

Homework 4 – Suggested Answers

Problem 1.

- 1) All else the same, a higher plowback ratio means a(n) ... P/E ratio
- A) higher
 - B) lower
 - C) unchanged
 - D) unable to determine

Correct answer is D. Notice that $P/E = (1-b)/(k-ROE*b)$. Say, we increase the value of plowback ratio b . Then, the numerator of formula for P/E will go down as well as the denominator will. If you are not convinced about these, plug some hypothetical numbers in both and see what happens. Since both numerator and denominator will go down we cannot really say what happens with the P/E ratio.

- 2) P/E ratios tend to be ... when inflation is ...
- A) higher, higher
 - B) lower, lower
 - C) higher, lower
 - D) they are unrelated

Correct answer is C. When the inflation goes up then the earnings in the economy in period 1 usually are going up relative to the prices in period 0. Therefore, the value of P/E ratio will decline.

- 3) An underpriced stock provides an expected return, which is ... the required return based on the capital asset pricing model (CAPM).
- A) less than
 - B) equal to
 - C) greater than
 - D) greater than or equal to

Correct answer C. If the stock is underpriced, it means, using CAPM jargon, that its alpha is positive. In this situation, it means that the difference between the expected return on our stock is higher than the own implied by the asset pricing model. Stated differently, people expect that the stock's overall situation is better than what all other players in the economy believe.

- 4) You wish to earn a return of 10% on each of two stocks, A and B. Each of the stocks is expected to pay a dividend of \$4 in the upcoming year. The expected growth rate of dividends is 6% for stock A and 5% for stock B. Using the constant growth DDM, the intrinsic value of stock A ...
- A) will be higher than the intrinsic value of stock B
 - B) will be the same as the intrinsic value of stock B
 - C) will be less than the intrinsic value of stock B
 - D) more information is necessary to answer this question

Correct answer A. Notice that the only information, which distinguishes stock A from stock B is the growth in dividends (earnings). We know that the $IV = D1/(k-g)$ using a constant growth DDM. Consequently, it must be the case that if the value of g increases the denominator of the IV equation decreases and hence, the IV value increases. Since A has a higher value of g it means that its IV value will be higher than the value of IV for B.

- 5) You are considering acquiring a common share of R&A Shopping Center Corporation that you would like to hold for one year. You expect to receive both \$1.25 in dividends and \$35 from the sale of the share at the end of the year. The maximum price you would pay for a share today is ... if you wanted to earn a 12% return.
- A) \$31.25
 - B) \$32.37
 - C) \$38.47
 - D) \$41.32

Correct answer B. In order to answer this question we have to realize that we have to use a formula for the holding period value of the stock. In our case since we sell the stock in a year this value will be equal to $IV = (D_1 + P_1)/(1+k)$. Consequently, $IV = (35 + 1.25)/(1 + 0.12) = \32.37 . Notice that an investor who believes in her calculations would not pay more than the intrinsic value of this stock. Hence, the maximum price she would pay today is the intrinsic value of the stock.

- 6) The market capitalization rate on the stock of K&O Wholesale Company is 10%. Its expected ROE is 12% and its expected EPS is \$5.00. If the firm's plowback ratio is 40%, its P/E ratio will be ...
- A) 8.33
 - B) 11.54
 - C) 19.23
 - D) 50.00

Correct answer B. Looking at the data given in the question we can apply the constant growth DDM model to calculate the P/E ratio. It is given by the equation $P/E = (1-b)/(k-g)$, where $g = ROE \cdot b$. In this particular question, $k=0.1$, $ROE=0.12$, $b=0.4$. Thus, $g = 0.12 \cdot 0.4 = 0.048$. Finally, plugging the numbers into equation above we obtain:
 $P/E = (1-0.4)/(0.1-0.048) = 0.6/0.052 = 11.54$.

