Name: _____

Finance II (441) Professors Matsa

Corporate Finance Midterm: Practice Exam C

1) Time limit. You have 1 hour and 30 minutes to complete the exam.

2) The exam is closed book and closed notes. You may not use any outside material. You may use a calculator or a blank excel spreadsheet. The last page of the exam contains a list of formulas taken from my lectures and the textbook. These formulas may or may not be useful for solving the exam.

3) You should have 8 numbered pages. Point totals for each question are specified in parentheses. There are 120 total points.

4) Circle your numerical answers. This makes it easier for me to find them. Show your work. If you get stuck on the math, tell me what the correct answer should be based on your intuition. Incorrect numerical answers based on the correct logic will receive partial credit.

5) As always, I expect you to abide by the honor code. I trust that no one will give or receive assistance which gives them an unfair advantage over other students. You may not speak about the exam to anyone who has not yet completed it.

6) The characters and events depicted in this exam are fictitious. Any similarity to actual persons or firms, living or dead, is purely coincidental.

I acknowledge and accept the Honor Code and the restrictions outlined above.

_____

(signature)

Permission to Return Exam in Mailbox

The Family Educational Rights and Privacy Act (FERPA) is intended to protect students from the unauthorized disclosure of their personal information. One aspect of the law would require that graded assignments be either handed out directly to students or be placed in sealed envelopes before placing in mailboxes.

In order to facilitate a quicker turnaround, this release gives permission for this exam to be returned directly to my mailbox in the Jacobs Center.

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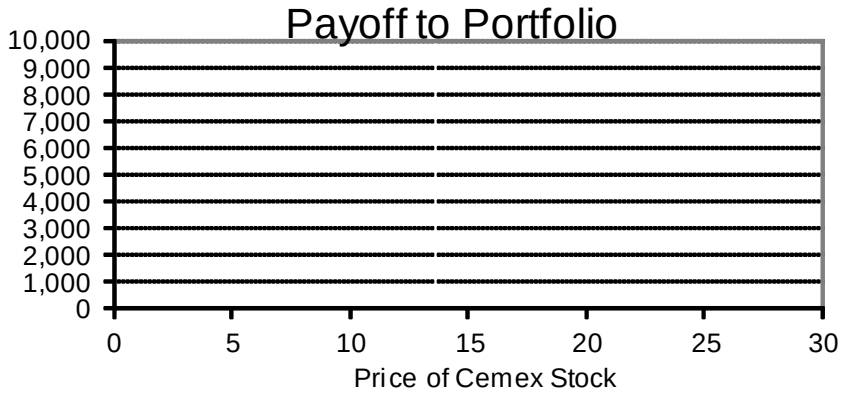
(signature)

Midterm Exam

Question	Score
1 (45)	
2 (15)	
3 (45)	
4 (15)	
Total (120)	

1) Financial options. Round your answers to one decimal place. The current risk-free rate is 2%.

A) Your financial advisor is very positive on Cemex as their sales and earnings seem to be recovering (although more so in South America than Europe). Cemex's β is 1.2 and their current stock price is 9.42 pesos. She has recommended you purchase 500 shares of Cemex and sell 400 two-year call options with a strike price of 12.5 pesos. Draw the gross payoff diagram for this portfolio as a function of Cemex's stock price in two years (e.g. February, 2014). Cemex does not pay a dividend. Make sure your diagram is well labeled. (15)



B) What, if anything, can you say about the β of your investment (graphed in 1-A)? Explain as completely as possible. (10)

C) One of CEMEX's major competitors Holcim just announced they are expanding the variety of sizes of ready-mix concrete they are going to offer. Although the announcement did not move CEMEX's stock price (it is still 9.42), uncertainty about future market share and uncertainty about the future stock price has gone up according to Homero Gonzales, CEMEX's Director of Market Development (and a Kellogg alum). What effect will this have on the value of your portfolio? Explain completely. (10)

