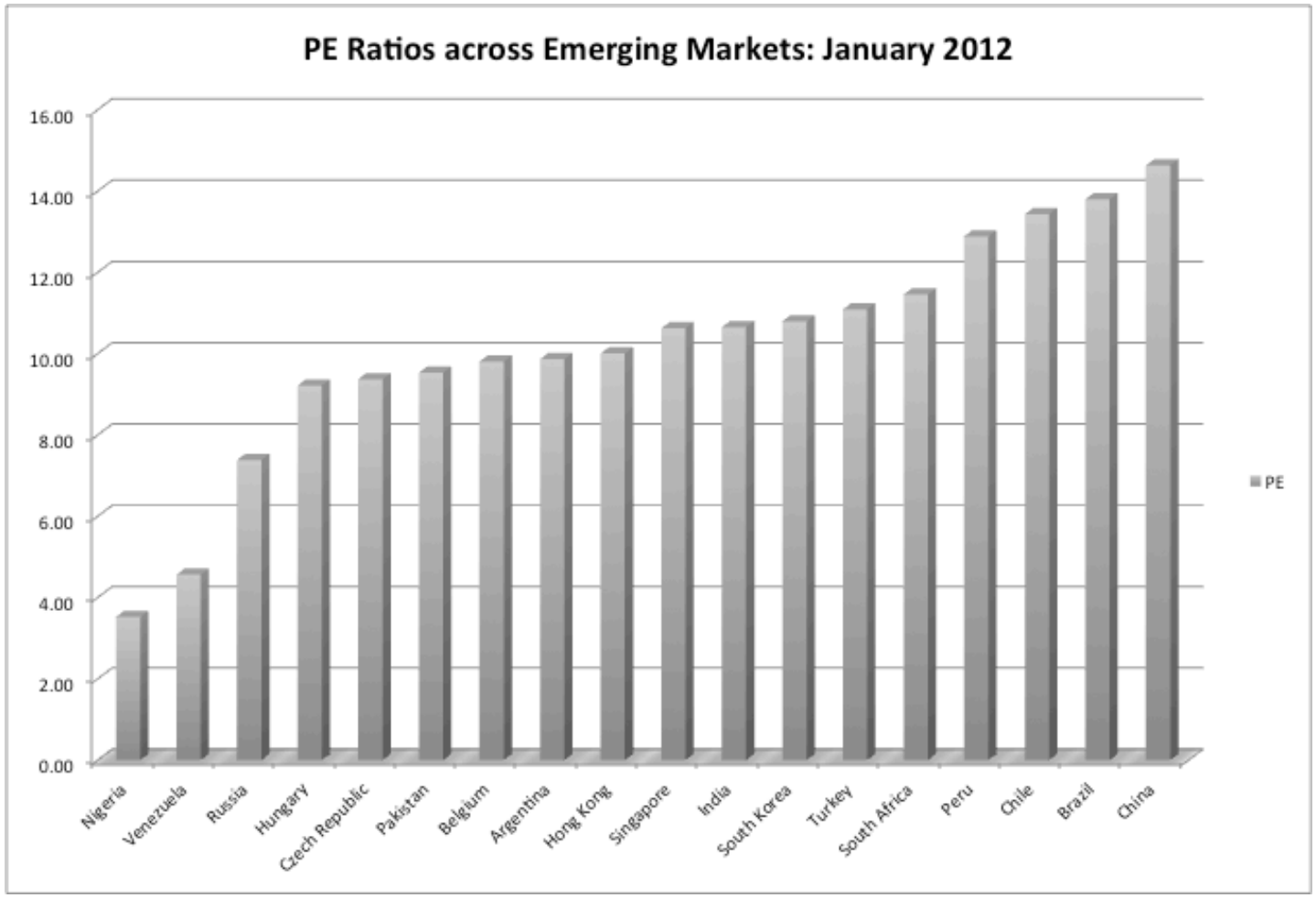


# The perfect under valued company…

- 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 a low 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?

# I. Comparing PE ratios across Emerging Markets



# II. 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 –

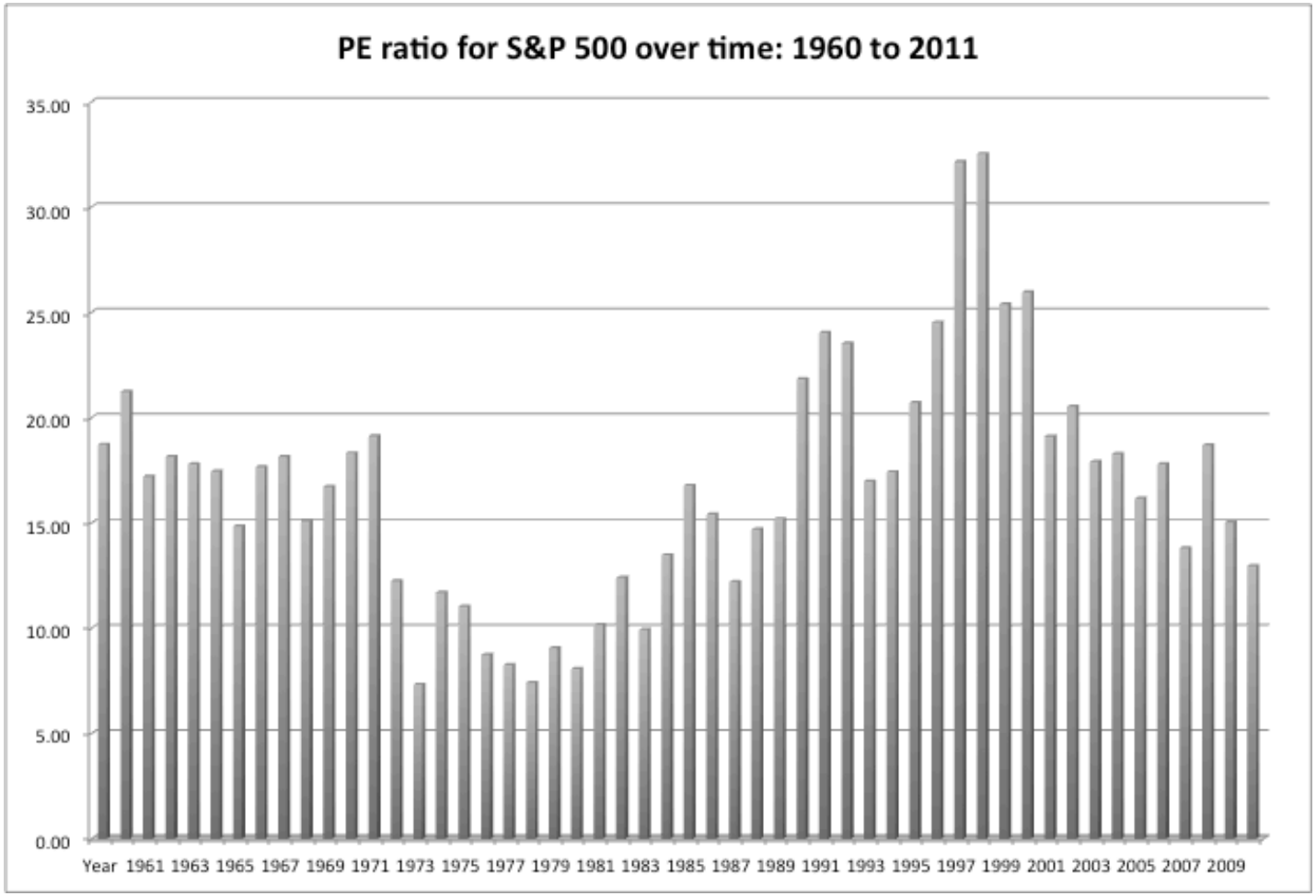
  PE = 16.16 - 7.94 Interest Rates
  + 154.40 Growth in GDP
  - 0.1116 Country Risk

  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 |

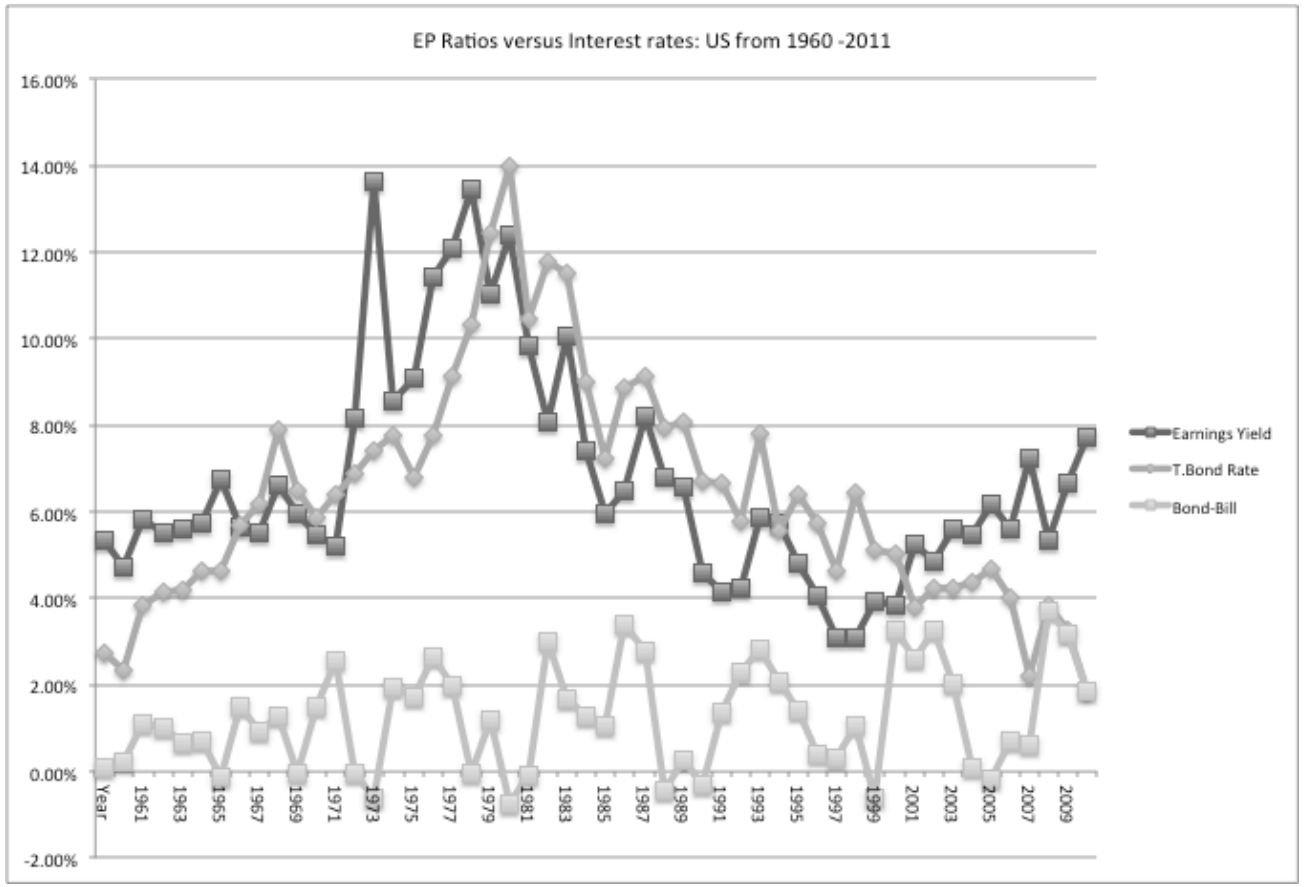
# III. Comparisons of PE across time: PE Ratio for the S&P 500



# Is low (high) PE cheap (expensive)?

- A market strategist argues that stocks are cheap because the PE ratio today is low relative to the average PE ratio across time. Do you agree?
  - Yes
  - No
- If you do not agree, what factors might explain the lower 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 0.69 between the two variables.,
- In addition, there is evidence that the term structure also affects the PE ratio.
- In the following regression, using 1960-2011 data, we regress E/P ratios against the level of T.Bond rates and a term structure variable (T.Bond - T.Bill rate)

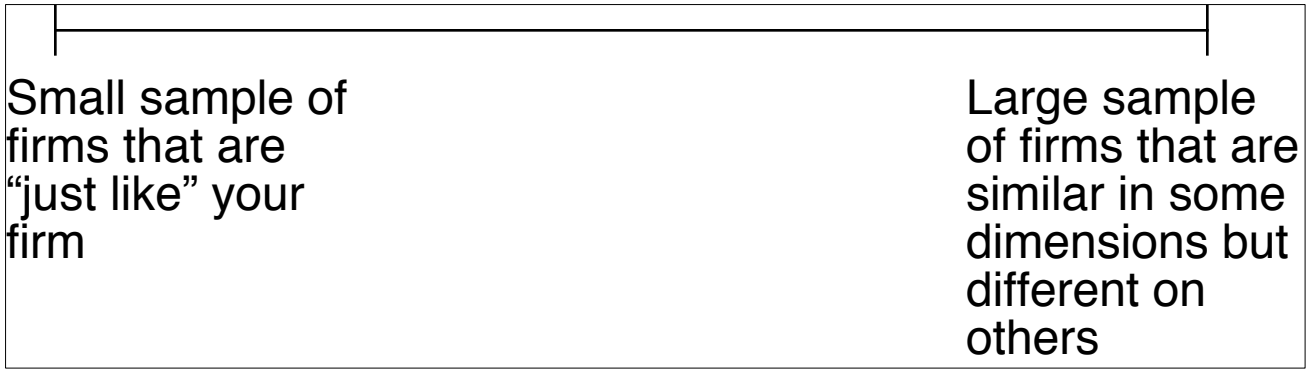
E/P = 3.16% + 0.597 T.Bond Rate – 0.213 (T.Bond Rate-T.Bill Rate)
(3.98) (5.71) (-0.92)

R squared = 40.92%

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

# IV. 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

- 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.
- 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.
- Modified multiple: You can modify the multiple to incorporate the dimension on which there are differences across firms.
- 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 Dev* |
|---|---|---|---|
| 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 Ltd. | 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?

- ❑ Yes
- ❑ No
- ■ Why or why not?

# Example 2: The limits of story telling
# Telecom ADRs in 1999

| 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 | 1.21223 | 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

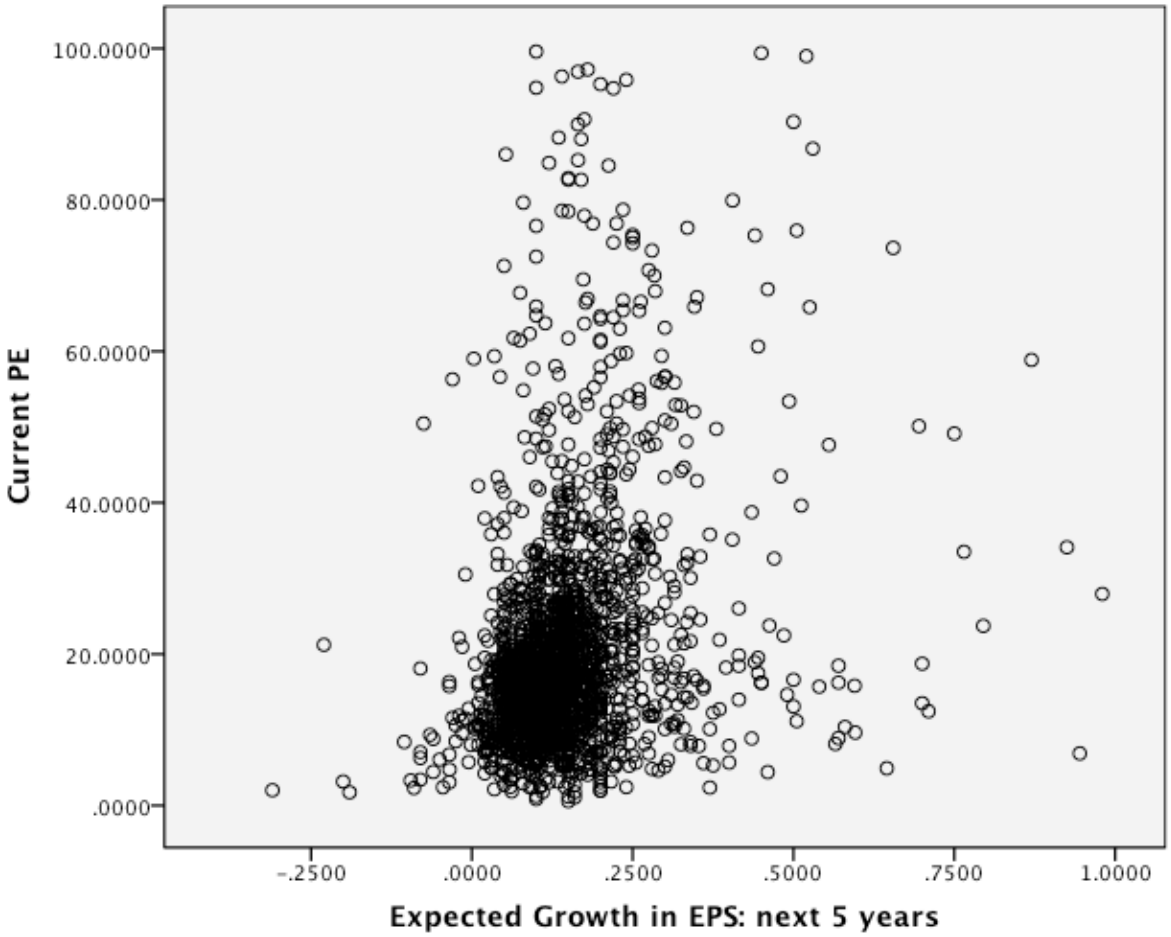
# Is Telebras under valued?

- Predicted PE = 13.12 + 1.2122 (7.5) - 13.85 (1) = 8.35
- At an actual price to earnings ratio of 8.9, Telebras is slightly overvalued.

# Relative to the entire market
# Extending your sample

- 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 company relative to the entire market (rather than just a sector).

# PE versus Expected EPS Growth: January 2012



# PE Ratio: Standard Regression for US stocks - January 2012

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .340[a] | .116 | .114 | 1068.79044 |

a. Predictors: (Constant), Payout Ratio, 3-yr Regression Beta, Expected Growth in EPS: next 5 years

**Coefficients[a,b]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 13.477 | .760 | | 17.734 | .000 |
| | Expected Growth in EPS: next 5 years | 40.841 | 2.627 | .354 | 15.545 | .000 |
| | 3-yr Regression Beta | -2.006 | .499 | -.092 | -4.023 | .000 |
| | Payout Ratio | 2.881 | .992 | .066 | 2.905 | .004 |

a. Dependent Variable: Current PE
b. Weighted Least Squares Regression - Weighted by Market Cap

# 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**

| | | Current PE | Expected Growth in EPS: next 5 years | 3-yr Regression Beta | Payout Ratio |
|---|---|---|---|---|---|
| Current PE | Pearson Correlation | 1 | .279** | .004 | .125** |
| | Sig. (2-tailed) | | .000 | .814 | .000 |
| | N | 3334 | 1981 | 2935 | 3334 |
| Expected Growth in EPS: next 5 years | Pearson Correlation | .279** | 1 | .222** | -.209** |
| | Sig. (2-tailed) | .000 | | .000 | .000 |
| | N | 1981 | 2308 | 2109 | 2273 |
| 3-yr Regression Beta | Pearson Correlation | .004 | .222** | 1 | -.033* |
| | Sig. (2-tailed) | .814 | .000 | | .025 |
| | N | 2935 | 2109 | 4798 | 4716 |
| Payout Ratio | Pearson Correlation | .125** | -.209** | -.033* | 1 |
| | Sig. (2-tailed) | .000 | .000 | .025 | |
| | N | 3334 | 2273 | 4716 | 5801 |

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

# Using the PE ratio regression

- Assume that you were given the following information for Dell. The firm has an expected growth rate of 10%, a beta of 1.20 and pays no dividends. Based upon the regression, estimate the predicted PE ratio for Dell.