- 7) C&N Trading Company is expected to have EPS in the upcoming year of \$6.00. The expected ROE is 18.0%. An appropriate required return on the stock is 14%. If the firm has a plowback ratio of 60%, its growth rate of dividends should be ...
- A) 2.5%
 - B) 4.0%
 - C) 8.4%
 - D) 10.8%

Correct answer D. I intentionally included lots of redundant information in this question. The important thing to realize is that the growth rate will be equal to $ROE \cdot b$. Both of them are given in the question. Therefore, $g = 0.18 \cdot 0.6 = 0.108 = 10.8\%$

- 8) Sauder Enterprises is expected to have EPS (Earnings per share) in the upcoming year of \$6.00. The expected ROE is 18.0%. An appropriate required return on the stock is 14%. If the firm has a plowback ratio of 70%, its intrinsic value should be ...
- A) \$20.93
 - B) \$69.77
 - C) \$128.57
 - D) \$150.00

Correct answer C. Let's assume that constant growth DDM is valid. Therefore, the intrinsic value of DE would be equal to $IV = D_1/(k-g)$. The question specifies the amount of expected earnings E_1 and the plowback ratio. Hence, we can obtain the dividend in period 1 as $D_1 = E_1 \cdot (1-b) = \$6 \cdot 0.3 = \$1.8$. We also know $k=14\%$, but we do not know g . This can be obtained using the

formula $g = ROE \cdot b = 18\% \cdot 0.7 = 12.6\%$. Finally, plugging all these into the equation for IV we get $IV = \$1.8 / (14\% - 12.6\%) = \128.57

- 9) Moon Microsystems is expected to pay a dividend of \$3.36 in the upcoming year. Dividends are expected to grow at 8% per year. The riskless rate of return is 4% and the expected return on the market portfolio is 14%. Investors use the CAPM to compute the market capitalization rate, and the constant growth DDM to determine the value of the stock. The stock's current price is \$84.00. Using the constant growth DDM, the market capitalization rate is ...
- A) 9%
 - B) 12%
 - C) 14%
 - D) 18%

Correct answer B. In solving this problem we implicitly assume that the current price is equal to intrinsic value of the stock. Otherwise, it would be hard to answer the problem since we do not have any information about the beta of MM. We also assume constant growth DDM. Using formula for the IV for this model we get:

$IV = D1 / (k - g)$. We know that $IV = \$84.00$, and $g = 8\%$. Consequently, the problem can be really reduced to solving for k the equation $84 = 3.36 / (k - 8\%)$. We have $84 \cdot (k - 8\%) = 3.36$ or $k - 8\% = 4\%$. Hence, $k = 4\% + 8\% = 12\%$.

- 10) L&S, Inc. has expected earnings of \$3 per share for the next year. The firm's ROE is 20% and its earnings retention ratio is 70%. If the firm's market capitalization rate is 15%, what is the present value of its growth opportunities?
- A) \$20
 - B) \$70
 - C) \$90
 - D) \$115

Correct answer B. PVGO is calculated as a difference between the intrinsic value using constant growth model and the no growth component. Using mathematical notation, we have:

$PVGO = D1 / (k - g) - E1 / k$. In this question $D1 = 3 \cdot (1 - 70\%) = 0.9$, $k = 15\%$, $g = ROE \cdot b = 0.2 \cdot 0.7 = 14\%$. Plugging all these numbers into our formula for PVGO we get:
 $PVGO = 0.9 / (15\% - 14\%) - 3 / 15\% = \$90 - \$20 = \70

- 11) Smart Investors, Inc., is expected to pay a dividend of \$4.20 in the upcoming year. Dividends are expected to grow at the rate of 8% per year. The riskless rate of return is 4% and the expected return on the market portfolio is 14%. Investors use the CAPM to compute the market capitalization rate on the stock, and the constant growth DDM to determine the intrinsic value of the stock. The stock is trading in the market today at \$84.00. Using the constant growth DDM and the CAPM, the beta of the stock is ...
- A) 1.4
 - B) 0.9
 - C) 0.8
 - D) 0.5

Correct answer B. First, we assume that the price today is equal to the intrinsic value of the stock. Therefore, we can apply formula $P = D1 / (k - g)$. In this formula we know everything but the value of the required return k . Plugging the numbers we get the following equation with one unknown: $84 = 4.2 / (k - 8\%) \Rightarrow 84k - 6.72 = 4.20 \Rightarrow 84k = 10.92 \Rightarrow k = 0.13 = 13\%$. Knowing the value of required rate of return we can use the CAPM formula to find the value of beta. By CAPM: $k - \text{risk-free} = \text{beta}(r_M - r_f)$. Plugging numbers, we get $13\% - 4\% = \text{beta}(14\% - 4\%)$. Whence: $\text{beta} = 9\% / 10\% = 0.9$.