D) If Cemex stock price rises by 30% over the next two years (e.g. between now and February 2014) will the return of your portfolio (payoff graphed in 1-A) be better or worse than the return from owning 100 shares of Cemex stock? Explain completely. Hint: Compare the percent return. (10)

2) Short Discussion Questions

A) In the oil drilling simulation (Homework 3), you had to decide whether the value of the land was greater than the purchase price of the land. Increases in the uncertainty about the probability of success, lowers the value of the land. True, False, or Uncertain. Explain completely. (10)

B) Bessimer Corp., a large publicly traded company which was all equity, has just sold its first debt issue. If the debt is risk-free, the debt issue does not effect the riskiness of the equity. True, False, or Uncertain. Explain completely. (5)

3) GAP Inc. is a specialty retailer of clothing, accessories, and personal care products under the brands Gap, Banana Republic, Old Navy, Piperlime, and Athleta. Their income statement (on the left) and balance sheet (on the right) for the past year (2011) and pro-forma numbers (2012) are reported below. All numbers are in millions of dollars. GAP's cost of debt is 10% and their corporate tax rate is 25%. Don't calculate more numbers than necessary.

	Year ending 12/31/2011	Year ending 12/31/2012
Revenues	16,251	16,365
CGS	10,086	10,033
SGA	3,938	3,870
Depreciation	369	400
EBIT	1,858	2,062
Interest	0	477
Pre-tax Inc	1,858	1,585
Taxes	465	396
Net Income	1,393	1,189

	12/31/2011	12/31/2012
Cash	2,425	2,235
AR	227	229
Inventory	1,715	1,856
Current Assets	4,367	4,320
PPE	3,197	3,351
Goodwill	693	1,144
Total Assets	8,257	8,815
AP	1,235	1,099
Short Term Debt	1,275	850
Current Liabilities	2,510	1,949
Debt (long term)	3,497	3,497
Equity		
Total Liabilities	8,257	8,815

A) Are the level of accounts receivable reasonable for GAP? Explain. (5)

B) How much debt did the GAP have on January 2, 2011? Explain briefly. (5)

C) What is the pro-forma cash flow to assets in 2012? This is the cash generated by the assets and which could be paid out to the capital markets (if positive) or which would need to be financed (if negative). GAP's customers pay with credit cards, debit cards, and cash. Assume that 60% of GAP's cash is physically in its cash registers at one of GAP's 3,100 company-operated stores and the other 40% is in the bank. Explain completely. (15)

D) How much is the dividend expected to be in 2012 and how is GAP funding it? Assume no equity will be issued or repurchased during 2012. Explain completely. (10)

E) GAP has announced a quarterly dividend of $0.60 per share to be paid on February 15. The ex-dividend day is this Friday. You are planning to sell your stock. You purchased it two years ago for $15.09/share. Your private wealth manager says she expects the stock price to fall by $0.50 between Thursday night and Friday morning. Should you sell your stock on Thursday? Explain completely. Assume the current stock price is $18.93. (10)

4) Fixed Income and Bond Returns. The historic returns on US government bonds of various maturities are reported in the following table.

Table: Average Returns on U.S. Government Bonds

Maturity	1 year	2 year	3 year	5 year	10 year	20 year	30 year
Average Return	7.46%	7.75%	7.95%	8.19%	8.48%	8.69%	8.65%

A) The current yield on one-year government bonds (T-bills) is 0.21%. The current yield on 5-year government bonds is 0.78% and the yield on 10-year government bonds is 1.30%. You can purchase the 5-year government bond, collect the interest, and sell it in one year. Alternatively, you could purchase the 1-year T-bill. Which investment strategy has a greater expected return? Explain completely. Assume you have no inside information on the future direction of interest rates. (10)

B) Instead of selling the five-year government bond after one year, you could hold it to maturity. Would the annual return you expect to earn over the next five years be greater or less than the expected return from holding the five-year government bond for only one year? Explain completely. (5)

