
EARNINGS MULTIPLES
Problem 1

A. Payout Ratio = $1.06/\$2.40 = 44.17\%$
 Expected Growth Rate = 6%
 Cost of Equity = $7\% + 1.05 * 5.5\% = 12.775\%$
 P/E Ratio = $0.4417 * 1.06/ (.12775 - .06) = 6.91$

B. The stock is trading at ten times earnings.
 P/E Ratio = 10 = $0.4417 (1+g)/ (.12775-g)$

Solving for g in this equation,

$$g = (1.2775 - 0.4417)/10.4417 = 8.00\%$$

Problem 2

A. Dividend Payout Ratio = Dividend Yield/(1/P/E)
 $= 0.025/(1/16.9) = 0.4225$

Expected Growth Rate

$$= (1+\text{Real Growth Rate}) (1+ \text{Expected Inflation}) - 1$$

$$= 1.035 * 1.025 - 1 = 6.09\%$$

Cost of Equity = $6.95\% + 5.5\% = 12.45\%$

Expected P/E Ratio = Payout * $(1 + g)/(r - g)$
 $= 0.4225 * 1.0609/ (.1245 - .0609) = 7.05$

B. P/E Ratio = 16.9 = $0.4225 (1+g)/ (.1245 - g)$

Solving for g,

$$g = (16.9 * .1245 - 0.4225)/(16.9 + 0.4225) = 9.71\%$$

In fact, this cannot be a stable growth rate.. It has to be valued using a high growth model.

C. Yes. It has to be real growth. If the growth arises because of higher inflation, interest rates will also rise, erasing much of the benefits of higher growth.

Problem 3

A.

	<i>First 5 Years</i>	<i>After Year 5</i>
Dividend Payout Ratio =	55.49%	60.00%
Return On Equity =	20.00%	15.00%

Expected Growth Rate =	8.90%	6.00%
Cost Of Equity =	13.05%	13.05%

$$PE = \frac{0.5549 * (1.0890) * 1 - \frac{(1.0890)^5}{(1.1305)^5}}{(.1305 - .0890)} + \frac{0.6 * (1.089)^5 * (1.06)}{(.1305-.06) (1.1305)^5}$$

$$= 9.97$$

B. P/E Ratio Based Upon Stable Growth (6%; 60% dividend payout)

$$= 0.6 * 1.06 / (.1305 - .06) = 9.02$$

$$\text{Difference Due to High Growth} = 9.97 - 9.02 = 0.95$$

Problem 4

A.
$$PE = \frac{0.10 * (1.15) * 1 - \frac{(1.15)^5}{(1.1388)^5}}{(.1388 - .15)} + \frac{0.5 * (1.15)^5 * (1.06)}{(.1305-.06) (1.1388)^5}$$

$$= 8.41$$

B. Growth Rate from 1983 to 1993 = $(0.78/0.08)^{(1/10)} - 1 = 25.57\%$

$$PE = \frac{0.10 * (1.2557) * 1 - \frac{(1.2557)^5}{(1.1388)^5}}{(.1388 - .2557)} + \frac{0.5 * (1.2557)^5 * (1.06)}{(.1305-.06) (1.1388)^5}$$

$$= 12.94$$

C.
$$PE = \frac{0.10 * (1.10) * 1 - \frac{(1.10)^5}{(1.1388)^5}}{(.1388 - .10)} + \frac{0.5 * (1.10)^5 * (1.06)}{(.1305-.06) (1.1388)^5} = 6.77$$

Problem 5

A. Dividend Payout Ratio = $0.0274 / (1/21.2) = 0.581$

$$\text{Cost of Equity} = 6\% + 5.5\% = 11.5\%$$

Solving for the Implied Growth Rate

$$g = (21.2 * .115 - 0.581) / (21.2 + .581) = 8.53\%$$

$$1+g = (1 + \text{Expected Inflation Rate}) (1 + \text{Real Growth Rate})$$

Solving for Expected Inflation

$$1.0853 = (1 + \text{Expected Inflation rate}) (1.025)$$

$$\text{Expected Inflation Rate} = 1.0853 / 1.025 - 1 = 5.88\%$$

(This assumes that the earnings are in stable growth. The analysis becomes much more complicated if you have a period of high growth)

B. The P/E ratio would go down. For instance, in the formulation above,

$$\text{Dividend Payout Ratio} = 0.581$$

$$\text{Cost of Equity} = 12.5\%$$

$$\text{Expected Growth Rate} = 8.53\%$$

The new P/E ratio would be

$$P/E = 0.581 (1.0853) / (.125 - .0853) = 15.88$$

C. Not necessarily. If the increase in expected real growth is greater than the increase in interest rates, P/E ratios may go up as interest rates go up.

Problem 6

A. Average P/E Ratio for the Industry = 13.2

$$\text{Median P/E Ratio for the Industry} = 12.25$$

If the firms in this group are homogeneous, the average P/E ratio provides an estimate of how much the market values earnings in this sector, given the expected growth potential and the risk in the sector.

The average P/E ratio can be skewed by extreme values (usually high, since P/E cannot be less than zero). The median corrects for this by looking at the median firm in the sector.

B. This statement is likely to be true only if

(1) Thiokol has the same growth prospects and risk profile of the typical firm in the industry. It also generates cash flows for disbursement as dividends which are similar to the typical firm in the industry.

(2) Thiokol has higher growth potential and/or lower risk than the typical firm in the industry.

C. The regression of P/E ratios on fundamentals yields the following:

$$P/E = -2.33 + 35.74 \text{ Growth Rate} + 11.97 \text{ Beta} + 2.90 \text{ Payout Ratio}$$

$$R^2 = 0.4068$$

The following table provides predicted P/E ratios for the firms in the group:

	<i>Actual P/E</i>	<i>Predicted P/E</i>	<i>Difference</i>
Boeing	17.30	12.90	4.40
General Dynamics	15.50	17.90	-2.40
GM- Hughes	16.50	13.68	2.82
Grumman	11.40	12.07	-0.67
Lockheed Corp.	10.20	12.31	-2.11
Logicon	12.40	13.17	-0.77
Loral Corporation	13.30	13.21	0.09
Martin Marietta	11.00	11.34	-0.34
McDonnell Doug.	22.60	17.15	5.45
Northrop	9.50	14.82	-5.32
Raytheon	12.10	10.85	1.25
Rockwell	13.90	14.85	-0.95
Thiokol	8.70	11.44	-2.74
United Industrial	10.40	9.11	1.29

Again, negative numbers indicate that the stock is undervalued.

The problem with a regression like this one is that it has relatively few observations and is likely to be thrown off by a few extreme observations.

Problem 7

A. Expected Growth Rate = 25%

$$\text{Unlevered Beta} = 1.15 / (1 + 0.6 * 0.25) = 1.00$$

$$\text{FCFE} = \text{Net Income} + \text{Depreciation} - \text{Capital Spending} = 10 + 5 - 12 = 3$$

$$\text{Estimated Dividend Payout Ratio} = 3 / 10 = 30\%$$

$$\text{P/E} = 18.69 + 0.0695 * 25 - 0.5082 (1.00) - 0.4262 * 0.30 = 19.79$$

B.

1. The cross-sectional relationship between P/E ratio and the fundamentals may change over time.
2. The market might be overvaluing all stocks.
3. Some of the fundamentals, such as growth rate or beta, might be estimated with error.
4. We are assuming that private companies are valued like publicly traded stocks. (In other words, we are not allowing for diversification and illiquidity discounts)