12) Marcin & Co. is expected to pay a dividend of \$2.00 in the upcoming year. The risk-free rate of return is 6% and the expected return on the market portfolio is 12%. Analysts expect the price of Marcin & Co. shares to be \$29 a year from now. The beta of its stock is 1.20. Using a one-period valuation model, the intrinsic value of Marcin & Co. stock today is ...

- A) \$24.29
- B) \$27.39
- C) \$31.13
- D) \$34.52

Correct answer B. First, we assume that the stock will be sold next period. Therefore, we can use the formula $IV = (D_1 + P_1) / (1 + k)$. In this equation we do not know both IV and k. However, we can obtain k using the CAPM equation $k = r_f + \beta(r_M - r_f) = 6\% + 1.2 \times (12\% - 6\%) = 13.2\%$. Plugging in the numbers into equation for IV, we get $IV = (2 + 29) / (1 + 0.132) = 27.39$

13) M&B Gold Mining Corporation is expected to pay a dividend of \$6 in the upcoming year. Dividends are expected to decline at the rate of 3% per year. The riskless rate of return is 5% and the expected return on the market portfolio is 13%. The stock of M&B Gold Mining Corporation has a beta of -0.50. Using the constant growth DDM, the intrinsic value of the stock is ...

- A) \$50.00
- B) \$150.00
- C) \$200.00
- D) \$400.00

Correct answer B. We can calculate the required rate of return k using CAPM model. $k = 5\% - 0.5(13\% - 5\%) = 1\%$. Now, we can apply the constant growth DDM to find an intrinsic value of this company.

$$IV = D_1 / (k - g) = 6 / (1\% - (-3\%)) = 6 / 4\% = \$150.00$$

14) K&T Corporation produces a good that is very mature in their product life cycles. K&T Corporation is expected to pay a dividend in year 1 of \$3.00, a dividend in year 2 of \$2.00, and a dividend in year 3 of \$1.00. After year 3, dividends are expected to decline at the rate of 2% per year. An appropriate required return for the stock is 8%. Using the multistage DDM, the stock should be worth ... today.

- A) \$13.06
- B) \$13.38
- C) \$18.25
- D) \$18.78

Correct answer A. This problem can be solved using the multistage DDM model. Recognize that we have two significant periods in the life of this asset. First, the period when the stocks pays dividends 3, 2, and 1 and next the time when the company pays the dividend at the decreasing rate of $g = -2\%$. Using the formula for IV in such a case we can write:

$$IV = D_1 / (1 + k) + D_2 / (1 + k)^2 + D_3 / (1 + k)^3 + D_3(1 + g) / (k - g) * (1 + k)^3$$

Substituting the values of D_1 , D_2 , and D_3 , as well as k and g we obtain: $IV = 3 / (1.08) + 2 / 1.08^2 + 1 / 1.08^3 + 1 * (1 - 2\%) / (8\% - (-2\%)) * (1.08)^3 = 3 / 1.08 + 2 / 1.08^2 + 0.98 / (10\% * 1.08^3) = 13.06$.

15) Assuming all other factors remain unchanged, ... would increase a firm's price/earnings ratio.

- A) an increase in the dividend payout ratio
- B) a reduction in investor risk aversion
- C) an expected increase in the level of inflation
- D) an increase in the yield on treasury bills

Correct answer B. First, I explain why this particular answer is correct. If the risk aversion of the investor decreases, we know that for the same amount of risk she requires a lower expected return. Since the expected return is negatively related to the prices of security, it implies that the P/E ratio will go up. The explanations for the dividend payout ratio and inflation have been provided in the questions before. If the yield on the treasury bills goes up it means that their prices go down. Consequently, since we can consider other assets as complementarities to this asset the respective P/E ratio will also go down.

16) Building a zero-investment portfolio will always involve...

- A) a mixture of short and long positions
- B) only short positions
- C) only long positions
- D) Any of the above answers could be correct

Correct answer: A. Zero investment strategy is called differently a self-financing strategy. For that to happen, you need to short something to have proceeds to be used for the long position.