  Predicted PE =

- Dell is actually trading at 18 times earnings. What does the predicted PE tell you?

# The value of growth

| *Time Period* | *PE Value of extra 1% of growth* | *Equity Risk Premium* |
|---|---|---|
| January 2012 | 0.408 | 6.04% |
| January 2011 | 0.836 | 5.20% |
| 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% |
| January 2003 | 2.621 | 4.10% |
| January 2002 | 1.003 | 3.62% |
| January 2001 | 1.457 | 2.75% |
| January 2000 | 2.105 | 2.05% |

# Fundamentals in other markets: PE regressions across markets…

| Region | Regression – January 2012 | R squared |
|---|---|---|
| Europe | PE = 19.57 - 2.91 Payout - 3.67 Beta | 6.9% |
| Japan | PE = 21.69 - 0.31 Expected Growth -4.12 Beta | 5.3% |
| Emerging Markets | PE = 15.48+ 9.03 ROE - 2.77 Beta + 2.91 Payout | 4.3% |

# Investment Strategies that compare PE to the expected growth rate

- If we assume that all firms within a sector have similar growth rates and risk, a strategy of picking the lowest PE ratio stock in each sector will yield undervalued stocks.
- Portfolio managers and analysts sometimes compare PE ratios to the expected growth rate to identify under and overvalued stocks.
  - In the simplest form of this approach, firms with PE ratios less than their expected growth rate are viewed as undervalued.
  - In its more general form, the ratio of PE ratio to growth is used as a measure of relative value.

# Problems with comparing PE ratios to expected growth

- In its simple form, there is no basis for believing that a firm is undervalued just because it has a PE ratio less than expected growth.
- This relationship may be consistent with a fairly valued or even an overvalued firm, if interest rates are high, or if a firm is high risk.
- As interest rates decrease (increase), fewer (more) stocks will emerge as undervalued using this approach.

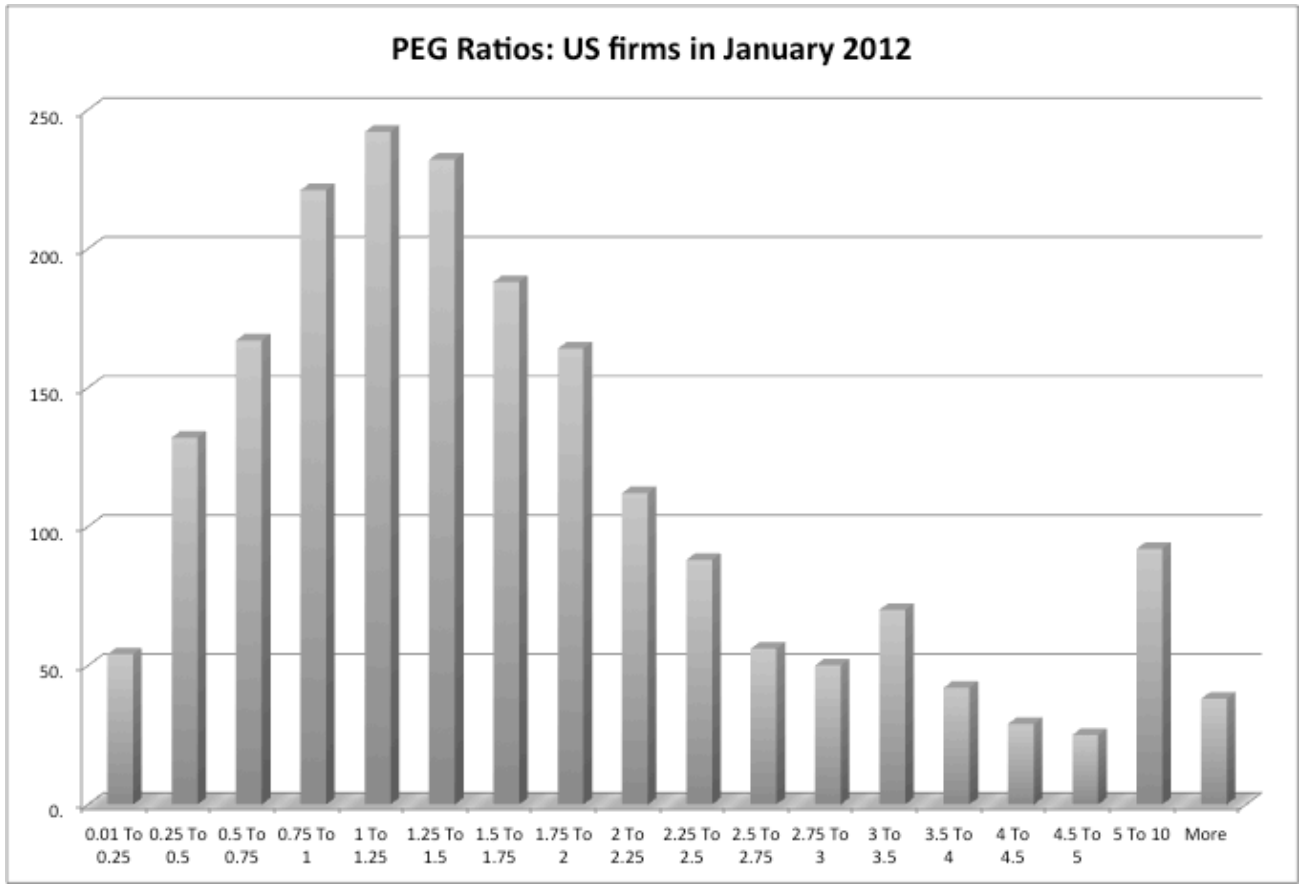
# PEG Ratio: Definition

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

$$\text{PEG} = \text{PE} / \text{Expected Growth Rate in Earnings}$$

- Definitional tests:
  - Is the growth rate used to compute the PEG ratio
    - on the same base? (base year EPS)
    - over the same period?(2 years, 5 years)
    - from the same source? (analyst projections, consensus estimates..)
  - Is the earnings used to compute the PE ratio consistent with the growth rate estimate?
    - No double counting: If the estimate of growth in earnings per share is from the current year, it would be a mistake to use forward EPS in computing PE
    - If looking at foreign stocks or ADRs, is the earnings used for the PE ratio consistent with the growth rate estimate? (US analysts use the ADR EPS)

# PEG Ratio: Distribution – US stocks



# 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** | **13.00%** | **33.00%** | **2.00** |

# PEG Ratio: Reading the Numbers

- The average PEG ratio for the beverage sector is 2.00. The lowest PEG ratio in the group belongs to Hansen Natural, which has a PEG ratio of 0.57. Using this measure of value, Hansen Natural is
  - the most under valued stock in the group
  - the most over valued stock in the group
- What other explanation could there be for Hansen's low PEG ratio?

# PEG Ratio: Analysis

- To understand the fundamentals that determine PEG ratios, let us return again to a 2-stage equity discounted cash flow model

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

- Dividing both sides of the equation by the earnings gives us the equation for the PE ratio. Dividing it again by the expected growth 'g'

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

# PEG Ratios and Fundamentals

- Risk and payout, which affect PE ratios, continue to affect PEG ratios as well.
  - Implication: When comparing PEG ratios across companies, we are making implicit or explicit assumptions about these variables.
- Dividing PE by expected growth does not neutralize the effects of expected growth, since the relationship between growth and value is not linear and fairly complex (even in a 2-stage model)

# A Simple Example

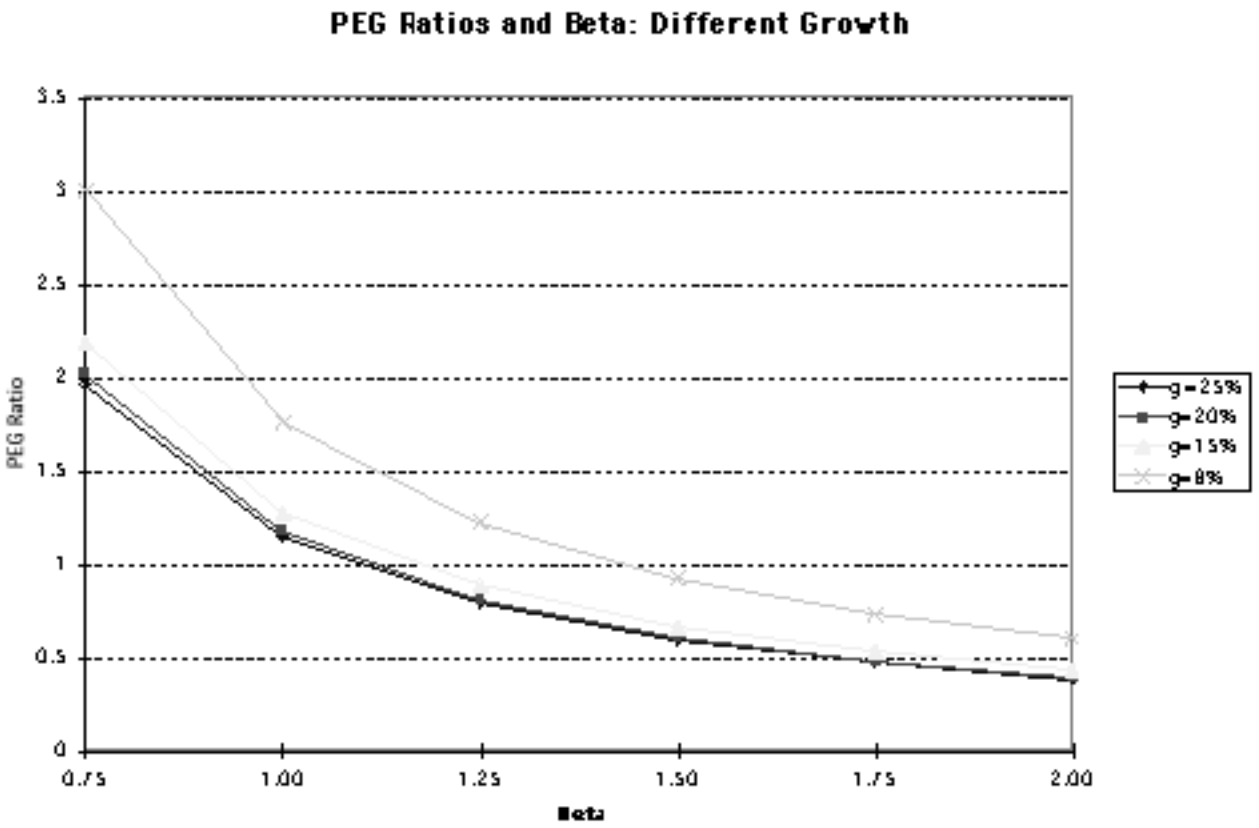
- Assume that you have been asked to estimate the PEG ratio for a firm which has the following characteristics:

| Variable | High Growth Phase | Stable Growth Phase |
|---|---|---|
| Expected Growth Rate | 25% | 8% |
| Payout Ratio | 20% | 50% |
| Beta | 1.00 | 1.00 |

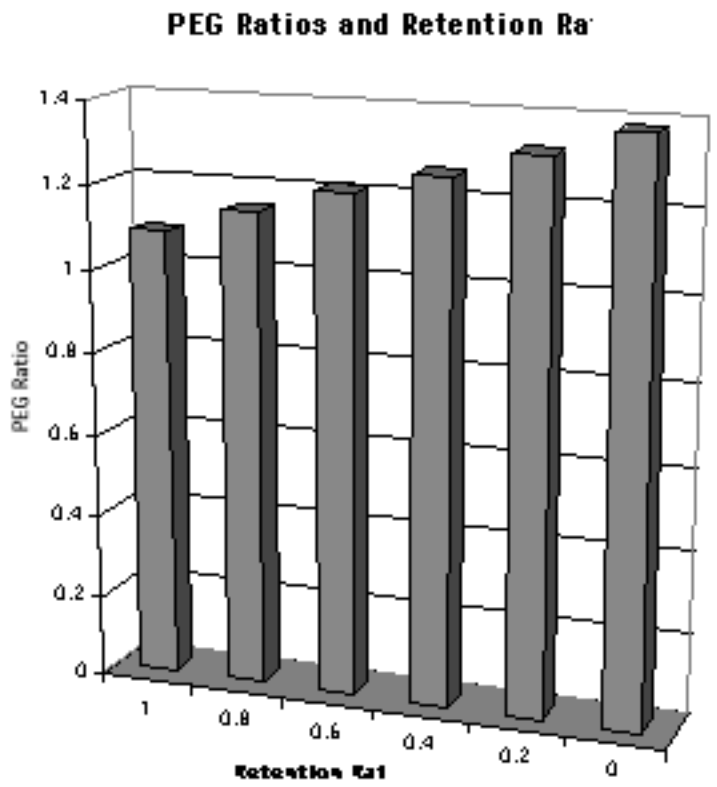
- Riskfree rate = T.Bond Rate = 6%
- Required rate of return = 6% + 1(5.5%)= 11.5%
- The PEG ratio for this firm can be estimated as follows:

$$PEG = \frac{0.2 * (1.25) * \left(1 - \frac{(1.25)^5}{(1.115)^5}\right)}{.25(.115 - .25)} + \frac{0.5 * (1.25)^5 * (1.08)}{.25(.115 - .08)(1.115)^5} = 115 \text{ or } 1.15$$