Facts and Formulas

Value of a growing perpetuity:

$$V_{\text{cashflows}} = \sum_{t=1}^{\infty} \frac{C_1(1+g)^{t-1}}{(1+r)^t} = \frac{C_1}{r-g}$$

Value of a growing annuity:

$$V_{\text{cashflows}} = \sum_{t=1}^{N} \frac{C_1(1+g)^{t-1}}{(1+r)^t} = \frac{C_1}{r-g}\left(1-\left(\frac{1+g}{1+r}\right)^N\right)$$

Asset β:

If Assets = Debt + Equity, then

$$\beta_{\text{Assets}} = \beta_{\text{Debt}} \frac{\text{Debt}}{\text{Debt+ Equity}} + \beta_{\text{Equity}} \frac{\text{Equity}}{\text{Debt+ Equity}}$$

Free Cash Flow to Assets:

FCF = Revenue – Costs – Depreciation – Taxes
+ Depreciation – Capital Expenditures – ΔNWC
– ΔOther Long-Term Assets + ΔOther Long-Term Liabilities

Capital Asset Pricing Model:

$$r_A = r_{\text{risk free}} + \beta_A \, \text{E}[\, r_{\text{market}} - r_{\text{risk free}} \,] + \varepsilon$$

$$Var[r_A] = 0 + \beta_A^2 Var[r_{market}] + Var[\varepsilon]$$

$$\text{E}[\, r_A \,] = r_{\text{risk free}} + \beta_A \, \text{E}[\, r_{\text{market}} - r_{\text{risk free}} \,]$$

$$\text{E}[\, r_{\text{market}} - r_{\text{risk free}} \,] = 8.0$$

Payoff to a call option:

$$\text{Payoff} = \text{Max}\,\{\,0\,,\, S_t - X\,\}$$

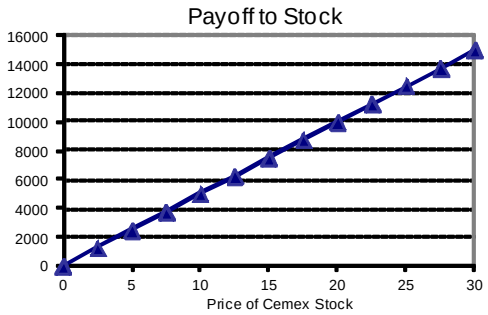
Payoff to a put option:

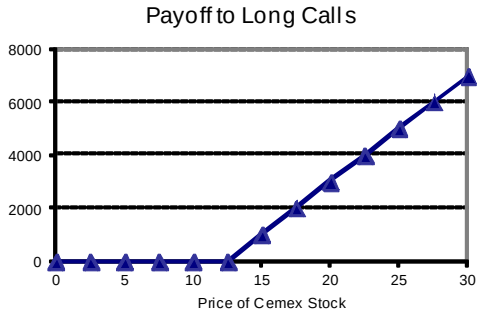
$$\text{Payoff} = \text{Max}\,\{\,0\,,\, X - S_t\,\}$$

Solutions to Corporate Finance Midterm: Practice Exam C

1) Option Payoffs.