17) Consider the single factor APT. Portfolio A has a beta of 1.3 and an expected return of 21%. Portfolio B has a beta of 0.7 and an expected return of 17%. The risk-free rate of return is 8%. If you wanted to take advantage of an arbitrage opportunity, you should take a short position in portfolio ... and a long position in portfolio

- A) A, A
- B) A, B
- C) B, A
- D) B, B

Correct answer: B. Assume that the factor return is equal to x . Then, alpha of stock A would be equal to $21\% - 8\% - 1.3(x\% - 8\%) = 2.6\% - 1.3x$. Similarly, alpha for stock B would be equal to $17\% - 8\% - 0.7(x\% - 8\%) = 3.4\% - 0.7x$. Note, that alpha of B will be greater than alpha of A for any positive value of x . Hence, stock B dominates stock A. As a result, you should short stock A and long stock B.

Part II.

Problem 2.

Explain why the following statements are true/false/uncertain.

- a. Holding all else constant, a firm will have a higher P/E if its beta is higher.
 - b. P/E will tend to be higher when ROE is higher (assuming plowback is positive)
 - c. P/E will tend to be higher when the plowback rate is higher.
-
- a. False. Higher beta means that the risk of the firm is higher and the discount rate applied to value cash flows is higher. For any expected path of earnings and cash flows the present value of the cash flows, and therefore, the price of the firm will be lower when risk is higher. Thus, the ratio of price to earnings will be lower.
 - b. True. Higher ROE means more valuable growth opportunities.
 - c. Uncertain. The answer will depend on a comparison of the expected rate of return on reinvested earnings versus the market capitalization rate. If the expected rate of return

on the firm's projects is higher than the market capitalization rate, then P/E will increase as the plowback ratio increases.

Problem 3.

Nima & Owen Medical Inc. (NR) is a little-known producer of heart pacemakers. The earnings and dividend growth prospects of the company are disputed by analysts. Trevor is forecasting 5% growth in dividends indefinitely. However, his brother Chris is predicting a 20% growth in dividends, but only for the next three years, after which the growth rate is expected to decline to 4% for the indefinite future. NR dividends per share are currently \$3. The expected market return is equal to 15% and the risk-free rate is 5%. Beta of a similar company is 0.5.

- a) What is the intrinsic value of NR stock according to Trevor?
- b) What is the intrinsic value of NR stock according to Chris?
- c) If both analysts predict a 12% return and the current price is \$55 what action would you recommend to somebody who is following estimates of Trevor or Chris? Is this recommendation entirely consistent? Make any assumptions you wish to justify your answer.
- a) First, we should compute the required rate of return respective for NO. Since NO is probably a new company we can look at beta from similar company as a valid measure of systematic risk. Using this value and CAPM we obtain $k = r_f + \text{beta}(E(r_M) - r_f) = 5\% + 0.5(15\% - 5\%) = 10\%$. Having obtained this information we can calculate IV both for Trevor and Chris.

Trevor: he uses a constant growth DDM with $g = 5\%$. Therefore, $IV = D_0(1+g)/(k-g) = 3 \times 1.05 / (10\% - 5\%) = 3.15 / 5\% = \63

b) Chris: he uses a switching growth model with $g_1 = 20\%$ for 3 periods and $g_2 = -4\%$ into the future. Hence, $IV = D_1/(1+k) + D_2/(1+k)^2 + D_3/(1+k)^3 + D_3(1+g_2)/(k-g_2) \times (1+k)^3$

Where:

$$D_1 = 3 \times (1+0.2) = 3.6$$

$$D_2 = 3 \times (1+0.2)^2 = 4.32$$

$$D_3 = 3 \times (1+0.2)^3 = 5.184$$

$$k = 10\%;$$

Plugging in the numbers we obtain:

$$IV = 3.6/1.1 + 4.32/1.21 + 5.184/1.331 + 5.184 \times 0.96 / (10\% - (-4\%)) \times 1.331 = 37.4451$$

c) In order to answer this question notice that we can use two different methods to provide investment recommendations. First, we can use the comparison between the current market price and the estimated intrinsic value.