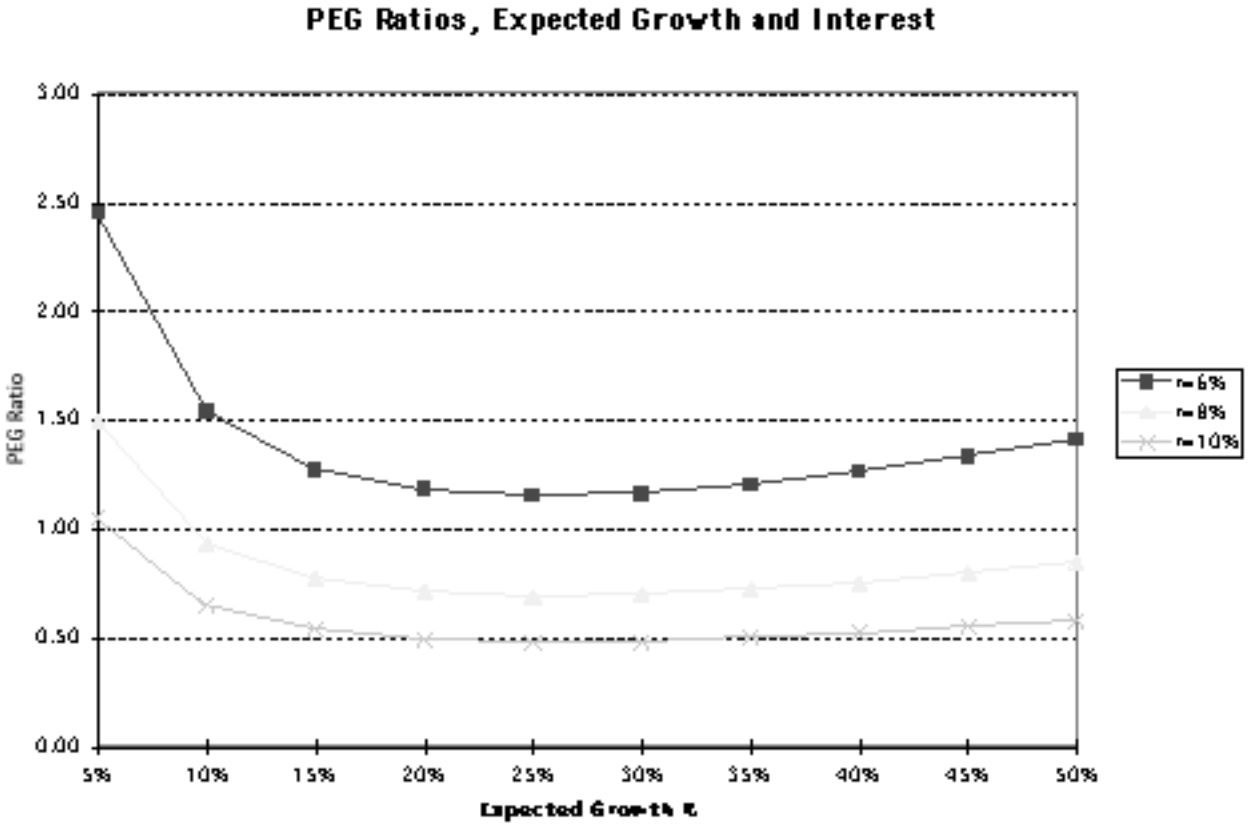
# PEG Ratios and Risk



# PEG Ratios and Quality of Growth



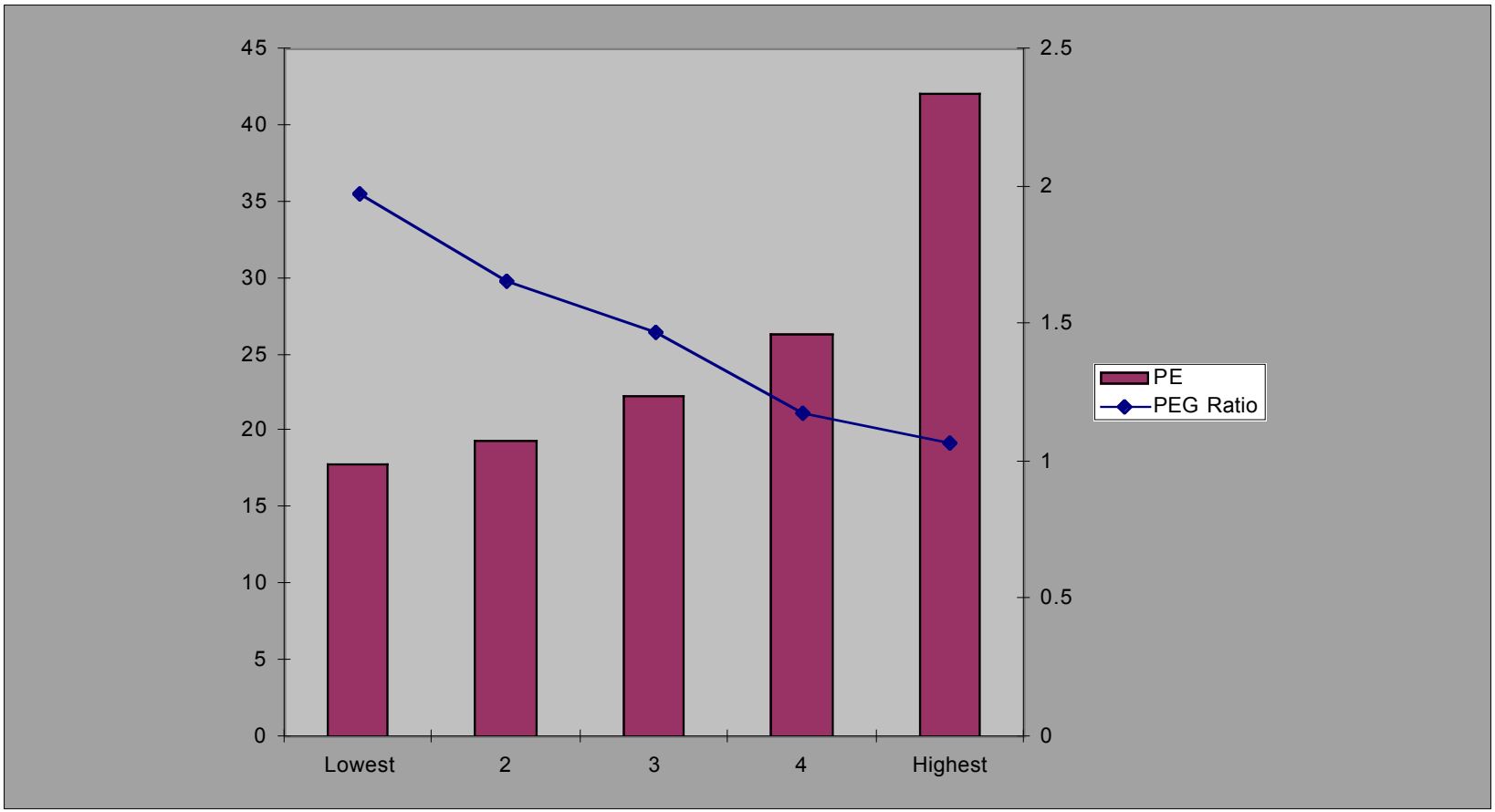
# PE Ratios and Expected Growth



# PEG Ratios and Fundamentals: Propositions

- Proposition 1: High risk companies will trade at much lower PEG ratios than low risk companies with the same expected growth rate.
  - Corollary 1: The company that looks most under valued on a PEG ratio basis in a sector may be the riskiest firm in the sector
- Proposition 2: Companies that can attain growth more efficiently by investing less in better return projects will have higher PEG ratios than companies that grow at the same rate less efficiently.
  - Corollary 2: Companies that look cheap on a PEG ratio basis may be companies with high reinvestment rates and poor project returns.
- Proposition 3: Companies with very low or very high growth rates will tend to have higher PEG ratios than firms with average growth rates. This bias is worse for low growth stocks.
  - Corollary 3: PEG ratios do not neutralize the growth effect.

# PE, PEG Ratios and Risk




Risk classes

# PEG Ratio: Returning to 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 |
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| Corby Distilleries Ltd. | 16.24 | 7.50% | 23.66% | 2.16 |
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| Todhunter Int'l | 8.94 | 3.00% | 25.74% | 2.98 |
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| 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** | **13.00%** | **33.00%** | **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)

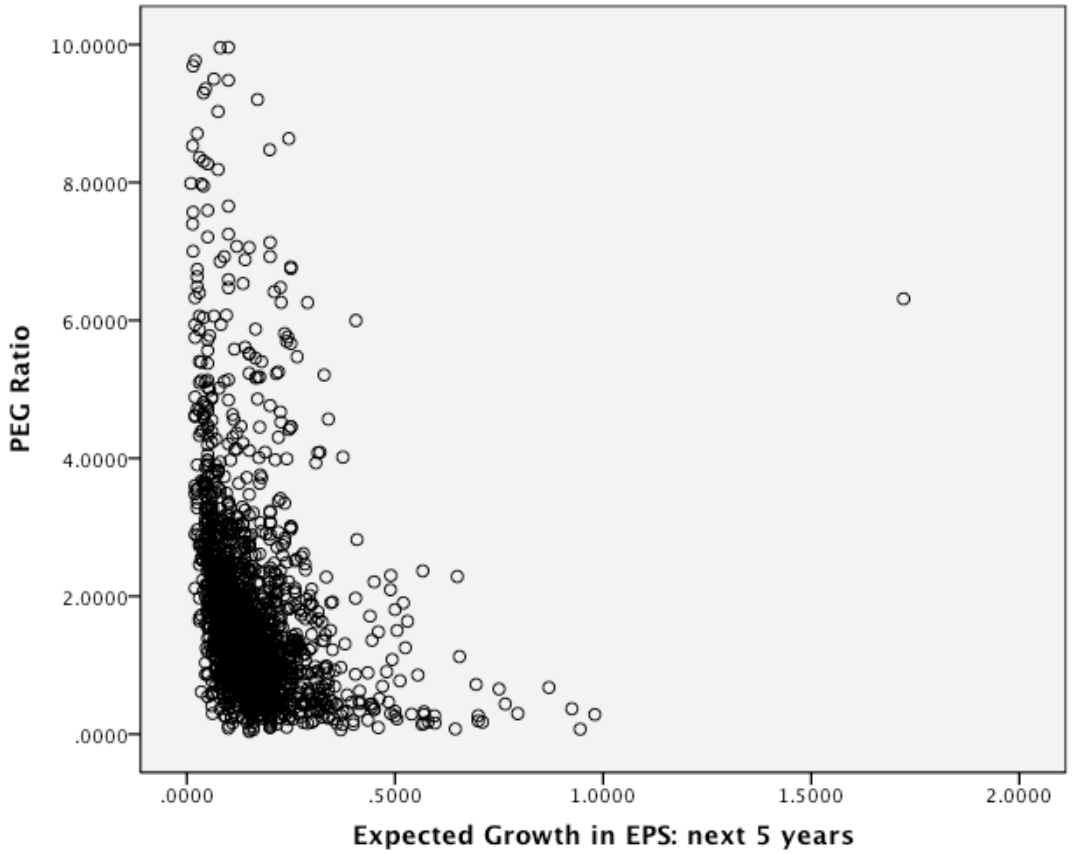
= 0.78

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

# Extending the Comparables

- This analysis, which is restricted to firms in the software sector, can be expanded to include all firms in the firm, as long as we control for differences in risk, growth and payout.
- To look at the cross sectional relationship, we first plotted PEG ratios against expected growth rates.

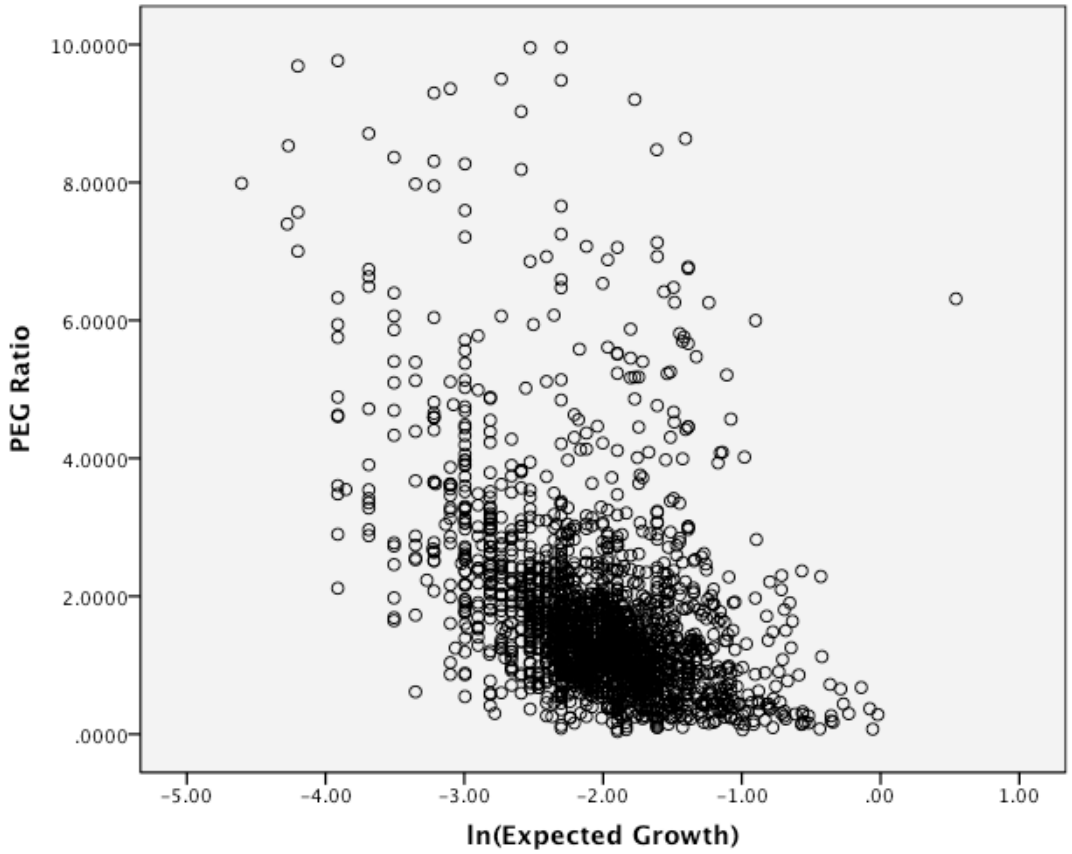
# PEG versus Growth – January 2012



# Analyzing the Relationship

- The relationship in not linear. In fact, the smallest firms seem to have the highest PEG ratios and PEG ratios become relatively stable at higher growth rates.
- To make the relationship more linear, we converted the expected growth rates in ln(expected growth rate). The relationship between PEG ratios and ln(expected growth rate) was then plotted.

# PEG versus ln(Expected Growth) – January 2012



# PEG Ratio Regression - US stocks
# January 2012

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .624[a] | .390 | .389 | 92.3626273 |

a. Predictors: (Constant), ln(Expected Growth), Payout Ratio, 3-yr Regression Beta

**Coefficients[a,b]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | -.513 | .115 | | -4.468 | .000 |
| | 3-yr Regression Beta | -.326 | .045 | -.142 | -7.273 | .000 |
| | Payout Ratio | .095 | .088 | .021 | 1.087 | .277 |
| | ln(Expected Growth) | -1.155 | .041 | -.555 | -27.983 | .000 |

a. Dependent Variable: PEG Ratio
b. Weighted Least Squares Regression - Weighted by Market Cap

# Negative intercepts…and problem forecasts..

- When the intercept in a multiples regression is negative, there is the possibility that forecasted values can be negative as well. One way (albeit imperfect) is to re-run the regression without an intercept.

**Coefficients[a,b]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | 3-yr Regression Beta | -.185 | .035 | -.114 | -5.309 | .000 |
| | ln(Expected Growth) | -.901 | .027 | -.836 | -33.458 | .000 |
| | Payout Ratio | .788 | .106 | .127 | 7.443 | .000 |

a. Dependent Variable: PEG Ratio
b. Linear Regression through the Origin

# Applying the PEG ratio regression

- Consider Dell again. The stock has an expected growth rate of 10%, a beta of 1.20 and pays out no dividends. What should its PEG ratio be?

- If the stock's actual PE ratio is 18, what does this analysis tell you about the stock?

# A Variant on PEG Ratio: The PEGY ratio

- The PEG ratio is biased against low growth firms because the relationship between value and growth is non-linear. One variant that has been devised to consolidate the growth rate and the expected dividend yield:

  PEGY = PE / (Expected Growth Rate + Dividend Yield)

- As an example, Con Ed has a PE ratio of 16, an expected growth rate of 5% in earnings and a dividend yield of 4.5%.
  - PEG = 16/ 5 = 3.2
  - PEGY = 16/(5+4.5) = 1.7

# Value/Earnings and Value/Cashflow Ratios

- While Price earnings ratios look at the market value of equity relative to earnings to equity investors, Value earnings ratios look at the market value of the operating assets of the firm (Enterprise value or EV) relative to operating earnings or cash flows.

  EV = Market value of equity + Debt – Cash
- The form of value to cash flow ratios that has the closest parallels in DCF valuation is the ratio of Firm value to Free Cash Flow to the Firm.
  - FCFF = EBIT (1-t) - Net Cap Ex - Change in WC
- In practice, what we observe more commonly are firm values as multiples of operating income (EBIT), after-tax operating income (EBIT (1-t)) or EBITDA.

# Value/FCFF Multiples and the Alternatives

- Assume that you have computed the value of a firm, using discounted cash flow models. Rank the following multiples in the order of magnitude from lowest to highest?
  - EV/EBIT
  - EV/EBIT(1-t)
  - EV/FCFF
  - EV/EBITDA
- What assumption(s) would you need to make for the Value/EBIT(1-t) ratio to be equal to the Value/FCFF multiple?

# EV/FCFF: Determinants

- Reverting back to a two-stage FCFF DCF model, we get:

$$V_0 = \frac{FCFF_0 (1+g)\left(1 - \frac{(1+g)^n}{(1+WACC)^n}\right)}{WACC - g} + \frac{FCFF_0 (1+g)^n (1+g_n)}{(WACC - g_n)(1+WACC)^n}$$

  - $FCFF_0$ = Free Cashflow to the firm in current year
  - g = Expected growth rate in FCFF in extraordinary growth period (first n years)
  - WACC = Weighted average cost of capital
  - $g_n$ = Expected growth rate in FCFF in stable growth period (after n years)\

- Dividing both sides by the FCFF

$$\frac{V_0}{FCFF_0} = \frac{(1+g)\left(1 - \frac{(1+g)^n}{(1+WACC)^n}\right)}{WACC - g} + \frac{(1+g)^n (1+g_n)}{(WACC - g_n)(1+WACC)^n}$$

# Illustration: Using Value/FCFF Approaches to value a firm: MCI Communications

- MCI Communications had earnings before interest and taxes of $3356 million in 1994 (Its net income after taxes was $855 million).
- It had capital expenditures of $2500 million in 1994 and depreciation of $1100 million; Working capital increased by $250 million.
- It expects free cashflows to the firm to grow 15% a year for the next five years and 5% a year after that.
- The cost of capital is 10.50% for the next five years and 10% after that.
- The company faces a tax rate of 36%.

$$\frac{V_0}{FCFF_0} = \frac{(1.15)\left(1 - \frac{(1.15)^5}{(1.105)5}\right)}{.105 - .15} + \frac{(1.15)^5(1.05)}{(.10 - .05)(1.105)^5}$$

$$= 31.28$$

# Multiple Magic

- In this case of MCI there is a big difference between the FCFF and short cut measures. For instance the following table illustrates the appropriate multiple using short cut measures, and the amount you would overpay by if you used the FCFF multiple.

  Free Cash Flow to the Firm
  = EBIT (1-t) - Net Cap Ex - Change in Working Capital
  = 3356 (1 - 0.36) + 1100 - 2500 - 250 = $ 498 million

| | *$ Value* | *Correct Multiple* |
|---|---|---|
| FCFF | $498 | 31.28382355 |
| EBIT (1-t) | $2,148 | 7.251163362 |
| EBIT | $ 3,356 | 4.640744552 |
| EBITDA | $4,456 | 3.49513885 |

# Reasons for Increased Use of Value/EBITDA

1. The multiple can be computed even for firms that are reporting net losses, since earnings before interest, taxes and depreciation are usually positive.
2. For firms in certain industries, such as cellular, which require a substantial investment in infrastructure and long gestation periods, this multiple seems to be more appropriate than the price/earnings ratio.
3. In leveraged buyouts, where the key factor is cash generated by the firm prior to all discretionary expenditures, the EBITDA is the measure of cash flows from operations that can be used to support debt payment at least in the short term.
4. By looking at cashflows prior to capital expenditures, it may provide a better estimate of "optimal value", especially if the capital expenditures are unwise or earn substandard returns.
5. By looking at the value of the firm and cashflows to the firm it allows for comparisons across firms with different financial leverage.

