



PE Ratios

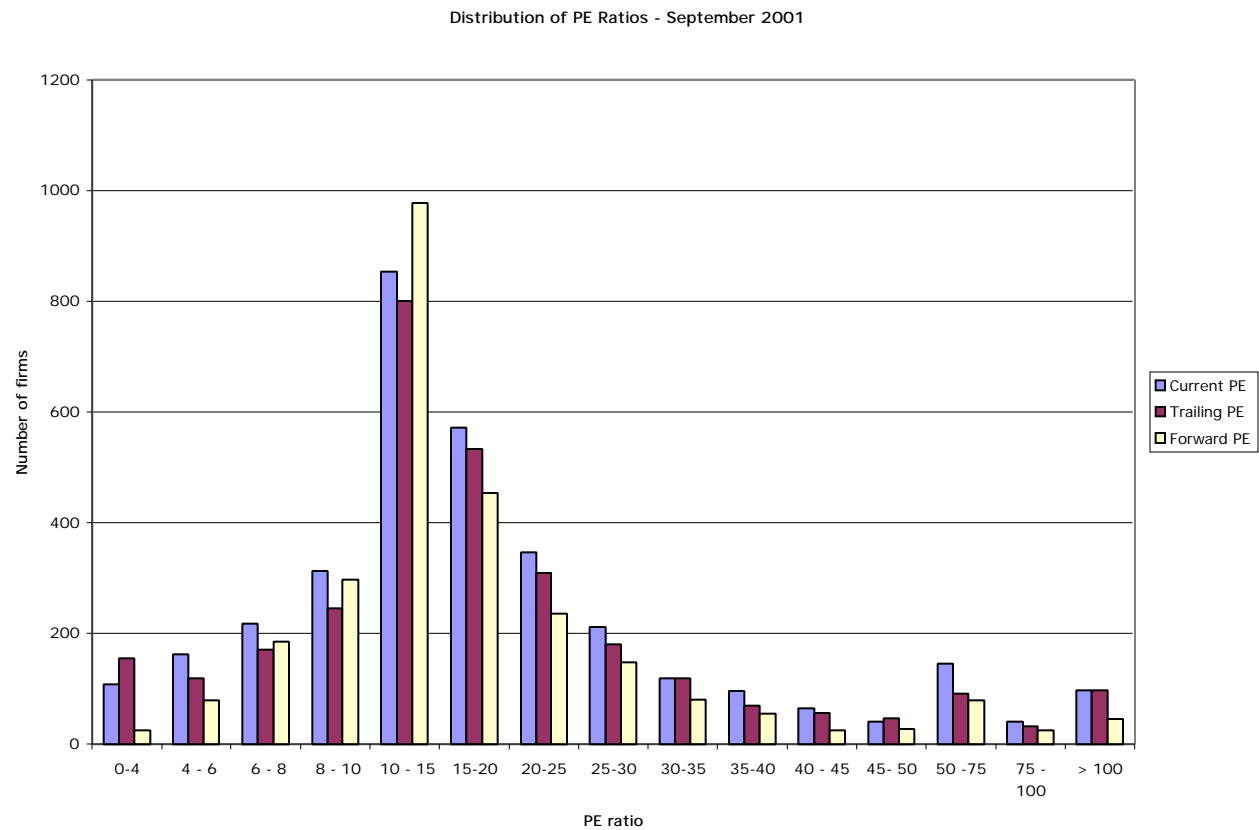
Aswath Damodaran

Price Earnings Ratio: Definition

$$\text{PE} = \text{Market Price per Share} / \text{Earnings per Share}$$

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

PE Ratio: Descriptive Statistics



PE: Deciphering the Distribution

	Current PE	Trailing PE	Forward PE
Mean	30.93	30.33	21.13
Standard Error	2.70	2.74	0.73
Median	15.27	15.20	13.71
Mode	10	0	14
Standard Deviation	157.30	150.65	38.22
Kurtosis	795.82	1615.73	224.85
Skewness	26.28	36.04	12.97
Range	5370.00	7090.50	864.91
Maximum	5370.00	7090.50	865.00
Count	3387	3021	2737

PE Ratio: Understanding the Fundamentals

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

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

- Dividing both sides by the earnings per share,

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

- If this had been a FCFE Model,

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

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

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:

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

- 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:

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

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:

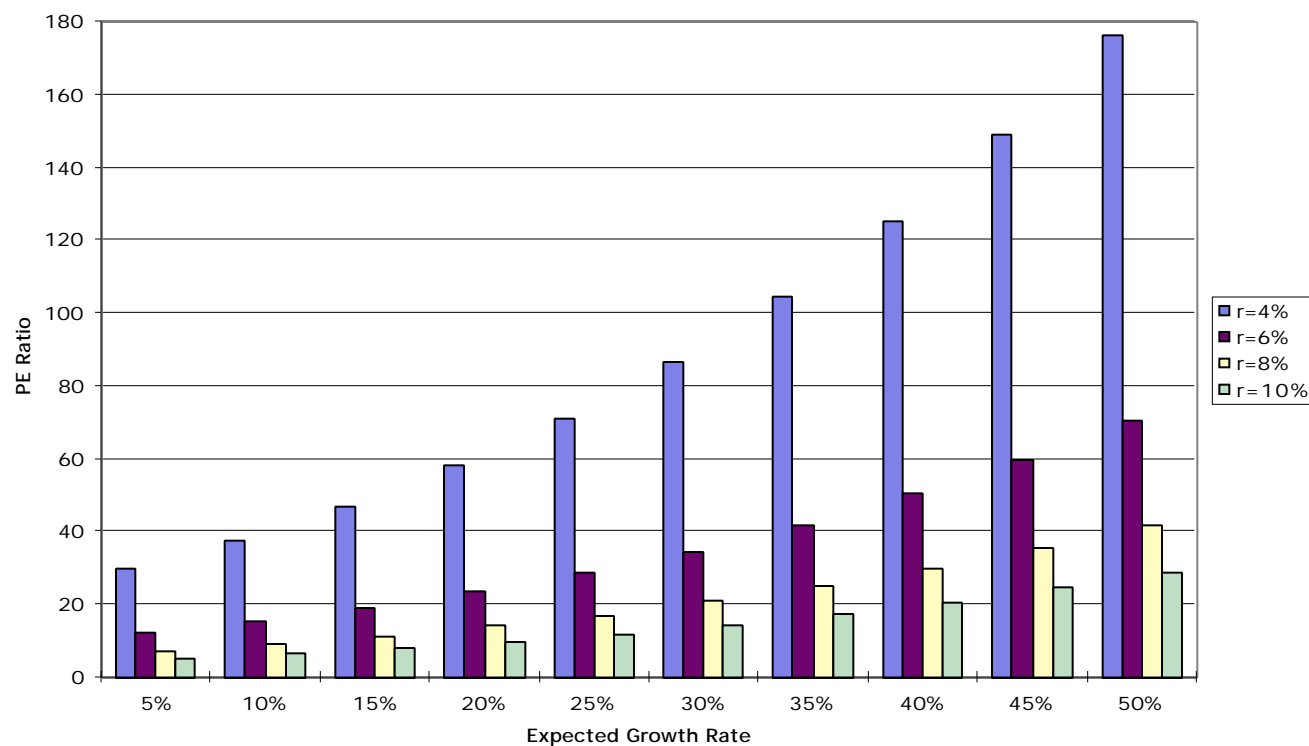
Variable	High Growth Phase	Stable Growth Phase
Expected Growth Rate	25%	8%
Payout Ratio	20%	50%
Beta	1.00	1.00

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

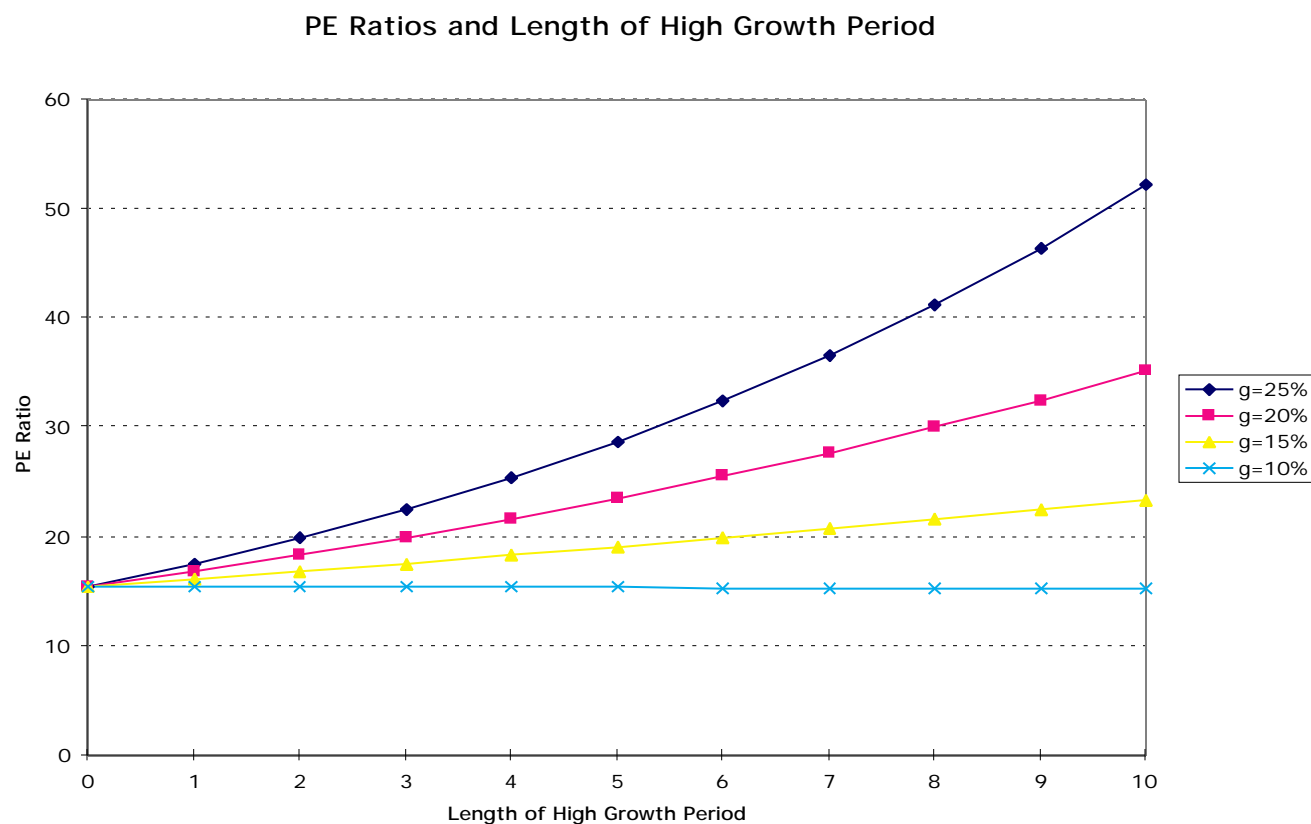
$$PE = \frac{0.2 * (1.25)^5 * \left(1 - \frac{(1.25)^5}{(1.115)^5}\right)}{(.115 - .25)} + \frac{0.5 * (1.25)^5 * (1.08)}{(.115 - .08) (1.115)^5} = 28.75$$