For Trevor: $IV = \$63 > \$55 = \text{Market Price}$ therefore he would recommend to buy this stock

For Chris: $IV = \$37.4451 < \$55 = \text{Market price}$ therefore he would recommend to sell this stock

Another method we can use in this problem is the alpha obtained as an output of the CAPM model. Since both have the same expectations and they come up with the same CAPM-implied return equal to 10%, alpha in both cases will be equal to $12\% - 10\% = 2\%$. This indicates that both analysts would provide a buy recommendation. This is however inconsistent with Trevor's previous recommendation of selling the stock.

Problem 4.

Brian, Aaron and Kevin live in a country where by law the stock market can either go up by 25% or fall by 5% each year. Each of them has \$100, with \$60 invested in stocks and \$40 in bonds. Bonds return a guaranteed 5% per year. They all agree that the odds are 50/50 that the stock market will go up in the coming year. Each of them plans to retire in two years on whatever is left from their current investment portfolio. Brian has decided that if the market goes up in the coming year he will sell \$10 of the stocks in her portfolio and put the proceeds into bonds; on the other hand, if the market goes down in the coming year he plans to sell \$10 of the bonds in his portfolio and put the proceeds into stocks. Aaron has decided that whatever happens in the coming year, he will leave his portfolio alone. Kevin has decided that if the market goes up he will sell \$10 of bonds and use the proceeds to buy stocks; on the other hand, if the market goes down he will sell \$10 of stocks and use the proceeds to buy bonds.

a. Which, if any, of these three investors is a contrarian? A momentum trader? A buy-and-hold investor?

Brian is a clear contrarian because he sells the stocks whenever it goes up and buys the stocks when the market goes down.

Aaron follows a buy-and hold strategy because he does not rebalance his portfolio over time.

Kevin is a cheerful momentum fellow who buys the stocks whenever the market goes up and sells them when it goes down.

b. Two years from now, what could happen? How rich would each investor be in each of the associated states of the world?

To establish the wealth of each of the investors in two years it is useful to realize that there are four possibilities how the market can behave over time. UU, UD, DU, DD, where U means the upturn of the market and D denotes the downturn of the market. Knowing that we can track the wealth of each of our brave investors in all four states of the world, knowing that each of them initially started with \$60 in stocks and \$40 in bonds. To illustrate the evolution of wealth I have constructed the following table:

Name	State of the world in period 1	Wealth at the end of period 1	State of the world in period 2	Wealth at the end of period 2
Brian	Upturn	$60 \cdot (1.25) + 40 \cdot (1.05) = 75 + 42 = 117$	Upturn	$(75-10) \cdot 1.25 + (42+10) \cdot 1.05 = 135.85$
			Downturn	$(75-10) \cdot (1-0.05) + (42+10) \cdot 1.05 = 116.35$
	Downturn	$60 \cdot (1-0.05) + 40 \cdot (1.05) = 57 + 42 = 99$	Upturn	$(57+10) \cdot 1.25 + (42-10) \cdot 1.05 = 117.35$

			Downturn	$(57+10)*(1-0.05) + (42-10)*1.05 = 97.25$
Aaron	Upturn	$60*(1.25) + 40*(1.05) = 75 + 42 = 117$	Upturn	$75*1.25 + 42*1.05 = 137.85$
			Downturn	$75*(1-0.05) + 42*1.05 = 115.35$
	Downturn	$60*(1-0.05) + 40*(1.05) = 57 + 42 = 99$	Upturn	$57*1.25 + 42*1.05 = 115.35$
			Downturn	$57*(1-0.05) + 42*1.05 = 98.25$
Kevin	Upturn	$60*(1.25) + 40*(1.05) = 75 + 42 = 117$	Upturn	$(75+10)*1.25 + (42-10)*1.05 = 139.85$
			Downturn	$(75+10)*(1-0.05) + (42-10)*1.05 = 114.35$
	Downturn	$60*(1-0.05) + 40*(1.05) = 57 + 42 = 99$	Upturn	$(57-10)*1.25 + (42+10)*1.05 = 113.35$
			Downturn	$(57-10)*(1-0.05) + (42+10)*1.05 = 99.25$

c. If the stock market follows a random walk, what will be each investor's expected retirement wealth?