# Enterprise Value/EBITDA Multiple

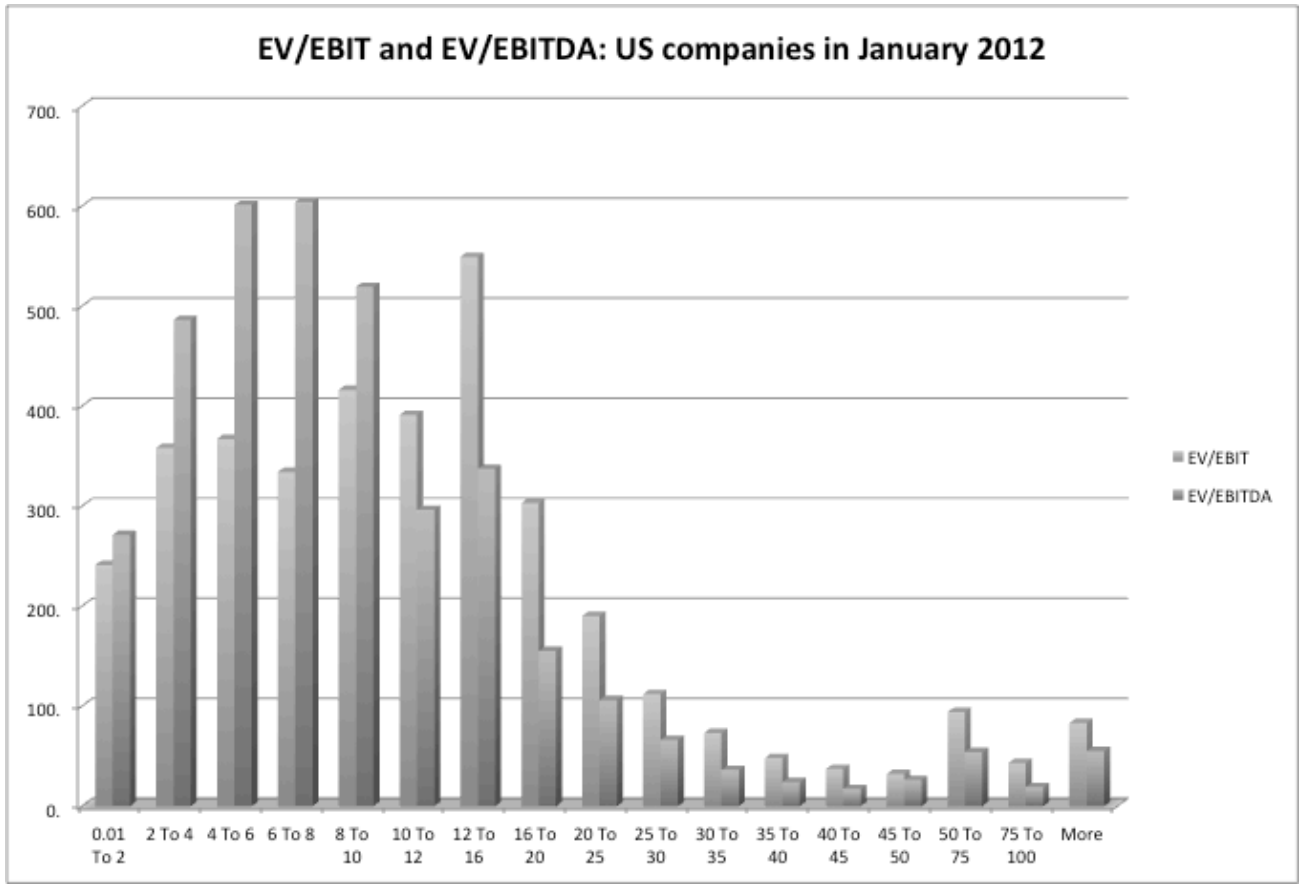
- The Classic Definition

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

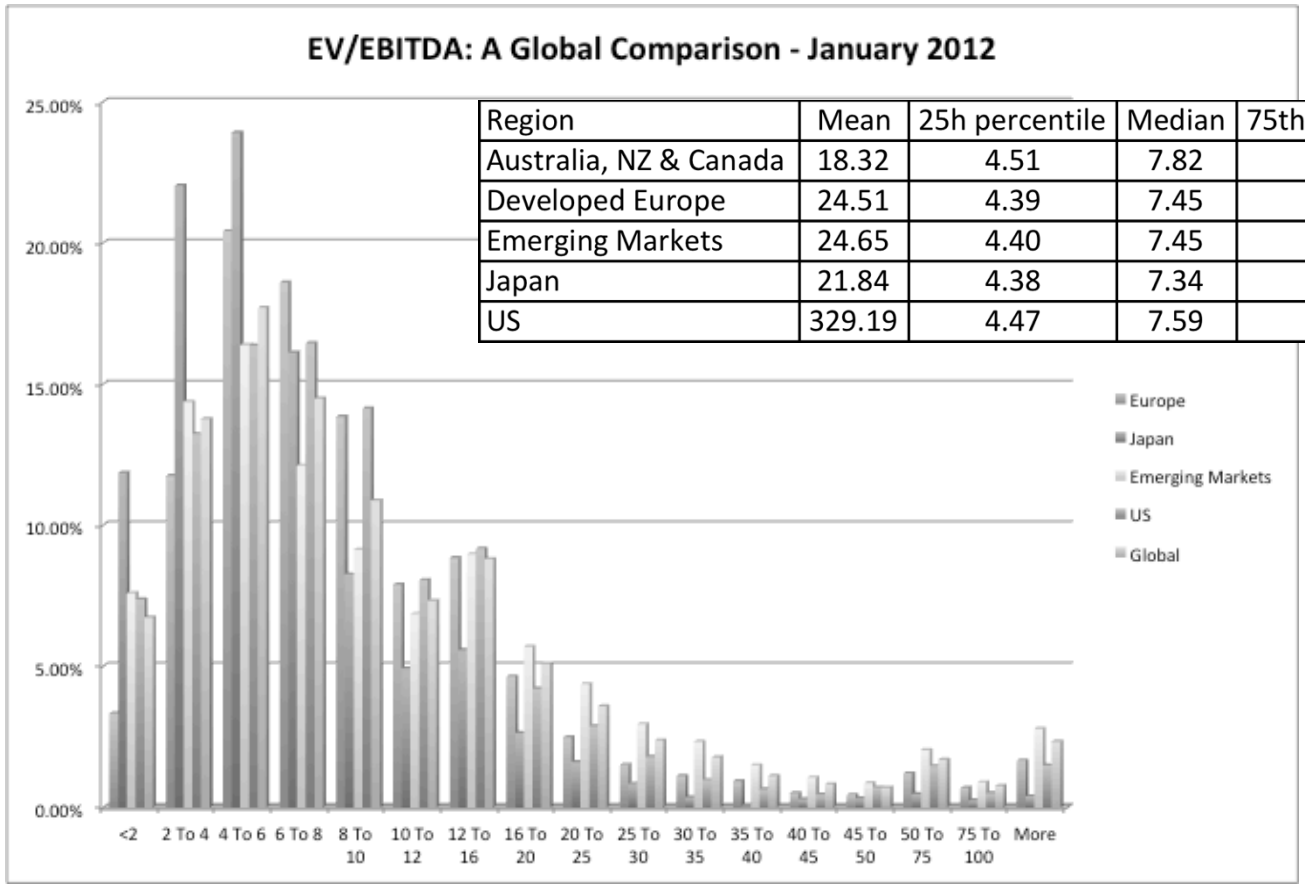
- The No-Cash Version

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

# Enterprise Value/EBITDA Distribution – US

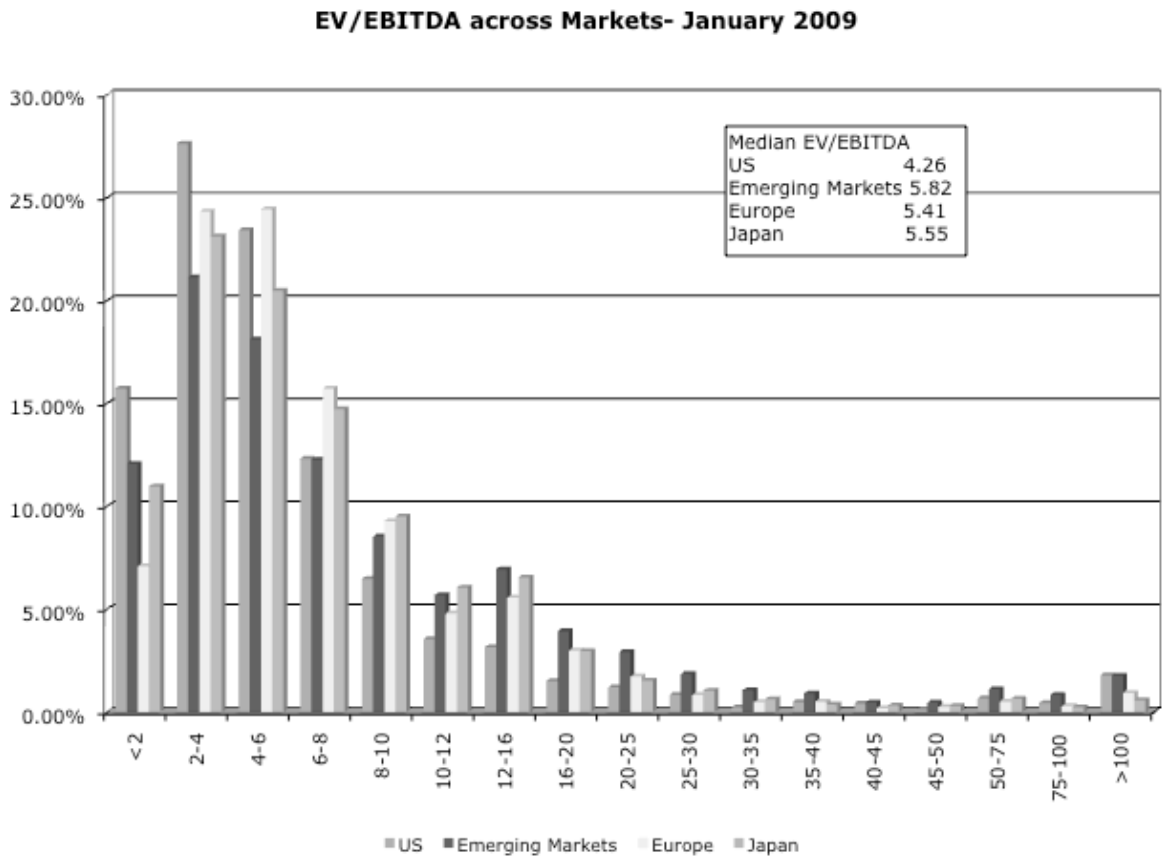


# Enterprise Value/EBITDA : Global Data
# 6 times EBITDA may seem like a good rule of thumb..




| Region | Mean | 25h percentile | Median | 75th percentile |
|---|---|---|---|---|
| Australia, NZ & Canada | 18.32 | 4.51 | 7.82 | 14.09 |
| Developed Europe | 24.51 | 4.39 | 7.45 | 13.21 |
| Emerging Markets | 24.65 | 4.40 | 7.45 | 13.53 |
| Japan | 21.84 | 4.38 | 7.34 | 12.77 |
| US | 329.19 | 4.47 | 7.59 | 13.83 |

# But not in early 2009…



# The Determinants of Value/EBITDA Multiples: Linkage to DCF Valuation

- 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)

# 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.

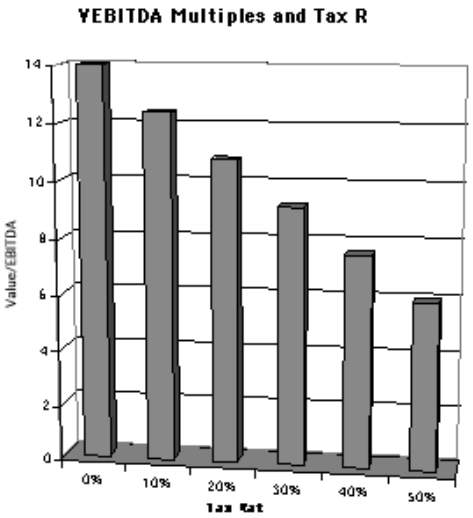
# Calculating Value/EBITDA Multiple

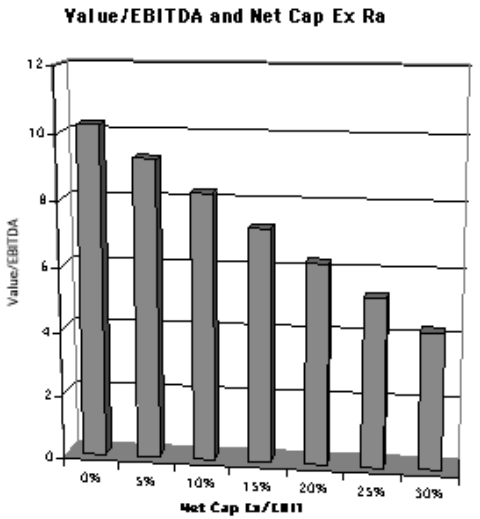
- In this case, the Value/EBITDA multiple for this firm can be estimated as follows:

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

# The Determinants of EV/EBITDA

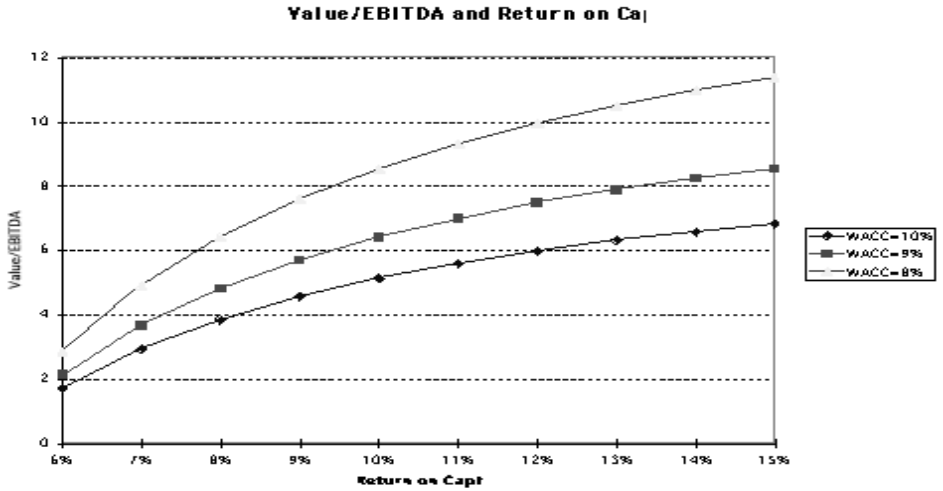
Tax Rates




Reinvestment Needs

Excess Returns



# Is this stock cheap?

- Assume that I am trying to convince you to buy a company, because it trades at 5 times EBITDA. What are some of the questions you would ask me as a potential buyer?

- Following through, what combination of fundamentals would make for a cheap company on an EV/EBITDA basis:
  - Tax rate
  - Growth
  - Return on capital
  - Cost of capital/Risk

# Value/EBITDA Multiple: Trucking Companies: Is Ryder cheap?

| 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** |

# Extending to the market
# US Market: January 2012

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .477[a] | .228 | .226 | 543.163118 |

a. Predictors: (Constant), Market Debt to Capital, Eff Tax Rate, Expected Growth in Revenues: next 5 years

**Coefficients[a,b]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 8.080 | .532 | | 15.196 | .000 |
| | Expected Growth in Revenues: next 5 years | 42.675 | 2.876 | .394 | 14.838 | .000 |
| | Eff Tax Rate | -11.410 | 1.211 | -.221 | -9.422 | .000 |
| | Market Debt to Capital | -1.711 | .951 | -.048 | -1.799 | .072 |

a. Dependent Variable: EV/EBITDA
b. Weighted Least Squares Regression - Weighted by Market Cap

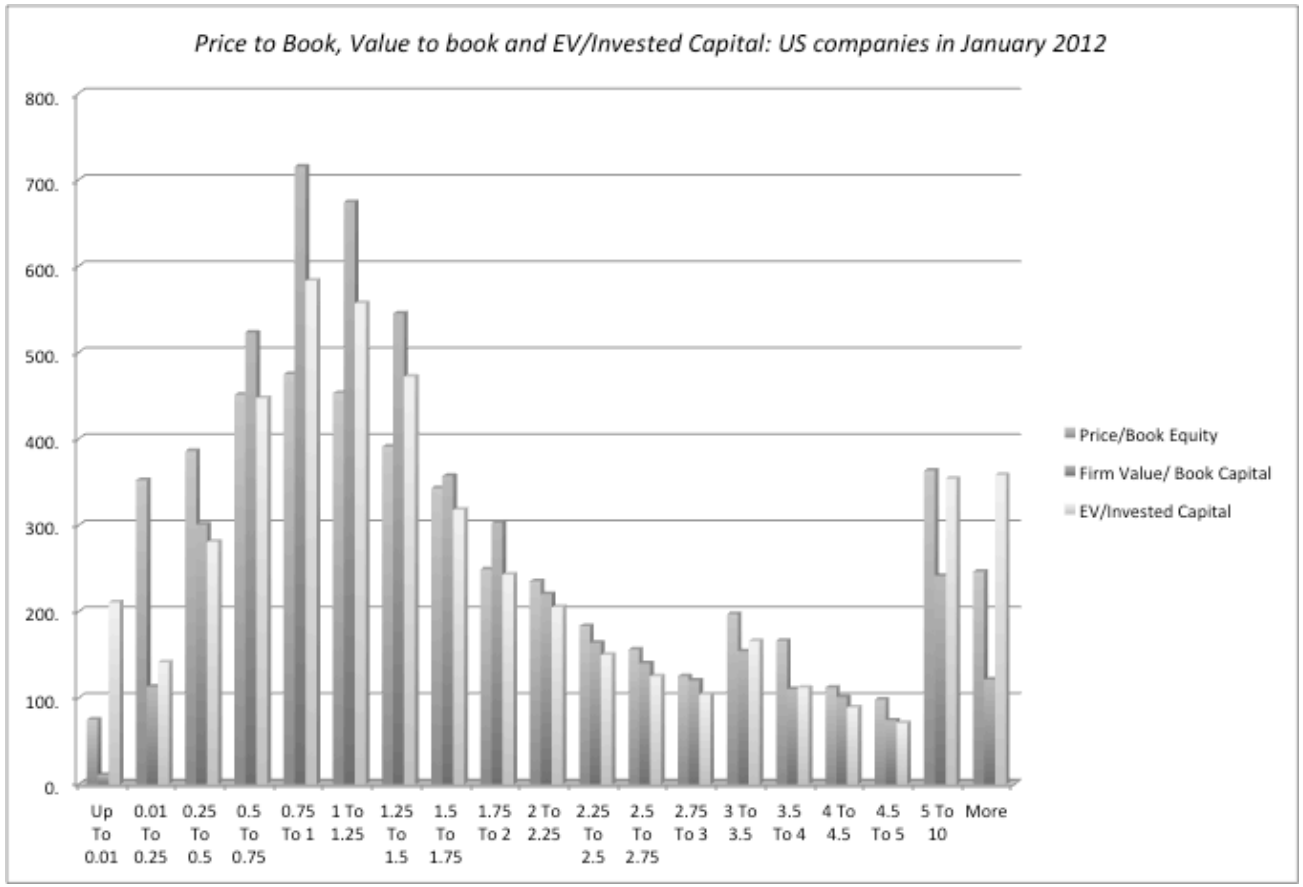
# EBITDA regressions across markets… January 2012

| Region | Regression – January 2011 | R squared |
|---|---|---|
| Europe | EV/EBITDA= 12.47 +0.02 Interest Coverage Ratio - 11.50 Tax Rate -3.31 Reinvestment Rate | 8.9% |
| Japan | EV/EBITDA= 3.70 -0.01 Interest Coverage Ratio + 8.00 Tax Rate + 3.05 Reinvestment Rate | 6.6% |
| Emerging Markets | EV/EBITDA= 15.01 - 10.70 Tax Rate -3.04 Reinvestment Rate | 2.2% |

# Price-Book Value Ratio: Definition

- The price/book value ratio is the ratio of the market value of equity to the book value of equity, i.e., the measure of shareholders' equity in the balance sheet.
- Price/Book Value = $\frac{\text{Market Value of Equity}}{\text{Book Value of Equity}}$
- Consistency Tests:
  - If the market value of equity refers to the market value of equity of common stock outstanding, the book value of common equity should be used in the denominator.
  - If there is more that one class of common stock outstanding, the market values of all classes (even the non-traded classes) needs to be factored in.

# Book Value Multiples: US stocks



# Price to Book: U.S., Europe, Japan and Emerging Markets – January 2012


| Region | Mean | 25h percentile | Median | 75th percentile |
|---|---|---|---|---|
| Australia, NZ & Canada | 7.94 | 0.63 | 1.20 | 2.36 |
| Developed Europe | 3.64 | 0.58 | 1.04 | 2.04 |
| Emerging Markets | 3.83 | 0.58 | 1.02 | 1.99 |
| Japan | 2.37 | 0.57 | 1.04 | 2.00 |
| US | 13.73 | 0.60 | 1.18 | 2.32 |

# Price Book Value Ratio: 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
# 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.

# Looking for undervalued securities - PBV Ratios and ROE

- Given the relationship between price-book value ratios and returns on equity, it is not surprising to see firms which have high returns on equity selling for well above book value and firms which have low returns on equity selling at or below book value.
- The firms which should draw attention from investors are those which provide mismatches of price-book value ratios and returns on equity - low P/BV ratios and high ROE or high P/BV ratios and low ROE.

# An Eyeballing Exercise: 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, (2.05), 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).