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

PE Ratios and Expected Growth: Interest Rate Scenarios

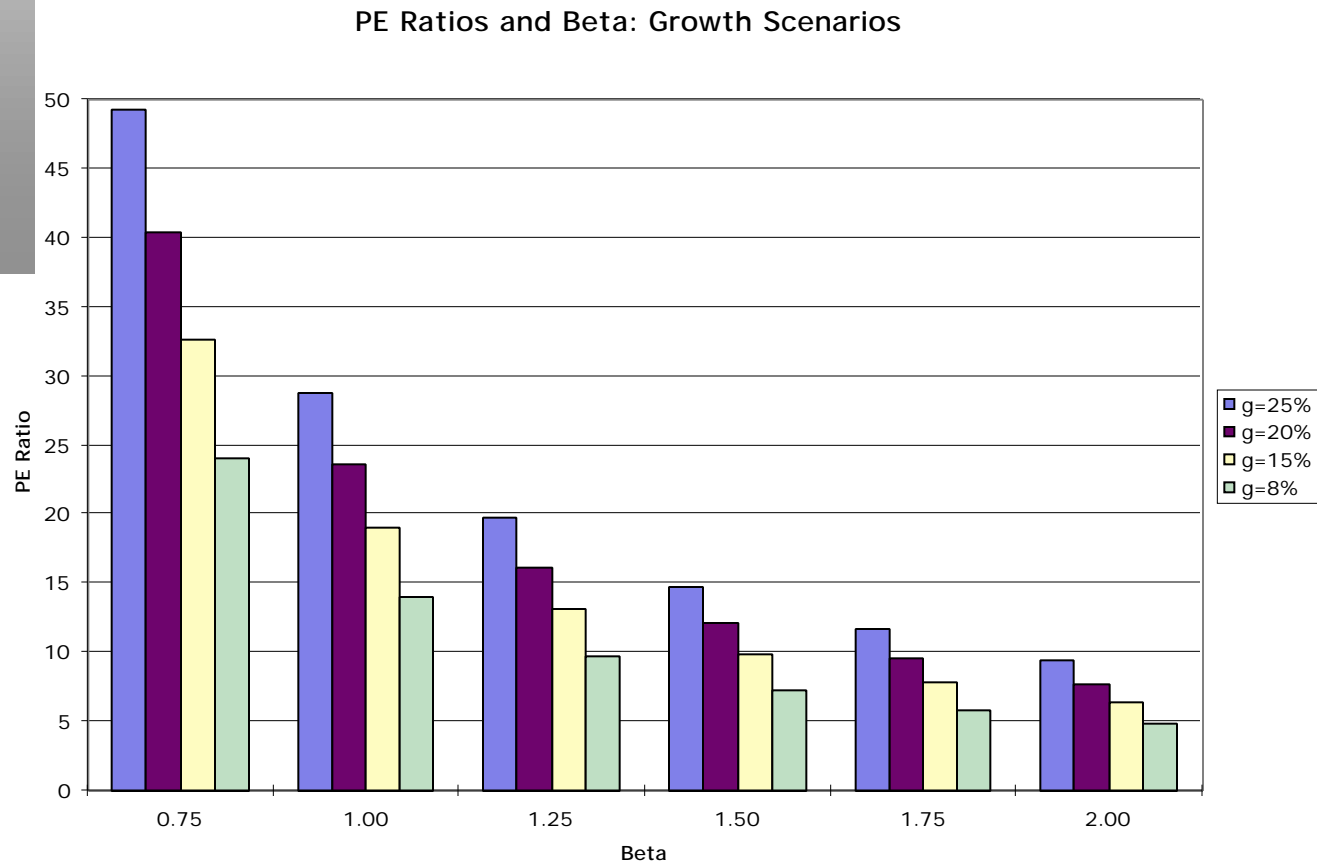