If the market follows the random walk then each state of the world is equally probable. Using the data from the table we can calculate the expected wealth of our eager investors:

Brian: Expected wealth = $1/4*135.85 + 1/4*116.35 + 1/4*117.35 + 1/4*97.25 = 116.70$

Aaron: Expected wealth = $1/4*137.85 + 1/4*115.35 + 1/4*115.35 + 1/4*98.25 = 116.70$

Kevin: Expected wealth = $1/4*139.85 + 1/4*114.35 + 1/4*113.35 + 1/4*99.25 = 116.70$

So each of them has the same expected wealth. Is it surprising? Probably not as in the random walk with equal probabilities of events and same wealth we should expect everybody to earn on average the same amount of money.

d. Alexi, a well-known portfolio manager, has appeared as a guest lecturer in an investment class at a local university. She predicts that if the market goes up in the coming year there will be only

a 40% chance that it will go up in the following year, but that if the market goes down in the coming year there will be a 60% chance that it will go up in the following year. If she is right, what will be each investor's expected retirement wealth?

To answer this question we have to understand that what it really means is that the probability of each event changes. In particular, using the same notation as before the probabilities will be:

$$UU = 40\% \quad UD = 60\% \quad DU = 60\% \quad DD = 40\%$$

Given above calculated wealth and the fact that initial Up and Down are equally likely, the expected wealth for each of our investors will be:

$$\text{Brian: } 0.5*(0.4*135.85+0.6*116.35) + 0.5*(0.6*117.35 + 0.4*97.25) = 116.73$$

$$\text{Aaron: } 0.5*(0.4*137.85+0.6*115.35) + 0.5*(0.6*115.35 + 0.4*98.25) = 116.43$$

$$\text{Kevin: } 0.5*(0.4*139.85+0.6*114.35) + 0.5*(0.6*113.35 + 0.4*99.25) = 116.13$$

Now, we can see that after we relax the assumptions of the random walk Brian is a winner of the game at least in the expectations, whereas Kevin has to understand that being a momentum trader in these hard times is not easy.

e. Wendy, who has appeared in the same class, feels that while Alexi may be right in the long term, she is wrong in the shorter term. Instead, Wendy predicts that if the market goes up in the coming year there will be a 60% chance that it will go up in the following year, but that if the market goes down in the coming year there will be only a 40% chance that it will go up in the following year. If she is right, what will be each investor's expected retirement wealth?

Using similar logic but changing respective probabilities we arrive at the following solutions:

$$\text{Brian: } 0.5*(0.6*135.85+0.4*116.35) + 0.5*(0.4*117.35 + 0.6*97.25) = 116.67$$

$$\text{Aaron: } 0.5*(0.6*137.85+0.4*115.35) + 0.5*(0.4*115.35 + 0.6*98.25) = 116.97$$

$$\text{Kevin: } 0.5*(0.6*139.85+0.4*114.35) + 0.5*(0.4*113.35 + 0.6*99.25) = 117.27$$

Now, the situation is reversed and Kevin can enjoy his winning streak while Brian should probably hope for the return of past good days. Aaron is staying cool, he is never the worst in the pool.

f. Is there any possibility that Alexi could be right and that all three investors could agree with her and still plan to act in the manner described? If not, why not? If so, why?

If all three investors are to be better off there must have been the consensus in odds about each of the four possible states of the world. However, Brian is really going against Kevin and thus the odds in favor of the market going up are bad for him but good for Kevin and vice versa for the event that the market is going down. Stated differently momentum and contrarian strategies form a zero sum game and thus there is no room for improvement given the same beliefs of all three investors.

Problem 5. "Practical valuation" (Optional)

Although the models we discussed in class many times depart from reality they are still useful for particular industries and companies. This question asks you the following:

- 1) Go to <http://finance.yahoo.com> or any other data source you may want to consider and find information on five companies Coca Cola, IBM, General Electric, Alcoa and Boeing. Using all the information you will find useful calculate the intrinsic value of each of these companies using constant growth DDM. Hint: lots of information is in the section profile.