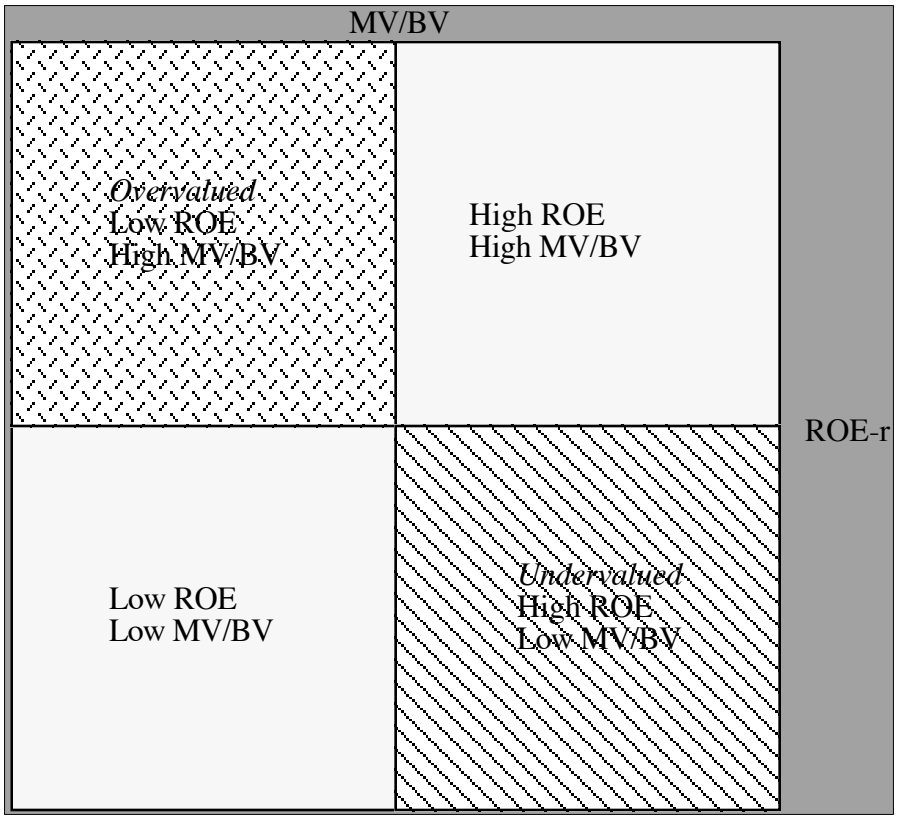
| | | | | | |
|---|---|---|---|---|---|
| PBV = | 2.27 | + | 3.63 ROE | - | 2.68 Std dev |
| | (5.56) | | (3.32) | | (2.33) |

R squared of regression = 79%

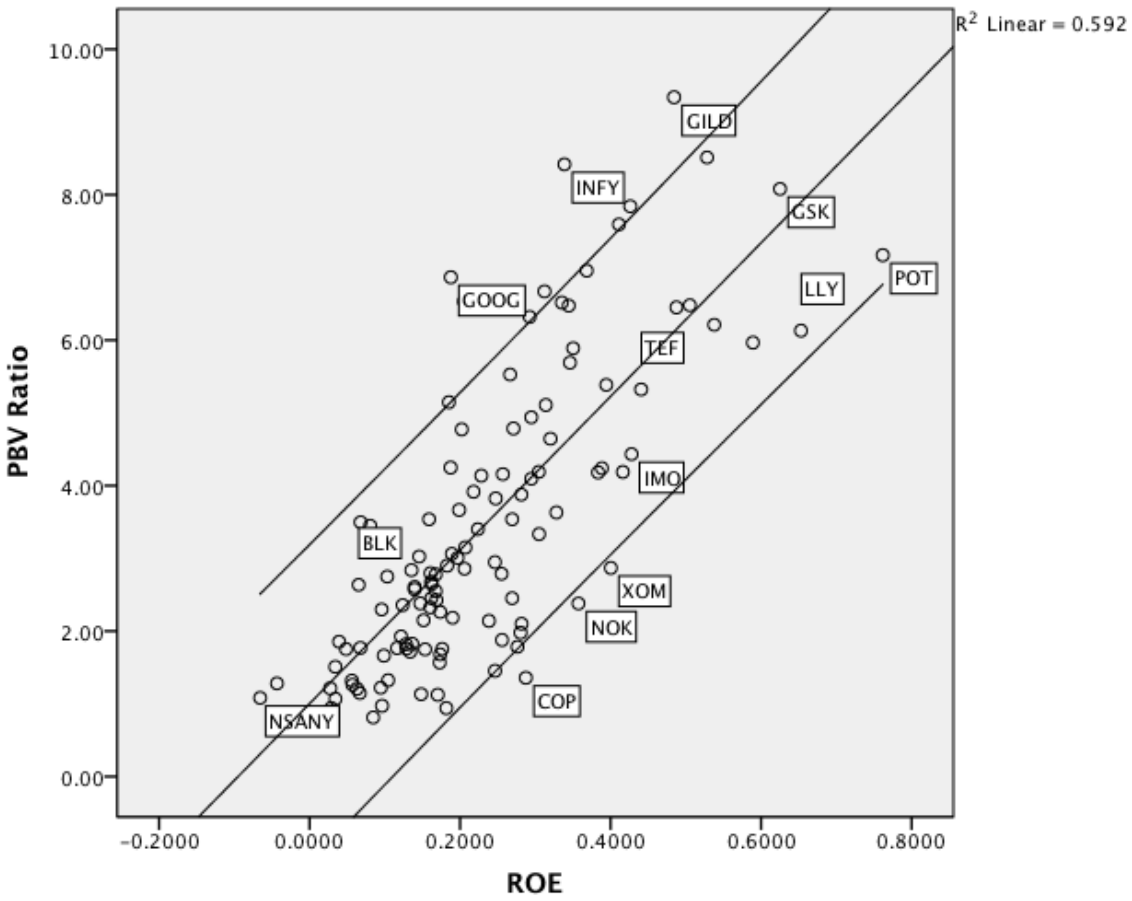
# And these predictions?

| *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% |

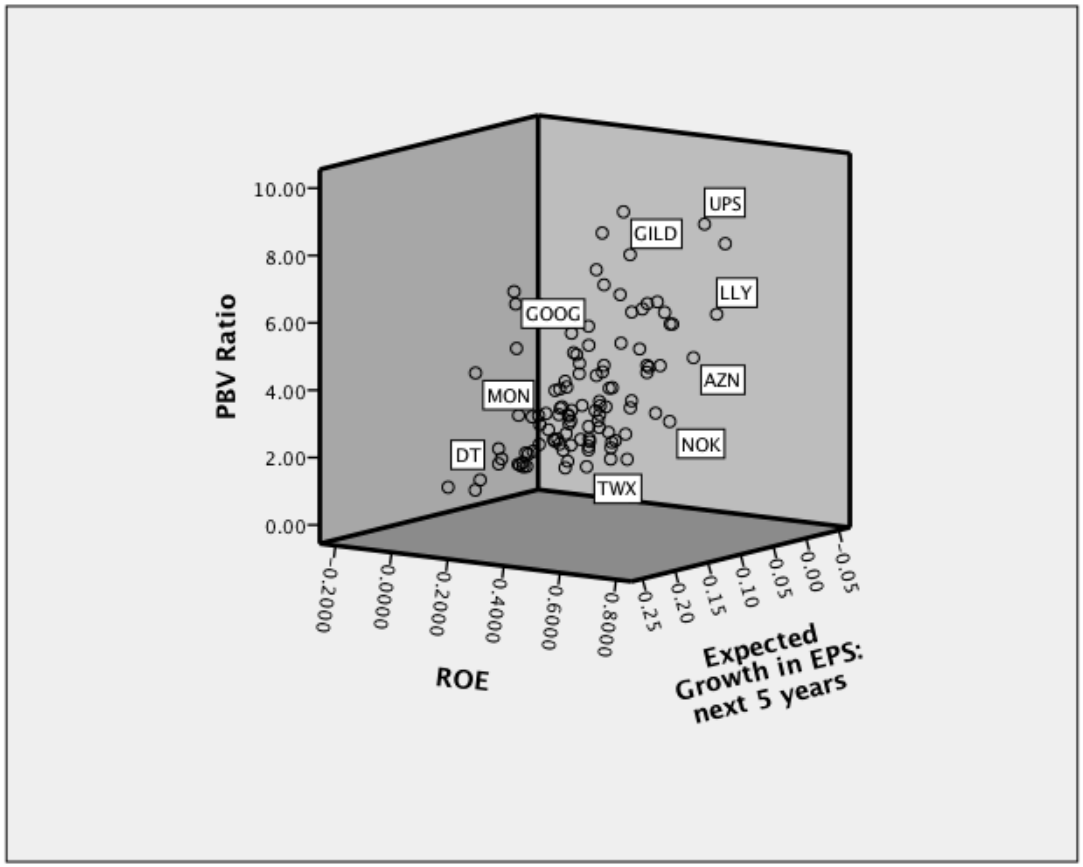
# The Valuation Matrix



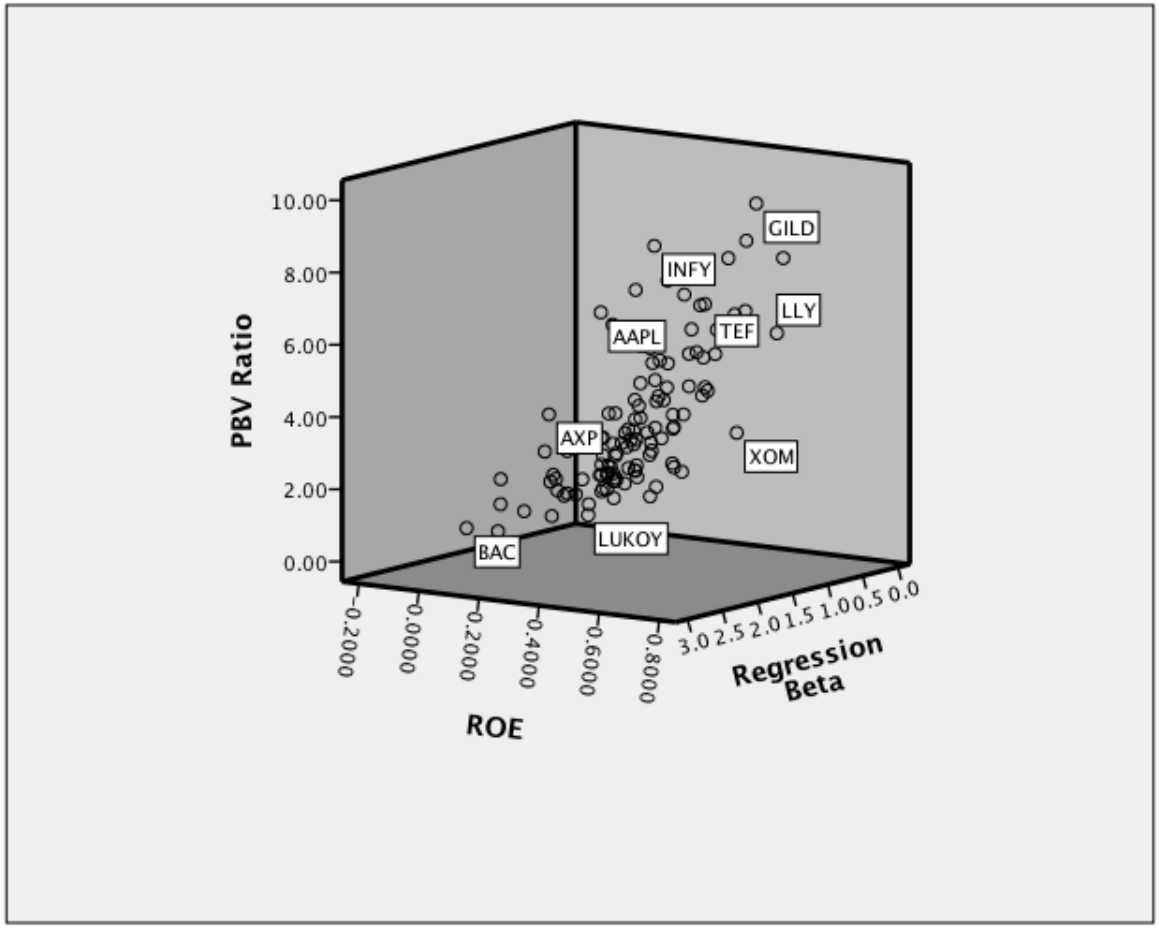
# Price to Book vs ROE: Largest Market Cap Firms in the United States: January 2010



# What are we missing?



# What else are we missing?
# PBV, ROE and Risk: Large Cap US firms



# Bringing it all together… Largest US stocks

**Model Summary**

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

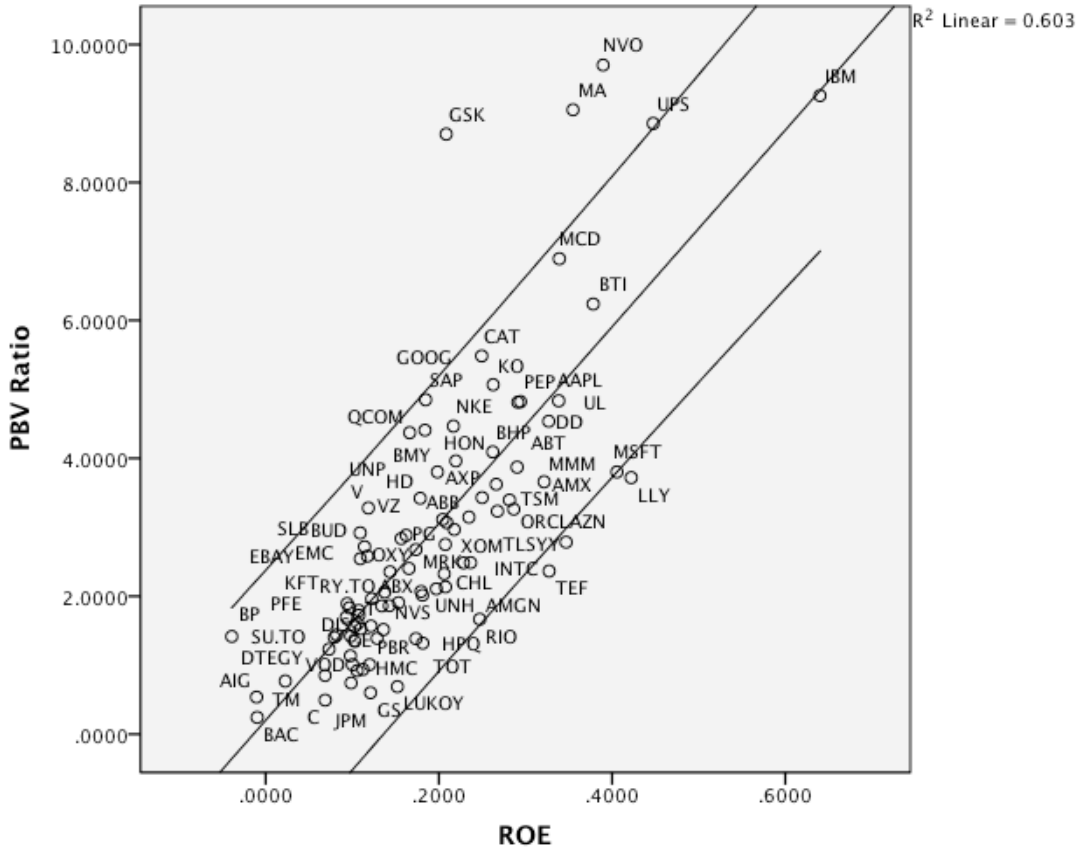
a. Predictors: (Constant), ROE, Expected Growth in EPS: next 5 years, Regression Beta

**Coefficients[a]**

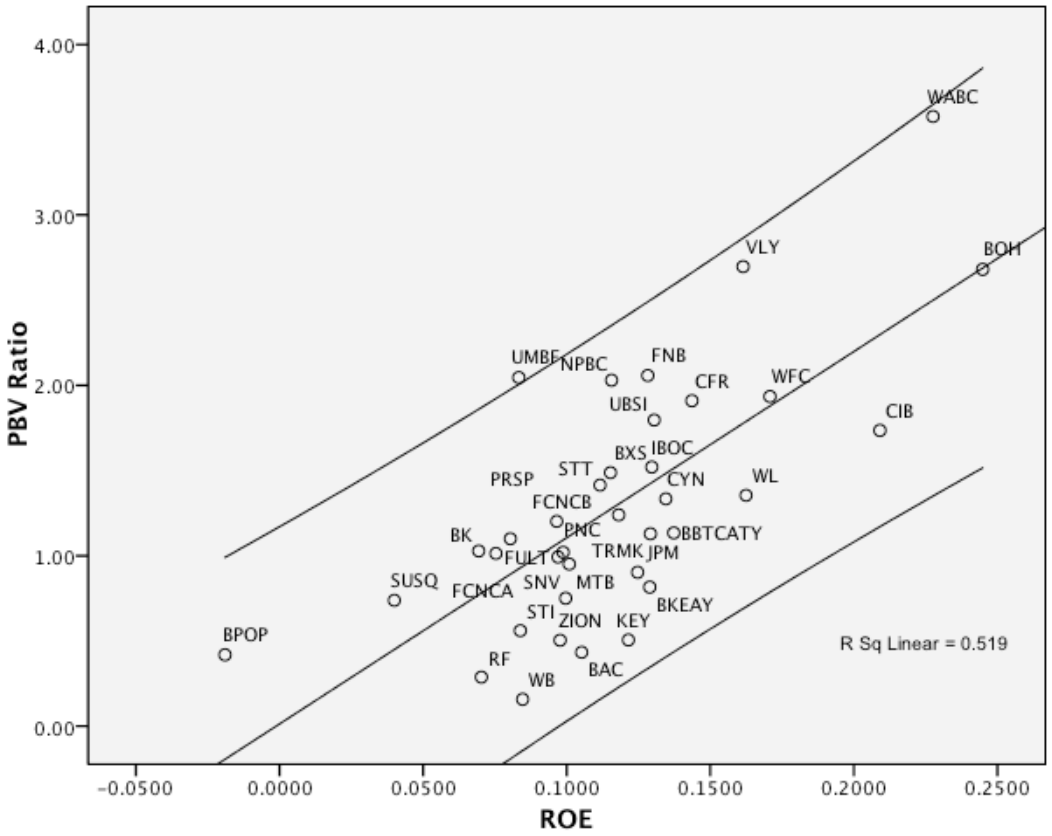
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | .406 | .424 | | .958 | .340 |
| | Regression Beta | -.065 | .253 | -.015 | -.256 | .799 |
| | Expected Growth in EPS: next 5 years | 9.340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

a. Dependent Variable: PBV Ratio

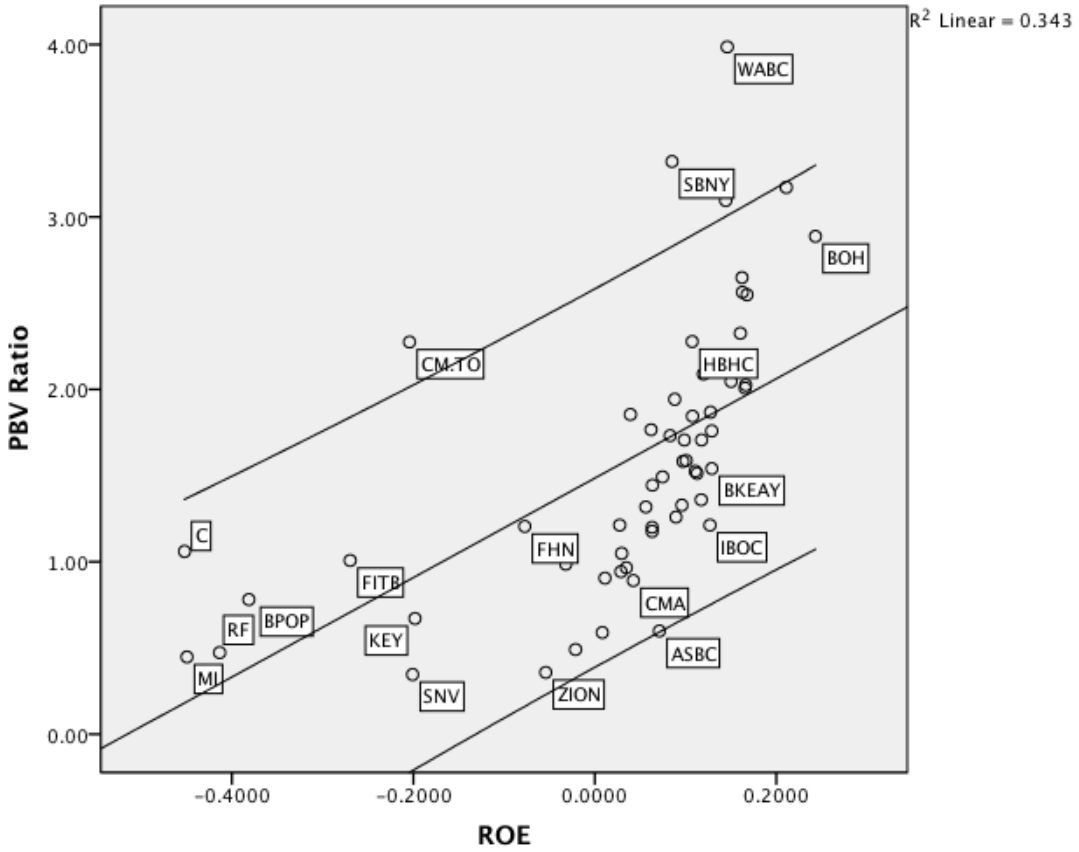
# PBV Ratios – Largest Market Cap US companies in January 2012