PE Ratios and Length of High Growth: 25% growth for n years; 8% thereafter



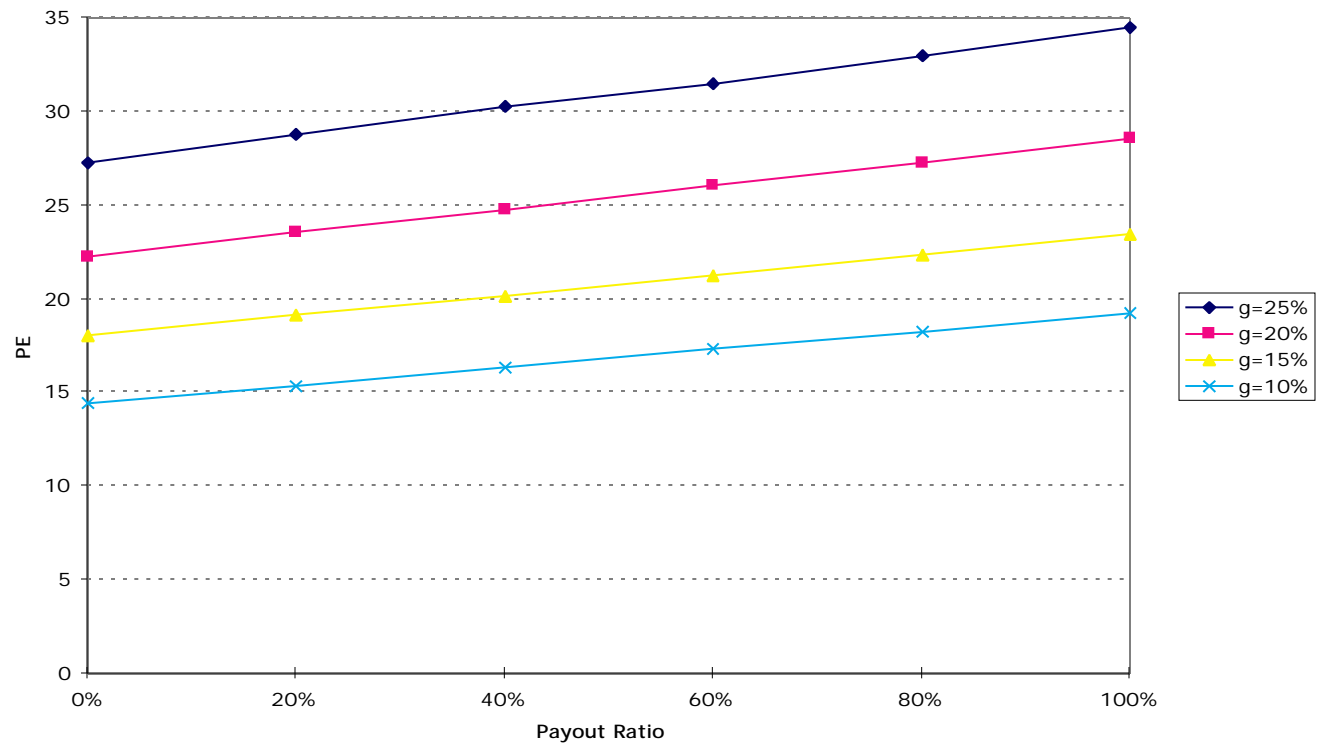
PE and Risk: Effects of Changing Betas on PE Ratio:

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

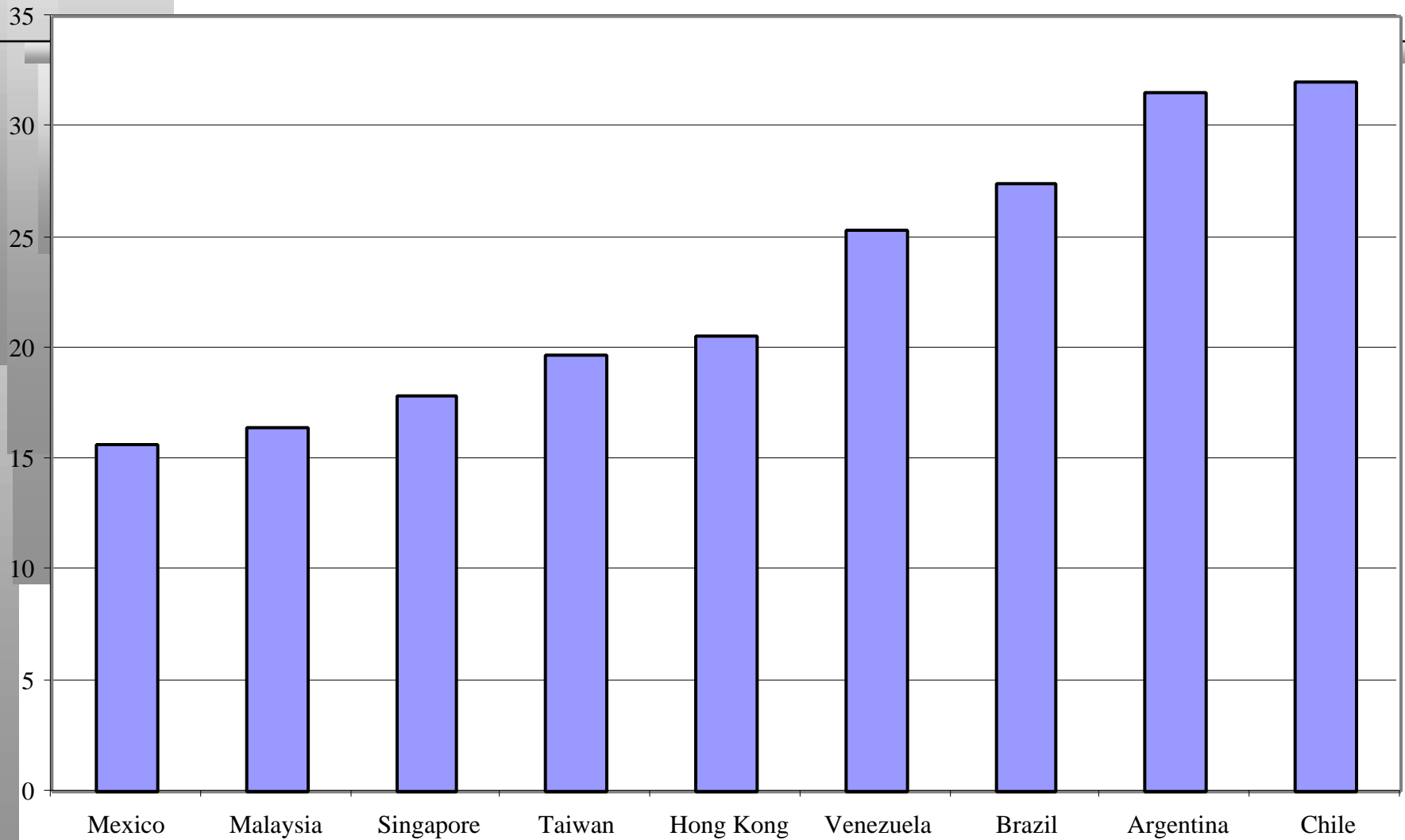


PE and Payout

PE Ratios and Payout Ratios: Growth Scenarios



PE: Emerging Markets



Comparisons across countries

- In July 2000, a market strategist is making the argument that Brazil and Venezuela are cheap relative to Chile, because they have much lower PE ratios. Would you agree?
 - Yes
 - No
- What are some of the factors that may cause one market's PE ratios to be lower than another market's PE?

A Comparison across countries: June 2000

<i>Country</i>	<i>PE</i>	<i>Dividend Yield</i>	<i>2-yr rate</i>	<i>10-yr rate</i>	<i>10yr - 2yr</i>
UK	22.02	2.59%	5.93%	5.85%	-0.08%
Germany	26.33	1.88%	5.06%	5.32%	0.26%
France	29.04	1.34%	5.11%	5.48%	0.37%
Switzerland	19.6	1.42%	3.62%	3.83%	0.21%
Belgium	14.74	2.66%	5.15%	5.70%	0.55%
Italy	28.23	1.76%	5.27%	5.70%	0.43%
Sweden	32.39	1.11%	4.67%	5.26%	0.59%
Netherlands	21.1	2.07%	5.10%	5.47%	0.37%
Australia	21.69	3.12%	6.29%	6.25%	-0.04%
Japan	52.25	0.71%	0.58%	1.85%	1.27%
US	25.14	1.10%	6.05%	5.85%	-0.20%
Canada	26.14	0.99%	5.70%	5.77%	0.07%

Correlations and Regression of PE Ratios

■ Correlations

- Correlation between PE ratio and long term interest rates = -0.733
- Correlation between PE ratio and yield spread = 0.706

■ Regression Results

PE Ratio = 42.62 - 3.61 (10'yr rate) + 8.47 (10-yr - 2 yr rate) $R^2 = 59\%$

Input the interest rates as percent. For instance, the predicted PE ratio for Japan with this regression would be:

PE: Japan = 42.62 - 3.61 (1.85) + 8.47 (1.27) = 46.70

At an actual PE ratio of 52.25, Japanese stocks are slightly overvalued.