All potentially useful information obtained in Yahoo! has been summarized in the following table:

Company	D0	ROE	EPS	b	$g = ROE \cdot b$	beta
Coca Cola (KO)	0.72	33.43%	1.33	0.46	15.37%	0.66
IBM	0.56	38.66%	4.50	0.87	33.63%	1.31
General Electric (GE)	0.64	27.37%	1.38	0.54	14.78%	1.18
Alcoa (AA)	0.60	13.07%	1.65	0.64	8.36%	1.17
Boeing (BO)	0.68	27.56%	3.80	0.82	22.59%	0.78

In order to calculate the required rate of return for each company, I have calculated the average annual market return (using S&P 500 index). It is equal to $R_M = 14\%$. Besides, given the recent data I assume that the risk free rate is equal to the discount rate of the 3-month Treasury bills and equal to $R_f = 2\%$. Hence, we obtain k for each of our companies using CAPM equation:

Coca Cola: $k = 2\% + 0.66 \cdot (14\% - 2\%) = 9.92\%$

IBM: $k = 2\% + 1.31 \cdot (14\% - 2\%) = 17.72\%$

GE: $k = 2\% + 1.18 \cdot (14\% - 2\%) = 16.16\%$

Alcoa: $k = 2\% + 1.17 \cdot (14\% - 2\%) = 16.04\%$

Boeing: $k = 2\% + 0.78 \cdot (14\% - 2\%) = 11.36\%$

From the table, it is clear that at least two companies (IBM & Boeing) have growth rates very far from the required returns, therefore it is impossible to calculate their values using constant growth DDM. For Coca Cola the value of growth is not much higher than k , therefore we can assume that the higher g may be the result of the inflated value of growth as compared to the current situation.

In order to get a better estimate of growth we use the expected growth rate equal to 8.6% published in research section of Yahoo! For two remaining companies - GE and AA the assumptions of DDM are satisfied.

Let me discuss quickly why it makes perfect sense that IBM and Boeing are the types of companies for which we should not apply the DDM model. They both are very much like growth firms with a very high plowback ratio. The fact that they pay dividends does not mean

that they can be considered as pure value companies. Their line of operation: IT and aircraft industry are very much like growth areas, therefore we conclude that our model is not the perfect tool to assess their value.

Given the values obtained for three remaining companies, we can calculate their intrinsic values.

Coca Cola: $IV = D_0 \cdot (1+g)/(k-g) = 0.72 \cdot 1.086/(9.92\% - 8.6\%) = \59.24

General Electric: $IV = D_0 \cdot (1+g)/(k-g) = 0.64 \cdot 1.1478/(16.16\% - 14.78\%) = \53.23

Alcoa: $IV = D_0 \cdot (1+g)/(k-g) = 0.6 \cdot 1.0836/(16.04\% - 8.36\%) = \8.46

- 2) Based on the calculations in 1 provide investment strategies for each of the company. This is a real problem faced by lots of analysts in their work. In forming your advice use three different market prices: one year average, 52wks.-hi and 52wks.-lo. Are your recommendations different depending on the method you use? Which one would you prefer to use to advise your client and why?

For three of these companies we find the following prices:

	Hi	Lo	Average (recent)
Coca Cola:	\$63.37	\$42.37	\$48.88
General Electric	\$56.19	\$28.50	\$37.96
Alcoa	\$45.71	\$25.87	\$33.26

Clearly, AA is overpriced to its intrinsic value compared to all three possible prices. However, the fundamental values for GE and KO are very close to their hi market prices. Given that the prices now are much below these values (especially for GE), we can consider both companies as good buys if we assume that our model is a close approximation of reality.

- 3) Using all information you have, calculate No-growth component and PVGO for each of the companies? Does this information affect your recommendations? Provide justification.

$PVGO = IV - E_1/k$

Coca Cola: $PVGO = 59.24 - 1.33/9.92\% = 59.24 - 13.31 = \45.93

General Electric: $53.23 - 1.38/16.16\% = \$44.70$

Alcoa: $8.46 - 1.65/16.04\% = 8.46 - 10.29 = -\1.83

Provided, that positive PVGO signals a good sign for the future we can observe that our recommendations would not change. Again, KO and GE are good buys with high positive PVGO, whereas AA has a negative PVGO and thus does not seem to be a good buy.

- 4) Do you think that the valuation in this question is far from the real value of the company? Give your justification.

In general, people tend to believe that constant growth DDM is a good model to price value companies with relatively high dividend payout ratios. Those are usually companies coming from stable industries (in our case GE, AA and KO) while it is probably not the best tool to find the value of the companies from growth industries (BE and IBM). This feature has been perfectly reflected in our valuation exercise.