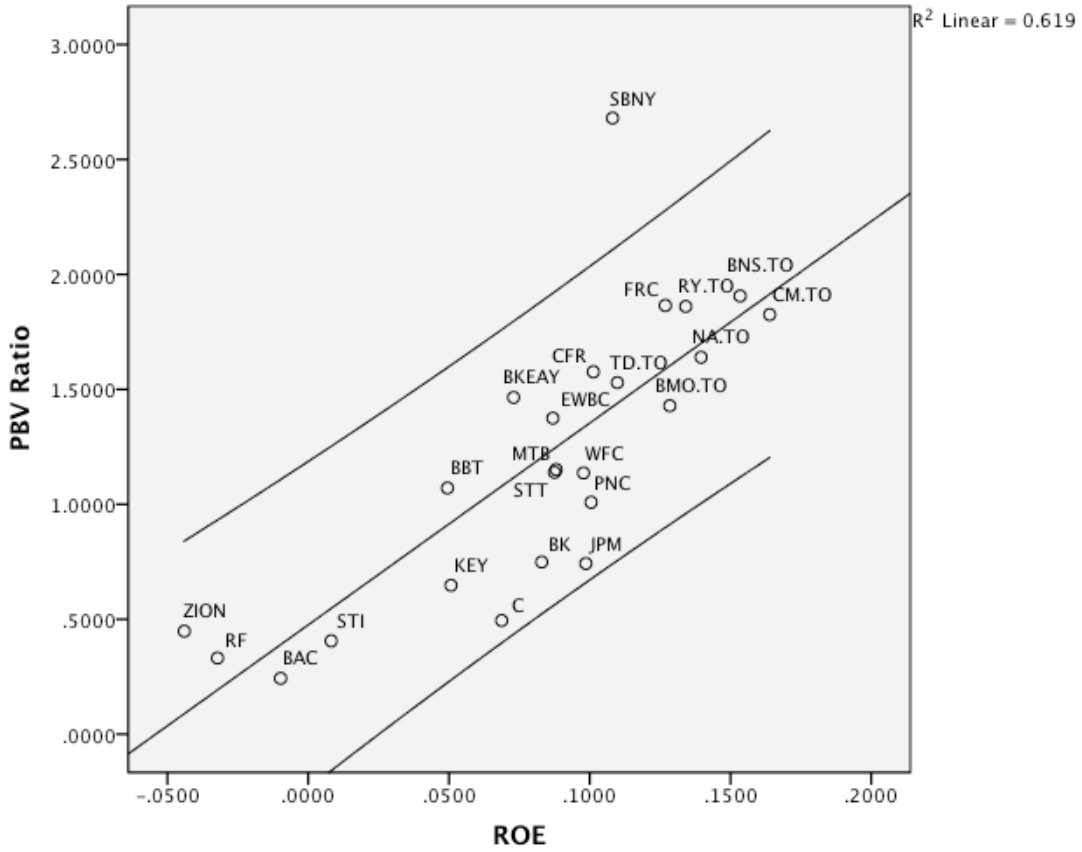
# Even in chaos, there is order…
# US Banks (Mkt cap> $ 1 billion) in January 2009



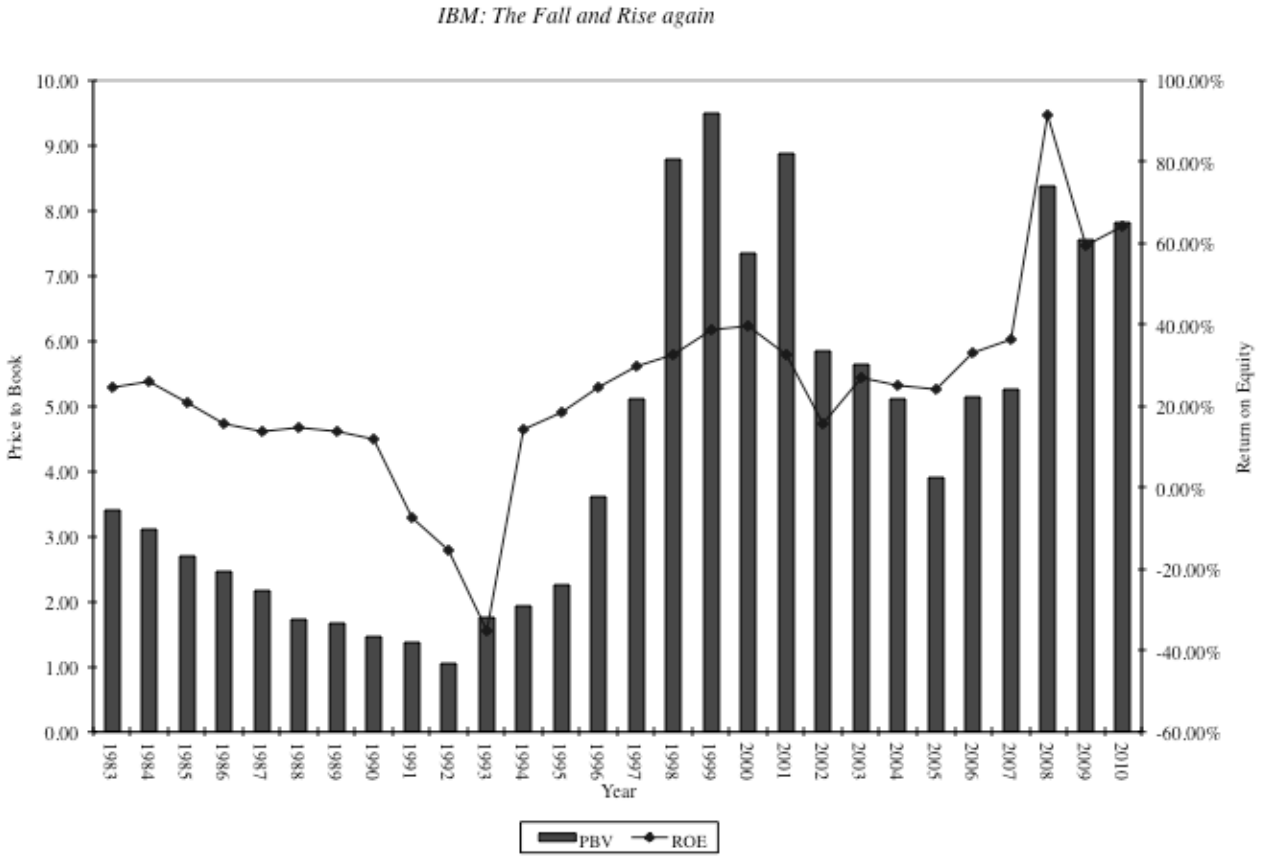
# In January 2010… Another look at US Banks



# Banks again.. In January 2012



# IBM: The Rise and Fall and Rise Again
# PBV vs ROE: 1983-2010



# PBV Ratio Regression: US
# January 2012

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .733[a] | .537 | .536 | 125.776416 |

a. Predictors: (Constant), ROE, Payout Ratio, Expected Growth in EPS: next 5 years, 3-yr Regression Beta

**Coefficients[a,b]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | .497 | .116 | | 4.289 | .000 |
| | 3-yr Regression Beta | -.376 | .061 | -.101 | -6.170 | .000 |
| | Payout Ratio | .529 | .121 | .070 | 4.369 | .000 |
| | Expected Growth in EPS: next 5 years | 3.126 | .313 | .160 | 9.981 | .000 |
| | ROE | 12.211 | .273 | .710 | 44.724 | .000 |

a. Dependent Variable: PBV Ratio
b. Weighted Least Squares Regression - Weighted by Market Cap

# PBV Ratio Regression- Other Markets
# January 2012

| Region | Regression – January 2012 | R squared |
|---|---|---|
| Australia, NZ & Canada | PBV = 0.90 + 0.92 Payout – 0.18 Beta + 5.43 ROE | 38.6% |
| Europe | PBV = 1.14 + 0.76 Payout – 0.67 Beta + 7.56 ROE | 47.2% |
| Japan | PBV = 1.21 + 0.67 Payout – 0.40 Beta + 3.26 ROE | 22.1% |
| Emerging Markets | PBV = 0.77 + 1.16 Payout – 0.17 Beta + 5.78 ROE | 20.8% |

# Value/Book Value Ratio: Definition

- While the price to book ratio is a equity multiple, both the market value and the book value can be stated in terms of the firm.
- Value/Book Value = $\frac{\text{Market Value of Equity + Market Value of Debt}}{\text{Book Value of Equity + Book Value of Debt}}$

# Determinants of Value/Book Ratios

- 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

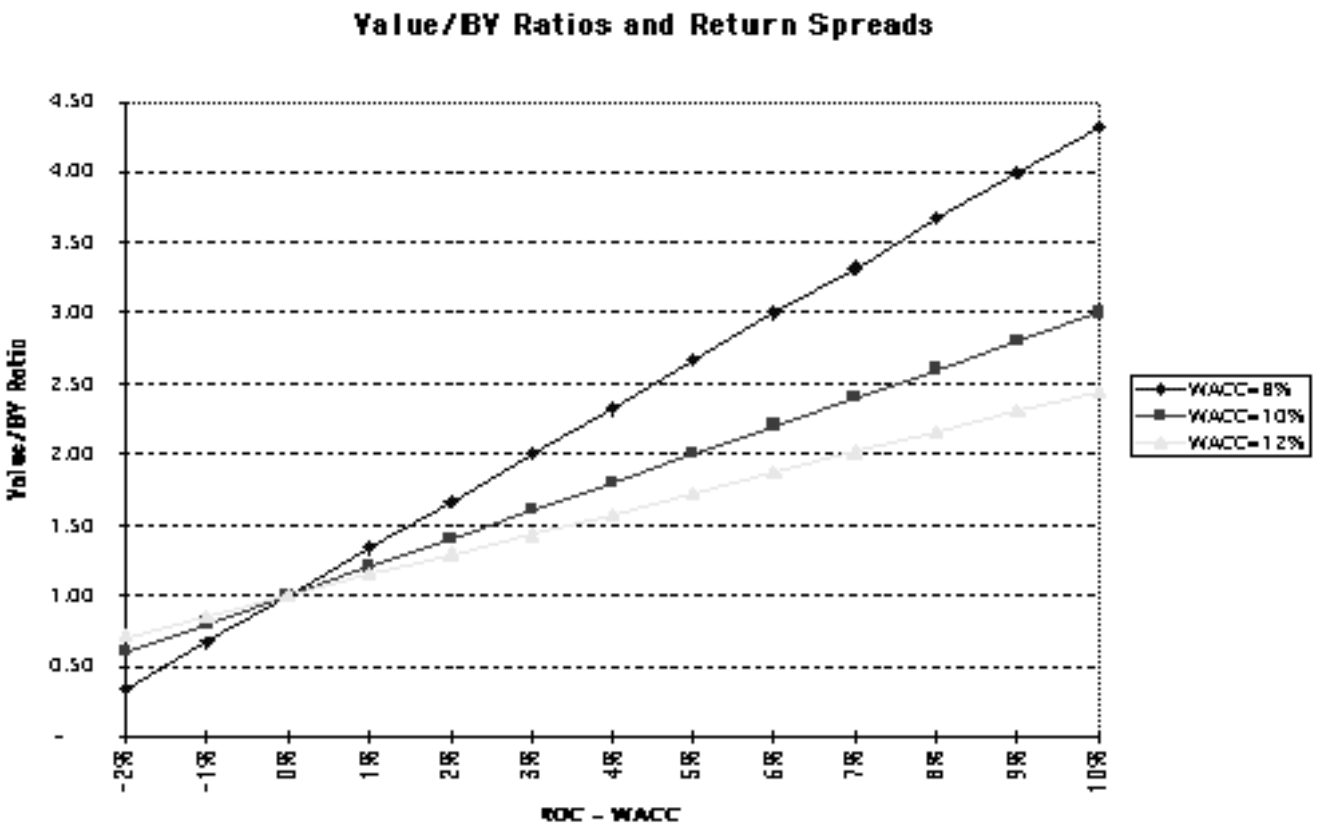
$$\frac{V_0}{BV} = \frac{ROC - g}{WACC - g}$$

# Value/Book Ratio: An Example

- Consider a stable growth firm with the following characteristics:
  - Return on Capital = 12%
  - Cost of Capital = 10%
  - Expected Growth = 5%
- The value/BV ratio for this firm can be estimated as follows:

  Value/BV = (.12 - .05)/(.10 - .05) = 1.40
- The effects of ROC on growth will increase if the firm has a high growth phase, but the basic determinants will remain unchanged.

# Value/Book and the Return Spread



# EV/ Invested Capital Regression - US - January 2012

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .763[a] | .582 | .581 | 120.593384 |

a. Predictors: (Constant), ROIC, Expected Growth in Revenues: next 5 years, Market Debt to Capital

**Coefficients[a,b]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 1.101 | .116 | | 9.495 | .000 |
| | Expected Growth in Revenues: next 5 years | 5.724 | .750 | .153 | 7.635 | .000 |
| | Market Debt to Capital | -2.397 | .234 | -.220 | -10.249 | .000 |
| | ROIC | 7.430 | .276 | .551 | 26.935 | .000 |

a. Dependent Variable: EV/ Invested Capital
b. Weighted Least Squares Regression - Weighted by Market Cap

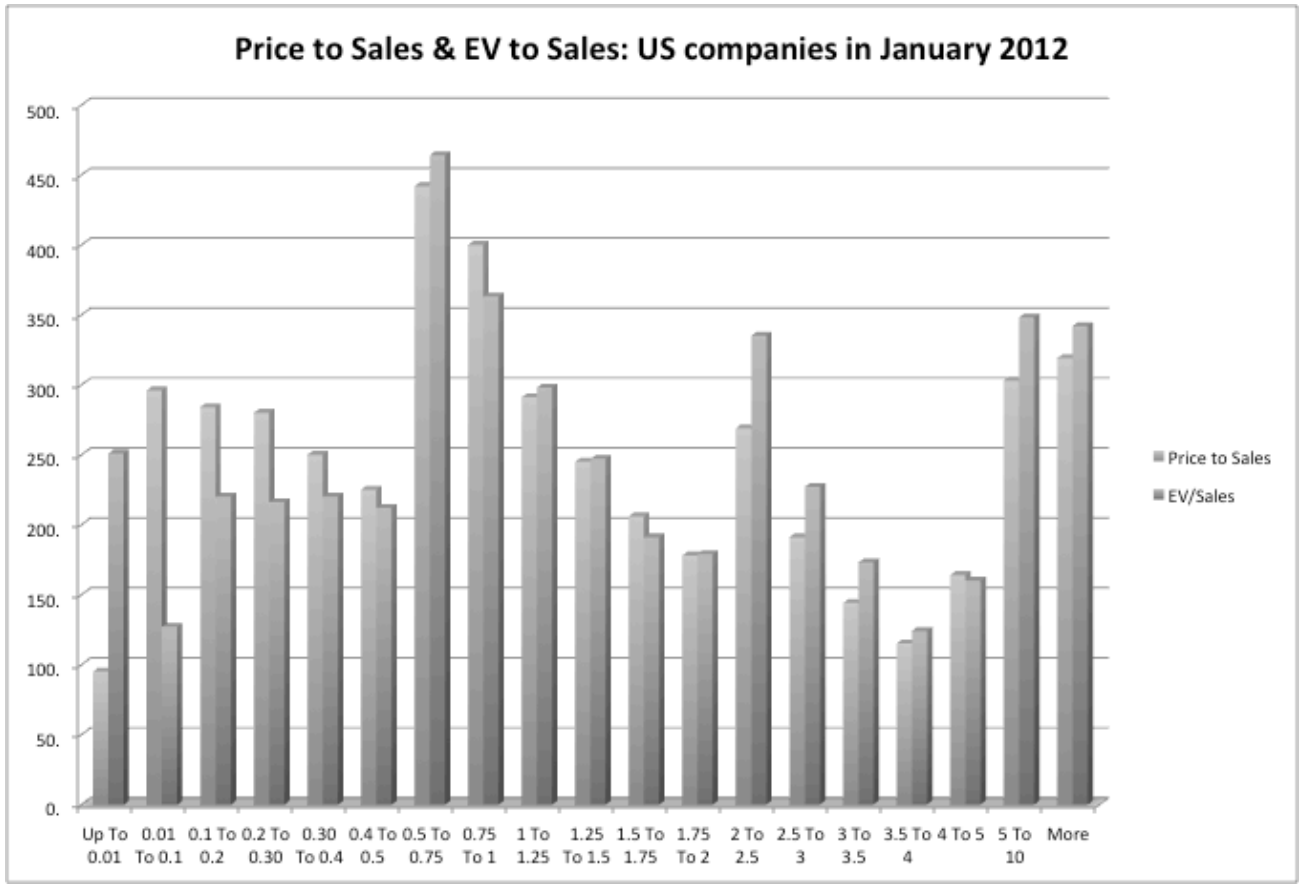
# Price Sales Ratio: Definition

- The price/sales ratio is the ratio of the market value of equity to the sales.