Predicted PE Ratios

Country	Actual PE	Predicted PE	Under or Over
UK	22.02	20.83	5.71%
Germany	26.33	25.62	2.76%
France	29.04	25.98	11.80%
Switzerland	19.6	30.58	-35.90%
Belgium	14.74	26.71	-44.81%
Italy	28.23	25.69	9.89%
Sweden	32.39	28.63	13.12%
Netherlands	21.1	26.01	-18.88%
Australia	21.69	19.73	9.96%
Japan	52.25	46.70	11.89%
United States	25.14	19.81	26.88%
Canada	26.14	22.39	16.75%

An Example with Emerging Markets: June 2000

<i>Country</i>	<i>PE Ratio</i>	<i>Interest Rates</i>	<i>GDP Real Growth</i>	<i>Country Risk</i>
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

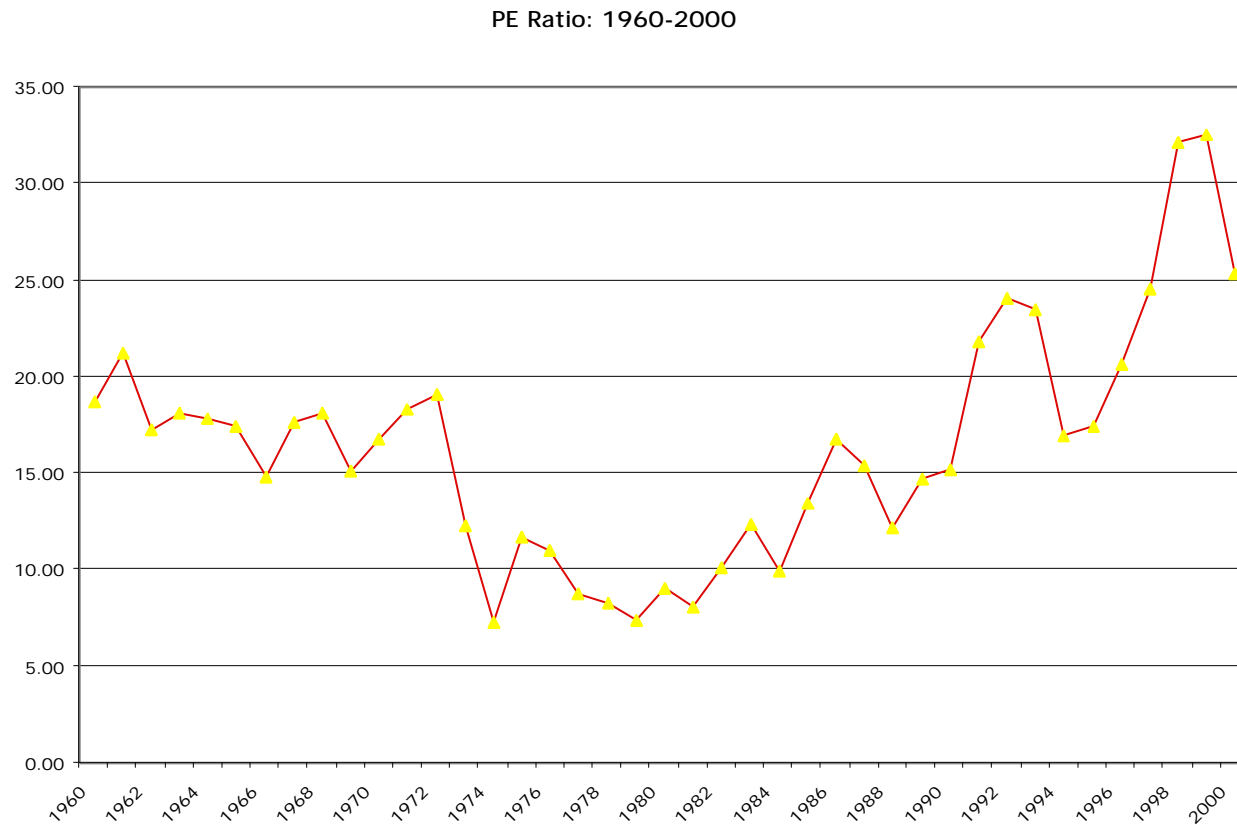
Regression Results

- 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

<i>Country</i>	<i>PE Ratio</i>	<i>Interest Rates</i>	<i>GDP Real Growth</i>	<i>Country Risk</i>	<i>Predicted PE</i>
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