- Price/ Sales= $\dfrac{\text{Market value of equity}}{\text{Revenues}}$

- Consistency Tests
  - The price/sales ratio is internally inconsistent, since the market value of equity is divided by the total revenues of the firm.

# Revenue Multiples: US stocks



# Price/Sales Ratio: Determinants

- The price/sales ratio of a stable growth firm can be estimated beginning with a 2-stage equity valuation model:

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

- Dividing both sides by the sales per share:

$$\frac{P_0}{Sales_0} = PS = \frac{\text{Net Profit Margin} * \text{Payout Ratio} * (1 + g_n)}{r - g_n}$$

# Price/Sales Ratio for High Growth Firm

- When the growth rate is assumed to be high for a future period, the dividend discount model can be written as follows:

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

- Dividing both sides by the sales per share:

$$\frac{P_0}{\text{Sales}_0} = \left[\frac{\text{Net Margin} * \text{Payout Ratio} * (1+g) * \left(1 - \frac{(1+g)^n}{(1+r)^n}\right)}{r - g} + \frac{\text{Net Margin}_n * \text{Payout Ratio}_n * (1+g)^n * (1+g_n)}{(r - g_n)(1+r)^n}\right]$$

where $\text{Net Margin}_n$ = Net Margin in stable growth phase

# Price Sales Ratios and Profit Margins

- The key determinant of price-sales ratios is the profit margin.
- A decline in profit margins has a two-fold effect.
  - First, the reduction in profit margins reduces the price-sales ratio directly.
  - Second, the lower profit margin can lead to lower growth and hence lower price-sales ratios.

Expected growth rate = Retention ratio * Return on Equity

= Retention Ratio *(Net Profit / Sales) * ( Sales / BV of Equity)

= Retention Ratio * Profit Margin * Sales/BV of Equity

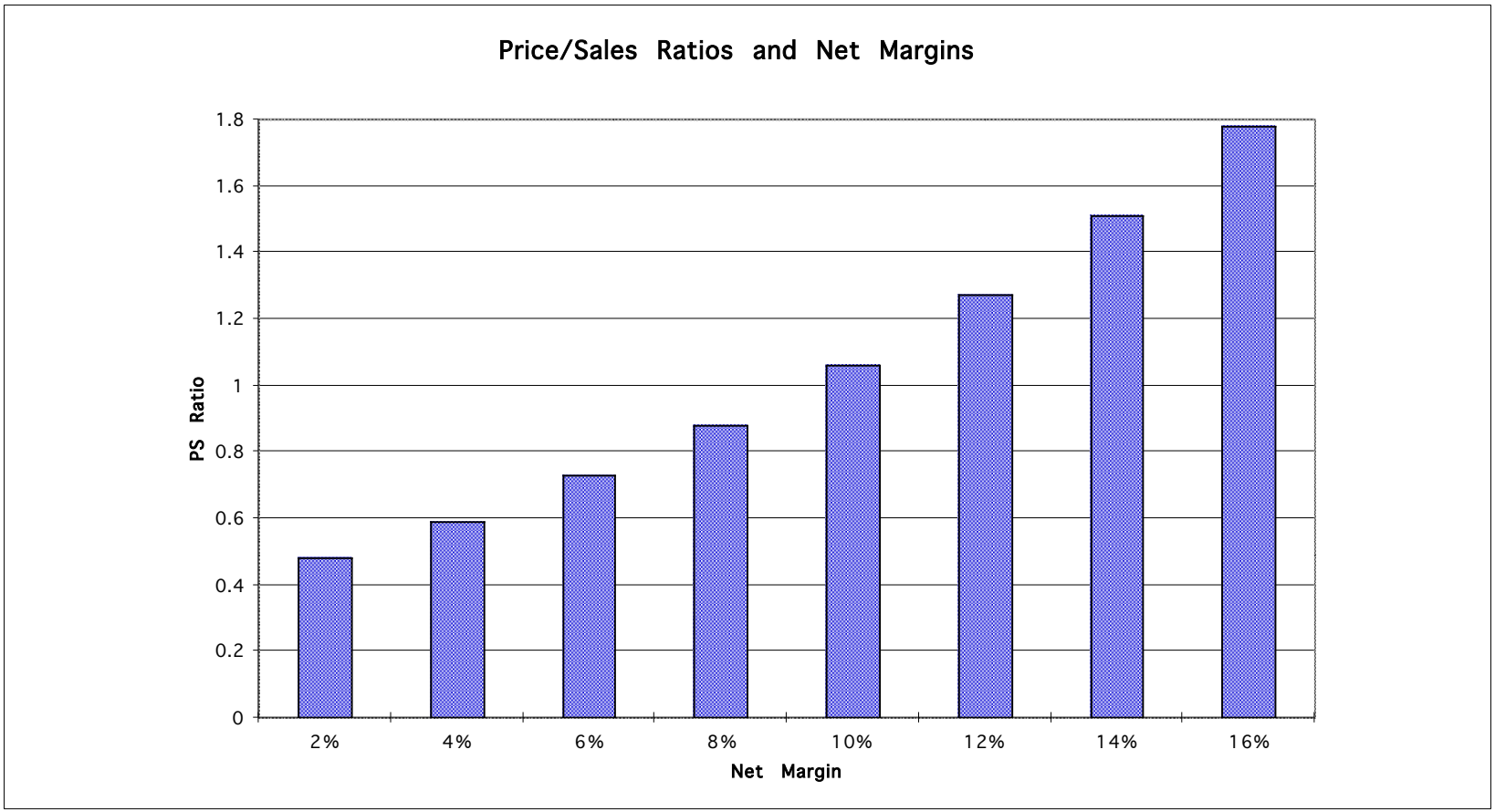
# Price/Sales Ratio: An Example

| | High Growth Phase | Stable Growth |
|---|---|---|
| Length of Period | 5 years | Forever after year 5 |
| Net Margin | 10% | 6% |
| Sales/BV of Equity | 2.5 | 2.5 |
| Beta | 1.25 | 1.00 |
| Payout Ratio | 20% | 60% |
| Expected Growth | (.1)(2.5)(.8)=20% | (.06)(2.5)(.4)=.06 |

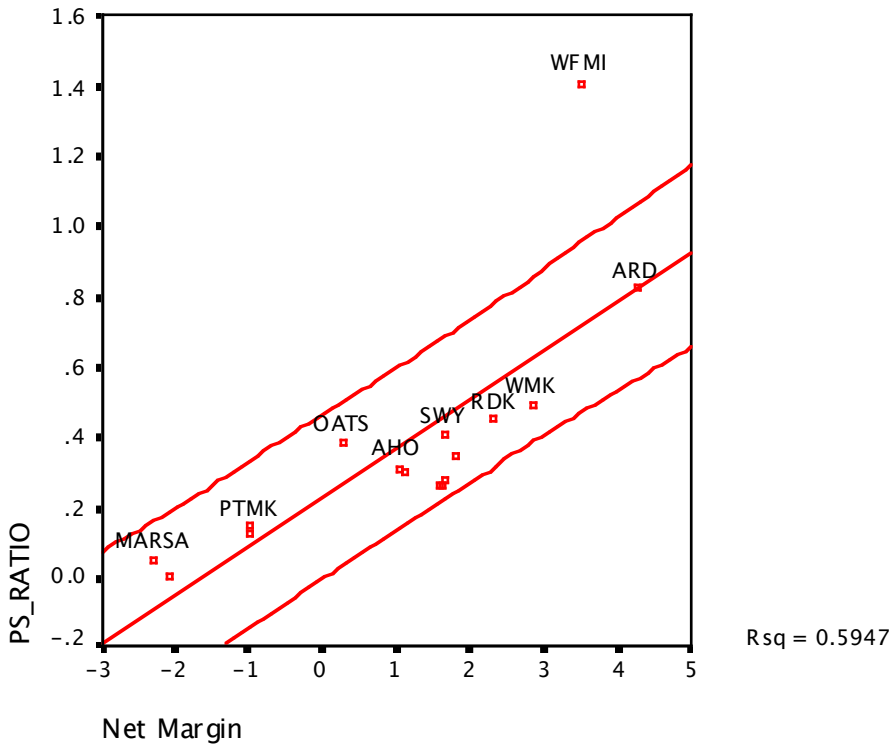
Riskless Rate =6%

$$PS = \left[ \frac{0.10 * 0.2 * (1.20) * \left(1 - \frac{(1.20)^5}{(1.12875)^5}\right)}{(.12875 - .20)} + \frac{0.06 * 0.60 * (1.20)^5 * (1.06)}{(.115 - .06)\,(1.12875)^5} \right] = 1.06$$

# Effect of Margin Changes



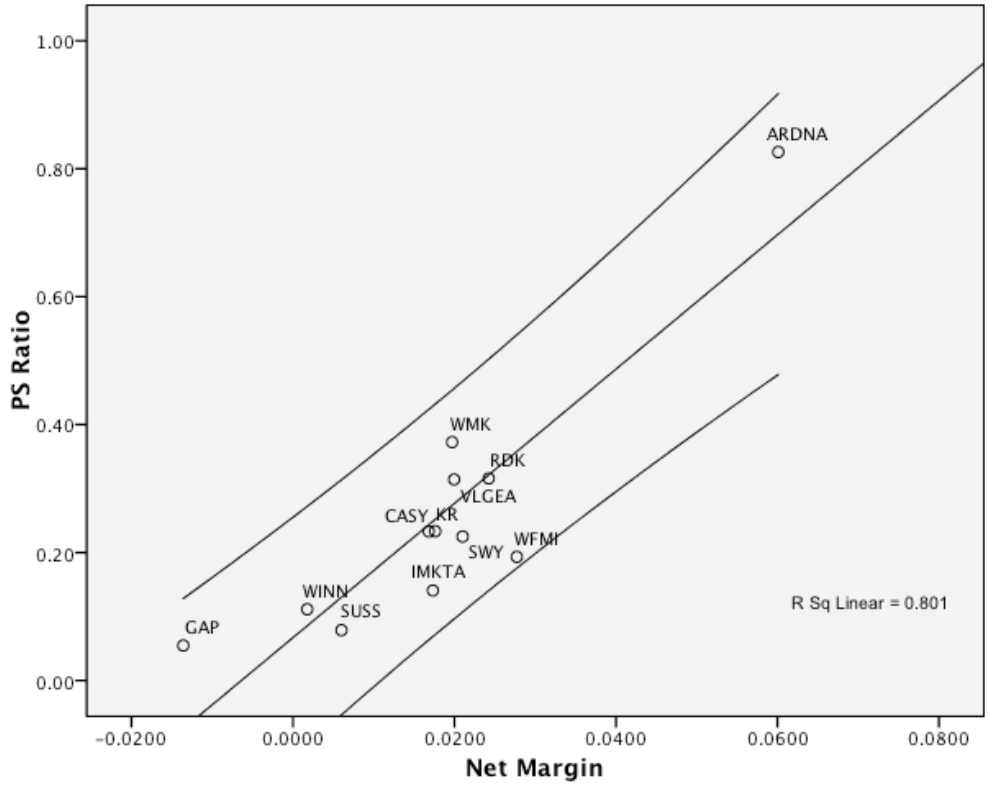
# Price to Sales Multiples: Grocery Stores - US in January 2007




Whole Foods: In 2007: Net Margin was 3.41% and Price/ Sales ratio was 1.41

Predicted Price to Sales = 0.07 + 10.49 (0.0341) = 0.43

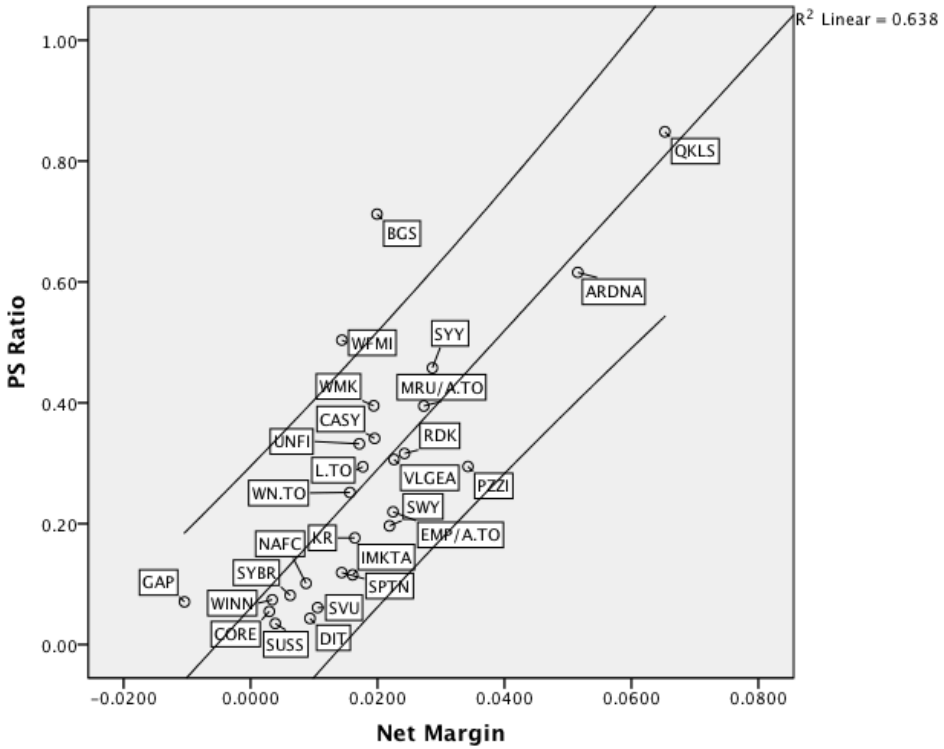
# Reversion to normalcy: Grocery Stores - US in January 2009




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

Predicted Price to Sales = 0.07 + 10.49 (.0277) = 0.36

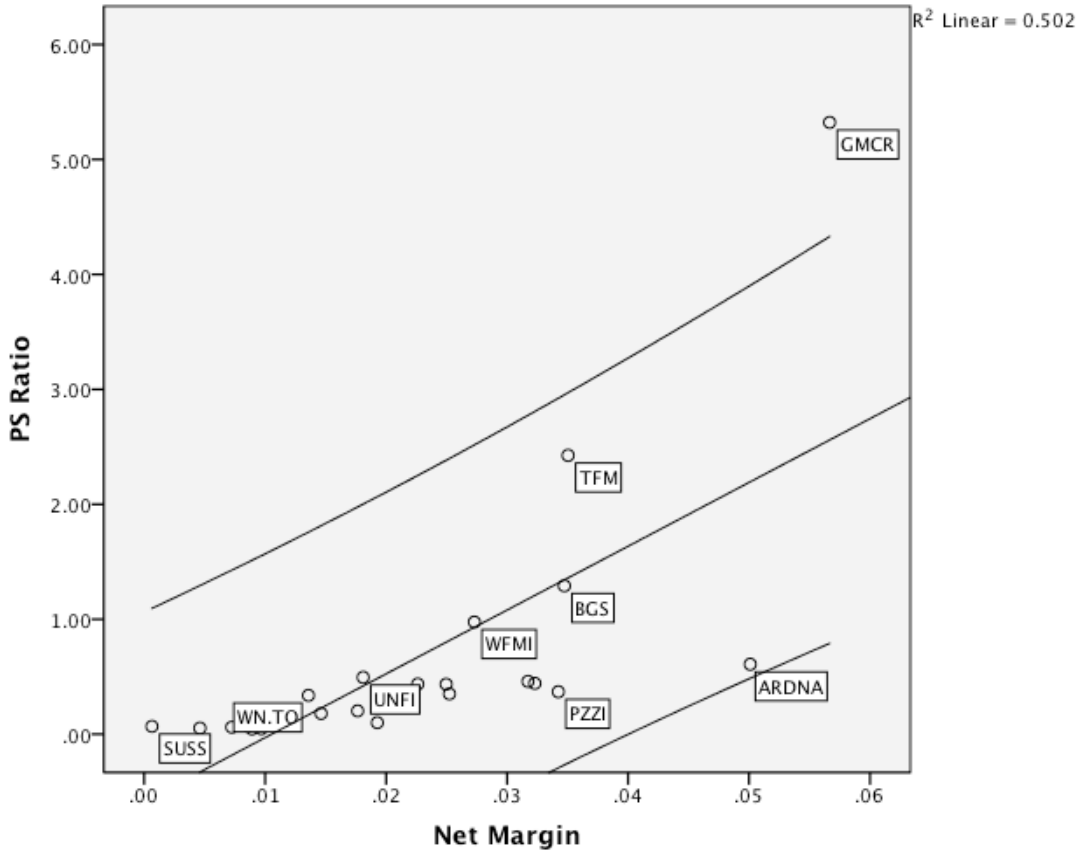
# And again in 2010..




Whole Foods: In 2010, Net Margin had dropped to 1.44% and Price to Sales ratio increased to 0.50.