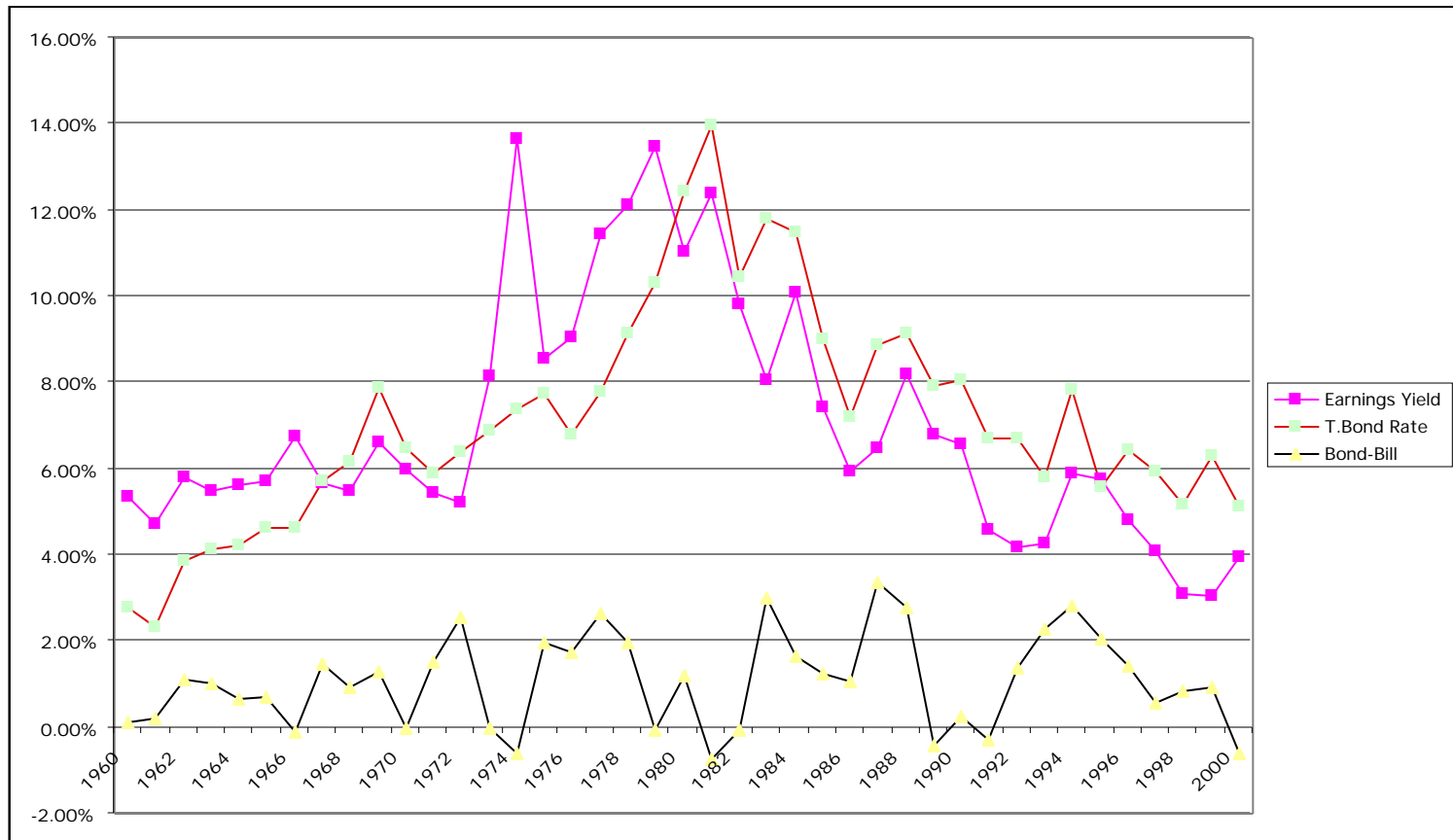
Comparisons of PE across time: PE Ratio for the S&P 500



Is low (high) PE cheap (expensive)?

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

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



Regression Results

- There is a strong positive relationship between E/P ratios and T.Bond rates, as evidenced by the correlation of 0.685 between the two variables.,
- In addition, there is evidence that the term structure also affects the PE ratio.
- In the following regression, using 1960-2000 data, we regress E/P ratios against the level of T.Bond rates and a term structure variable (T.Bond - T.Bill rate)

$$\text{E/P} = 1.88\% + 0.776 \text{ T.Bond Rate} - 0.407 (\text{T.Bond Rate} - \text{T.Bill Rate})$$

(2.84) (6.08) (-2.37)

R squared = 50%

Estimate the E/P Ratio Today

- T. Bond Rate =
- T.Bond Rate - T.Bill Rate =
- Expected E/P Ratio =
- Expected PE Ratio =

Comparing PE ratios across firms

<i>Company Name</i>	<i>Trailing PE</i>	<i>Expected Growth</i>	<i>Standard Dev</i>
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?

Comparing PE Ratios across a Sector

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

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.

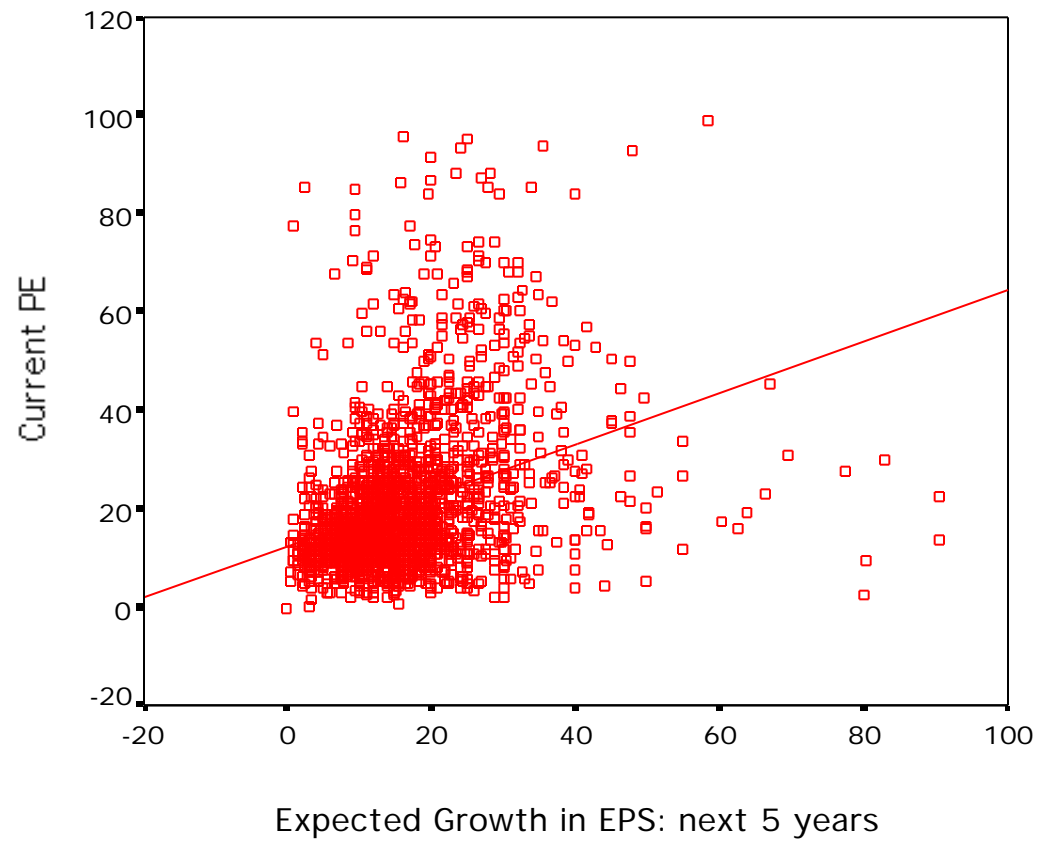
Using comparable firms- Pros and Cons

- The most common approach to estimating the PE ratio for a firm is
 - to choose a group of comparable firms,
 - to calculate the average PE ratio for this group and
 - to subjectively adjust this average for differences between the firm being valued and the comparable firms.
- Problems with this approach.
 - The definition of a 'comparable' firm is essentially a subjective one.
 - The use of other firms in the industry as the control group is often not a solution because firms within the same industry can have very different business mixes and risk and growth profiles.
 - There is also plenty of potential for bias.
 - Even when a legitimate group of comparable firms can be constructed, differences will continue to persist in fundamentals between the firm being valued and this group.

Using the entire crosssection: A regression approach

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

PE versus Growth



PE Ratio: Standard Regression

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.478 ^a	.229	.227	803.9541

a. Predictors: (Constant), Expected Growth in EPS: next 5 y, PAYOUT1, Beta

Coefficients^{a,b}

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	13.090	1.164		11.242	.000
	Beta	-3.392	.908	-.089	-3.737	.000
	PAYOUT1	4.938	1.190	.098	4.150	.000
	Expected Growth in EPS: next 5 y	.880	.040	.527	22.115	.000

a. Dependent Variable: Current PE

b. Weighted Least Squares Regression - Weighted by Market Cap

Second Thoughts?

- Based on this regression, estimate the PE ratio for a firm with no growth, no payout and no risk.

- Is there a problem with your prediction?

PE Regression- No Intercept

Model Summary

Model	R	R Square ^a	Adjusted R Square	Std. Error of the Estimate
1	.912 ^b	.832	.832	833.0224

- a. For regression through the origin (the no-intercept model), R Square measures the proportion of the variability in the dependent variable about the origin explained by regression. This CANNOT be compared to R Square for models which include an intercept.
- b. Predictors: Expected Growth in EPS: next 5 y, PAYOUT1, Beta

Coefficients^{a,b,c}

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	Beta	4.389	.609	.188	7.212	.000
	PAYOUT1	13.299	.962	.189	13.823	.000
	Expected Growth in EPS: next 5 y	1.014	.039	.608	25.786	.000

- a. Dependent Variable: Current PE
- b. Linear Regression through the Origin
- c. 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 y	Beta	Payout Ratio
Current PE	Pearson Correlation	1.000	.342*	.130*	.009
	Sig. (2-tailed)	.	.000	.000	.594
	N	3303	2085	3027	3290
Expected Growth in EPS: next 5 y	Pearson Correlation	.342*	1.000	.397*	-.078*
	Sig. (2-tailed)	.000	.	.000	.000
	N	2085	2675	2393	2143
Beta	Pearson Correlation	.130*	.397*	1.000	-.213*
	Sig. (2-tailed)	.000	.000	.	.000
	N	3027	2393	4534	3114
Payout Ratio	Pearson Correlation	.009	-.078*	-.213*	1.000
	Sig. (2-tailed)	.594	.000	.000	.
	N	3290	2143	3114	3388

** . Correlation is significant at the 0.01 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 1.40 and pays no dividends. Based upon the regression, estimate the predicted PE ratio for Dell.

Predicted PE =

(Work with absolute values in regression - 10 for 10% etc.)

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