Predicted Price to Sales = 0.06 + 11.43 (.0144) = 0.22

# Here is 2011…




PS Ratio= - 0.585 + 55.50 (Net Margin)  $R^2$= 48.2%

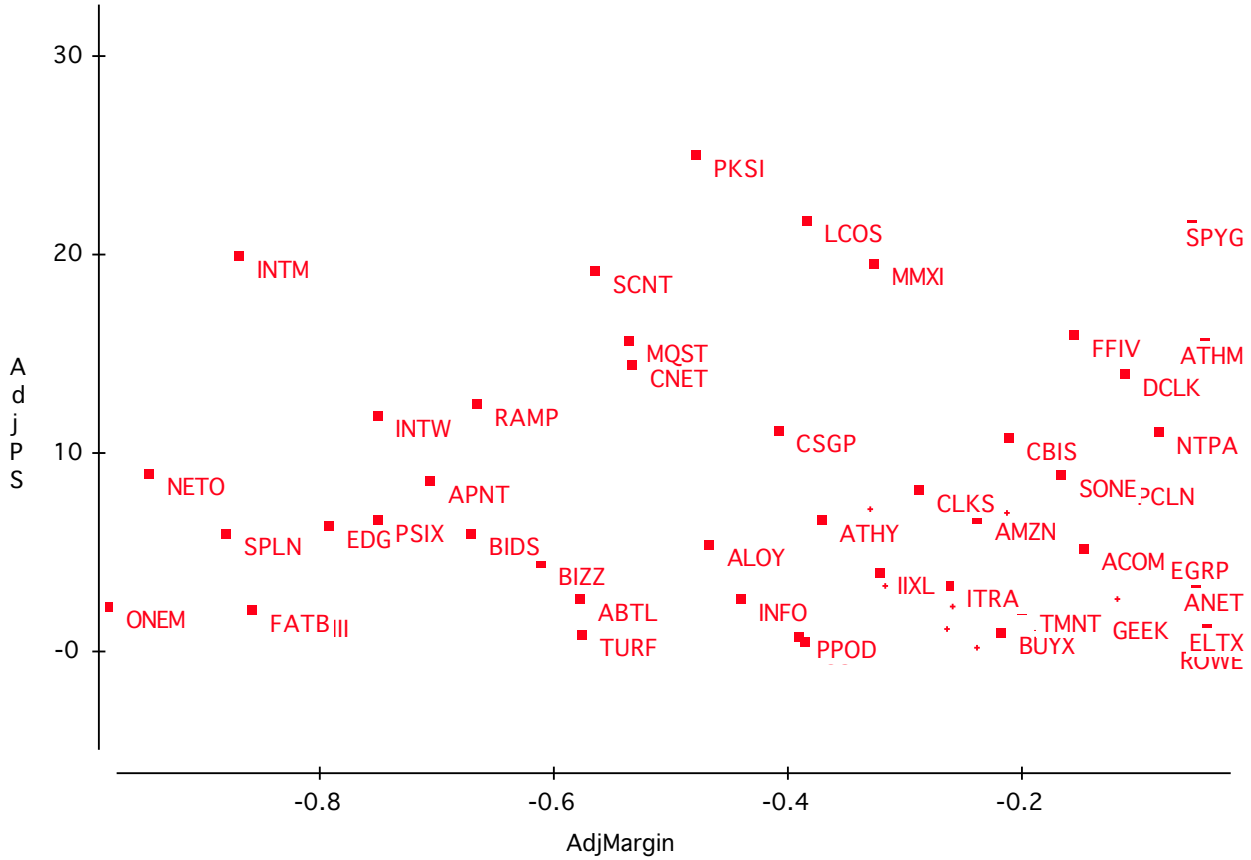
PS Ratio for WFMI = -0.585 + 55.50 (.0273) = 0.93

At a PS ratio of 0.98, WFMI is slightly over valued.

# Current versus Predicted Margins

- One of the limitations of the analysis we did in these last few pages is the focus on current margins. Stocks are priced based upon expected margins rather than current margins.
- For most firms, current margins and predicted margins are highly correlated, making the analysis still relevant.
- For firms where current margins have little or no correlation with expected margins, regressions of price to sales ratios against current margins (or price to book against current return on equity) will not provide much explanatory power.
- In these cases, it makes more sense to run the regression using either predicted margins or some proxy for predicted margins.

# A Case Study: Internet Stocks in January 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. Consequently, there is little relationship between current margins and market values.

# 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

Amazon is undervalued, relative to other internet stocks.

# Solution 2: Use forward multiples

- You can always estimate price (or value) as a multiple of revenues, earnings or book value in a future year. These multiples are called forward multiples.
- For young and evolving firms, the values of fundamentals in future years may provide a much better picture of the true value potential of the firm. There are two ways in which you can use forward multiples:
  - Look at value today as a multiple of revenues or earnings in the future (say 5 years from now) for all firms in the comparable firm list. Use the average of this multiple in conjunction with your firm's earnings or revenues to estimate the value of your firm today.
  - Estimate value as a multiple of current revenues or earnings for more mature firms in the group and apply this multiple to the forward earnings or revenues to the forward earnings for your firm. This will yield the expected value for your firm in the forward year and will have to be discounted back to the present to get current value.

# An Example of Forward Multiples: Global Crossing

- Global Crossing, a distressed telecom firm, lost $1.9 billion in 2001 and is expected to continue to lose money for the next 3 years. In a discounted cashflow 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
- This enterprise value does not fully reflect the possibility that Global Crossing will not make it as a going concern.
  - Based on the price of traded bonds issued by Global Crossing, the probability that Global Crossing will not make it as a going concern is 77% and the distress sale value is only a $ 1 billion (1/2 of book value of assets).
  - Adjusted Enterprise value = 5172 * .23 + 1000 (.77) = 1,960 million

# PS Regression: United States - January 2012

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .703[a] | .494 | .494 | 113.670012 |

a. Predictors: (Constant), Net Margin, Expected Growth in EPS: next 5 years, 3-yr Regression Beta

**Coefficients[a,b]**

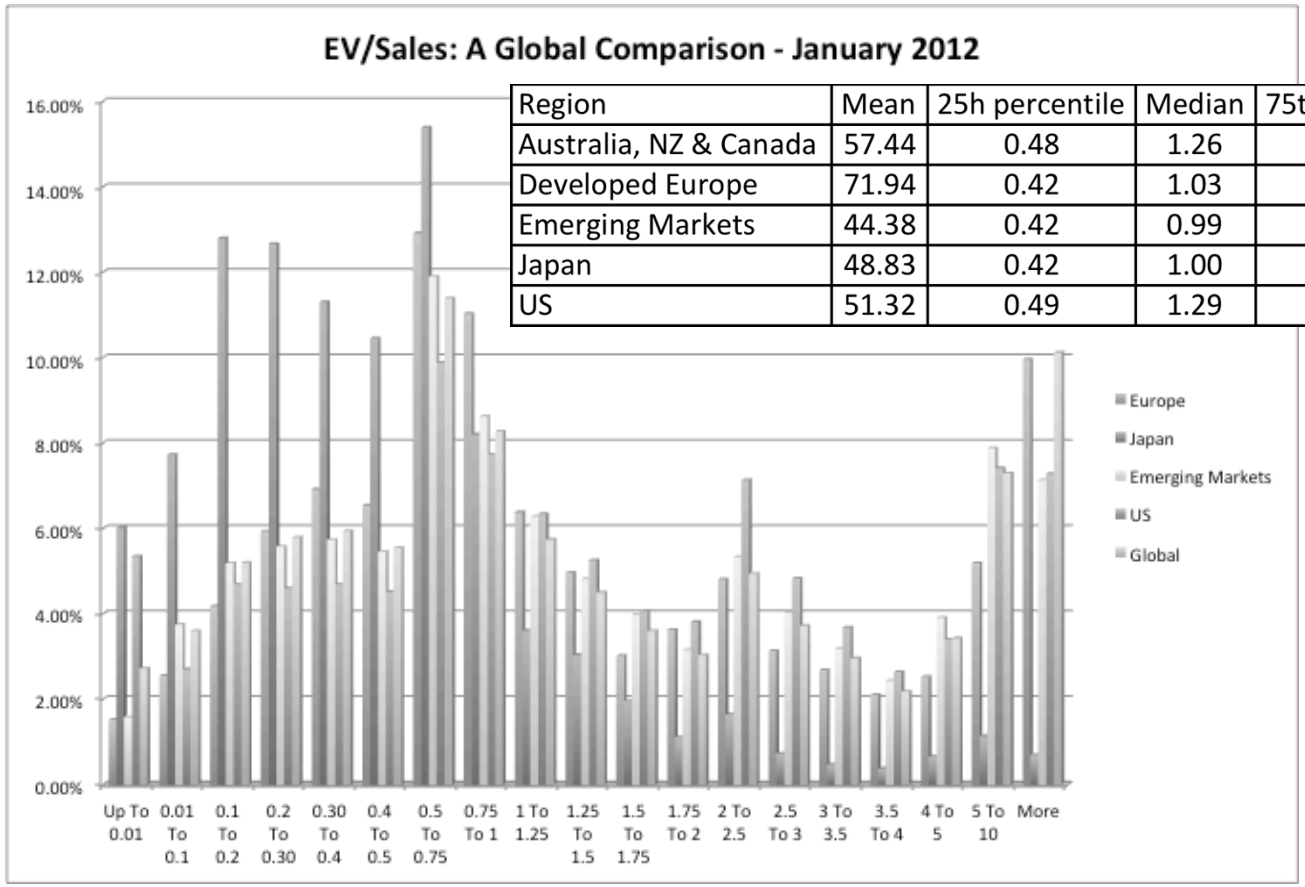
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | .359 | .083 | | 4.324 | .000 |
| | Expected Growth in EPS: next 5 years | 2.814 | .286 | .169 | 9.854 | .000 |
| | 3-yr Regression Beta | -.218 | .056 | -.068 | -3.912 | .000 |
| | Net Margin | 12.938 | .319 | .685 | 40.575 | .000 |

a. Dependent Variable: PS Ratio
b. Weighted Least Squares Regression - Weighted by Market Cap

# EV/Sales Ratio: Definition

- The value/sales ratio is the ratio of the market value of the firm to the sales.
- EV/ Sales= $\frac{\text{Market Value of Equity + Market Value of Debt-Cash}}{\text{Total Revenues}}$

# EV Sales across markets




| Region | Mean | 25h percentile | Median | 75th percentile |
|---|---|---|---|---|
| Australia, NZ & Canada | 57.44 | 0.48 | 1.26 | 3.80 |
| Developed Europe | 71.94 | 0.42 | 1.03 | 2.98 |
| Emerging Markets | 44.38 | 0.42 | 0.99 | 2.92 |
| Japan | 48.83 | 0.42 | 1.00 | 2.85 |
| US | 51.32 | 0.49 | 1.29 | 3.90 |

# EV/Sales Ratios: Analysis of Determinants

- If pre-tax operating margins are used, the appropriate value estimate is that of the firm. In particular, if one makes the assumption that
  - Free Cash Flow to the Firm = EBIT (1 - tax rate) (1 - Reinvestment Rate)
- Then the Value of the Firm can be written as a function of the after-tax operating margin= (EBIT (1-t)/Sales

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

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

$g_n$ = 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

# EV/Sales Ratio: An Example with Coca Cola

- Consider, for example, the Value/Sales ratio of Coca Cola. The company had the following characteristics:

  After-tax Operating Margin =18.56%  Sales/BV of Capital =  1.67

  Return on Capital = 1.67* 18.56% = 31.02%

  Reinvestment Rate= 65.00% in high growth; 20% in stable growth;

  Expected Growth = 31.02% * 0.65 =20.16%  (Stable Growth Rate=6%)

  Length of High Growth Period = 10 years

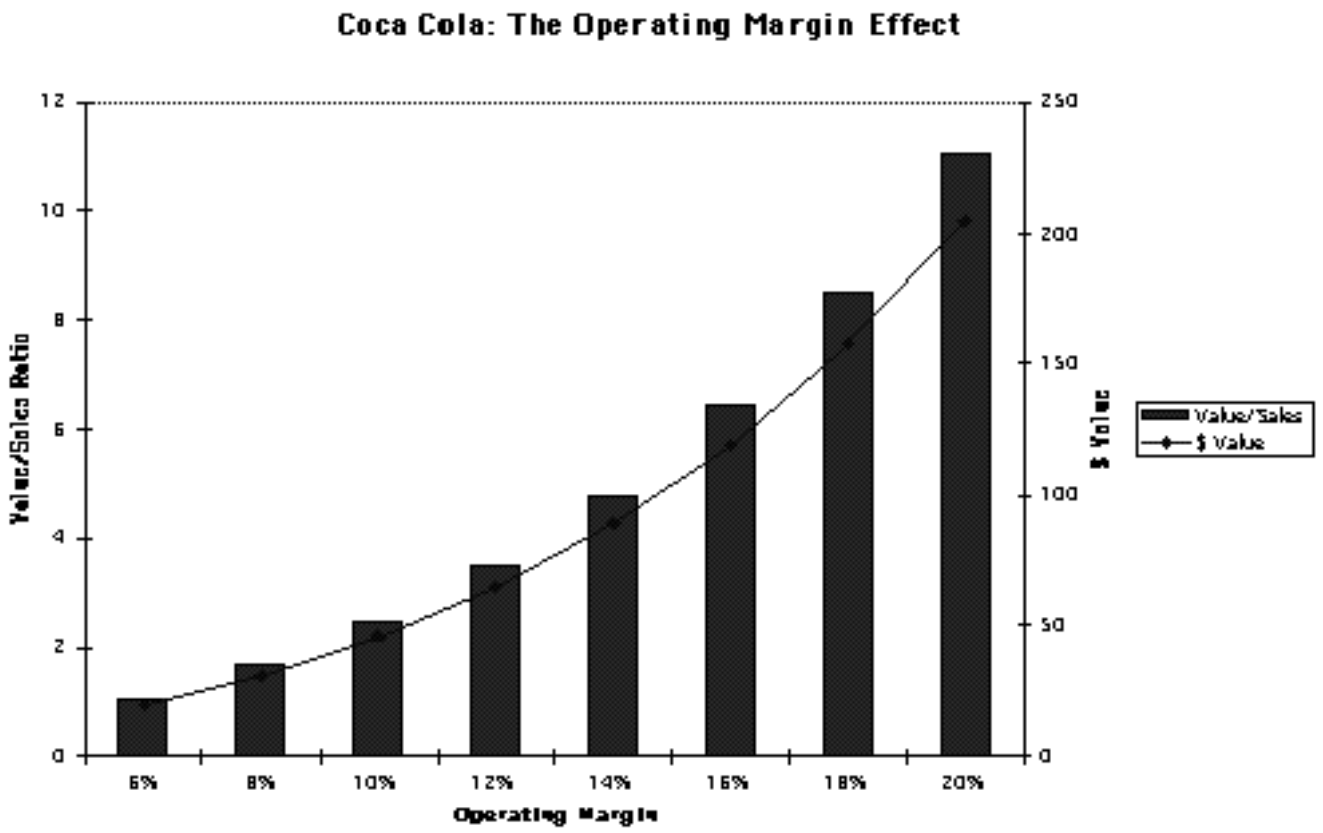
  Cost of Equity  =12.33%  E/(D+E) = 97.65%

  After-tax  Cost of Debt = 4.16%  D/(D+E)  2.35%

  Cost of Capital= 12.33% (.9765)+4.16% (.0235) =12.13%

$$\frac{\text{Value of Firm}_0}{\text{Sales}_0} = .1856 * \left[ \frac{(1-.65)(1.2016) * \left(1 - \frac{(1.2016)^{10}}{(1.1213)^{10}}\right)}{.1213 - .2016} + \frac{(1-.20)(1.2016)^{10} * (1.06)}{(.1213-.06)(1.1213)^{10}} \right] = 6.10$$

# EV/Sales Ratios and Operating Margins



# Brand Name Premiums in Valuation

- You have been hired to value Coca Cola for an analyst reports and you have valued the firm at 6.10 times revenues, using the model described in the last few pages. Another analyst is arguing that there should be a premium added on to reflect the value of the brand name. Do you agree?
  - Yes
  - No
- Explain.

# 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

# More on brand name value…

- When we use the difference in margins to value brand name, we are assuming that the difference in margins is entirely due to brand name and that it affects nothing else (cost of capital, for instance) . To the extent that this is not the case, we may be under or over valuing brand name.
- In which of these companies do you think valuing brand name will be easiest to do and which of them will it be hardest?
  - Kelloggs
  - Sony
  - Goldman Sachs
  - Apple

Explain.

# EV/Sales Ratio Regression: US in January 2012

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .733[a] | .537 | .536 | 120.019400 |

a. Predictors: (Constant), Pre-tax Operating Margin, Eff Tax Rate, Expected Growth in Revenues: next 5 years, Market Debt to Capital

**Coefficients[a,b]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | .434 | .133 | | 3.249 | .001 |
| | Expected Growth in Revenues: next 5 years | 7.121 | .682 | .215 | 10.447 | .000 |
| | Market Debt to Capital | -.389 | .212 | -.038 | -1.837 | .066 |
| | Eff Tax Rate | -1.871 | .271 | -.125 | -6.906 | .000 |
| | Pre-tax Operating Margin | 7.686 | .217 | .643 | 35.388 | .000 |

a. Dependent Variable: EV/Sales
b. Weighted Least Squares Regression - Weighted by Market Cap

# EV/Sales Regressions across markets…

| Region | Regression – January 2011 | R Squared |
|---|---|---|
| Europe | EV/Sales =2.28 - 0.01 Interest Coverage Ratio + 6.47 Operating Margin –3.70 Tax Rate -0.67 Reinvestment Rate | 49.8% |
| Japan | EV/Sales =1.01 + 5.31Operating Margin | 18.9% |
| Emerging Markets | EV/Sales = 1.67 - 2.70 Tax rate + 8.25 Operating Margin - 0.002 Interest Coverage Ratio -0.29 Reinvestment Rate | 31.7% |

# 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

# Averaging Across Multiples

- This procedure involves valuing a firm using five or six or more multiples and then taking an average of the valuations across these multiples.
- This is completely inappropriate since it averages good estimates with poor ones equally.
- If some of the multiples are "sector based" and some are "market based", this will also average across two different ways of thinking about relative valuation.

# Weighted Averaging Across Multiples

- In this approach, the estimates obtained from using different multiples are averaged, with weights on each based upon the precision of each estimate. The more precise estimates are weighted more and the less precise ones weighted less.
- The precision of each estimate can be estimated fairly simply for those estimated based upon regressions as follows:

  Precision of Estimate = 1 / Standard Error of Estimate

  where the standard error of the predicted value is used in the denominator.
- This approach is more difficult to use when some of the estimates are subjective and some are based upon more quantitative techniques.

# 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.

# Self Serving … But all too common

- When a firm is valued using several multiples, some will yield really high values and some really low ones.
- If there is a significant bias in the valuation towards high or low values, it is tempting to pick the multiple that best reflects this bias. Once the multiple that works best is picked, the other multiples can be abandoned and never brought up.
- This approach, while yielding very biased and often absurd valuations, may serve other purposes very well.
- As a user of valuations, it is always important to look at the biases of the entity doing the valuation, and asking some questions:
  - Why was this multiple chosen?
  - What would the value be if a different multiple were used? (You pick the specific multiple that you want to see tried.)

# The Statistical Approach

- One of the advantages of running regressions of multiples against fundamentals across firms in a sector is that you get R-squared values on the regression (that provide information on how well fundamentals explain differences across multiples in that sector).
- As a rule, it is dangerous to use multiples where valuation fundamentals (cash flows, risk and growth) do not explain a significant portion of the differences across firms in the sector.
- As a caveat, however, it is not necessarily true that the multiple that has the highest R-squared provides the best estimate of value for firms in a sector.

# 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.

# Sector or Market Multiples

- The conventional approach to using multiples is to look at the sector or comparable firms.
- Whether sector or market based multiples make the most sense depends upon how you think the market makes mistakes in valuation
  - If you think that markets make mistakes on individual firm valuations but that valuations tend to be right, on average, at the sector level, you will use sector-based valuation only,
  - If you think that markets make mistakes on entire sectors, but is generally right on the overall market level, you will use only market-based valuation
- It is usually a good idea to approach the valuation at two levels:
  - At the sector level, use multiples to see if the firm is under or over valued at the sector level
  - At the market level, check to see if the under or over valuation persists once you correct for sector under or over valuation.

# 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.

# 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 |