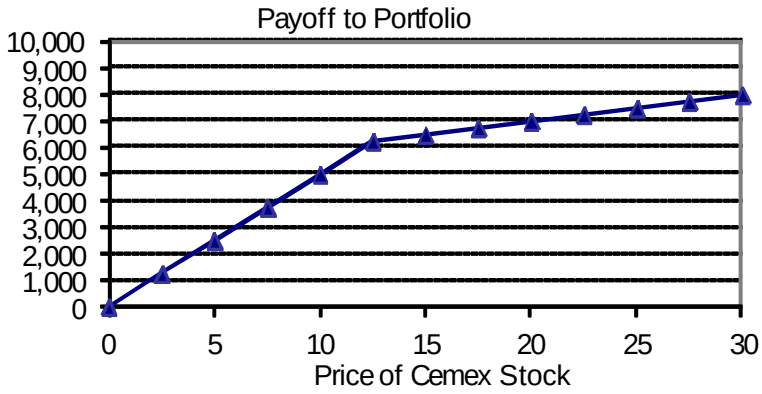
A) The first step is to draw the payoff diagrams for the individual parts of the portfolio: long 500 shares of Cemex stock and short 400 call options on Cemex stock with a strike price of 12.50. Draw the payoff diagram for long 400 call options and then subtract this payoff from the stock payoff. You also could have drawn the payoff diagram for short 400 call options and then added the payoff to the stock payoff.





In the stock diagram (left), the payoff is a straight line with a slope of 500. Thus as the stock price rises from 0 to 10, the payoff rises from 0 to 5,000. The payoff for long call options is zero until the stock price reaches 12.5 (options are out of the money). Then the slope is 400 (for long a call). The payoff rises by 4,000 as the stock price rises from 12.5 to 22.5 (ten peso change in the stock price). If the stock price rises to 30, the payoff to long 400 call options is 7,000 [400* (30-12.5)].

Now to put the payoff diagrams together. When the stock price is below 30, the payoff to the call options is zero. Thus, the payoff to our portfolio is just the payoff to the 500 shares of stock. Thus the value of the portfolio rises from 0 (when the stock price is zero) to 6,250 (when the stock price is 12.50). When the stock price rises above 12.50, the payoff to the call options becomes relevant. Now every 1 peso rise in the stock price, we make 500 on our stock (we own 500 shares), however, we also lose 400 on the 400 call options we sold. Thus above 12.50, the value of our portfolio rises but by 100 pesos per one peso increase in the stock price. If the stock price is 30, then the payoff to our portfolio would be 8,000 [500 * 30 - 400(30 - 12.5) =500 * 30 - 7,000 = 15,000 - 7,000].



B) The β on your portfolio will be greater than zero and less than 1.2. The β is greater than zero because the payoff on your portfolio will rise and fall with market, since CEMEX stock price rises and falls with the market (its β is positive). The β of your portfolio is less than 1.2 (the β of CEMEX stock), because your portfolio rises less than one for one with CEMEX stock. For stock prices below 12.5, your portfolio is the same as owning 500 shares of CEMEX. For stock prices above 12.5, you have sold off 80% (400/500) of your exposure to CEMEX stock and thus 80% of the market sensitivity. Since the sensitivity of your portfolio to CEMEX stock and thus the market is the same as CEMEX stocks' exposure (below 12.5) or smaller (above 12.5), the β of your portfolio is less than 1.2.

C) The announcement will lower the value of your portfolio. The announcement didn't change the stock price, but it did increase the risk of the stock. Since the risk is market share risk (CEMEX wins and Holcim loses or CEMEX loses and Holcim wins), the risk that increased is idiosyncratic risk. Thus there is no change in the discount rate. The increase in idiosyncratic risk makes the call options worth more. The higher uncertainty makes very high stock prices (e.g. 18) more likely and low stock prices (e.g. 4) are more likely. The higher stock prices (above 12.5) increase the payoff on the call, but lower stock prices (below 12.5) don't lower the payoff on the call. Since the higher volatility increases the expected payoff on the call, the value of the call rises. Since your portfolio is short the calls, the value of your portfolio will fall when this announcement is made.

D) The return on your portfolio will be more than the 30% return on CEMEX stock (your portfolio is better). If CEMEX stock rises by 30% over the next two years, the stock price will be 12.25. The return on holding CEMEX stock is thus 30% (from the equation, you can see that the percent return is the same whether we have one share, 100 shares, or 500 shares).

$$r_{CEMEX\ stock} = \frac{100(12.25)}{100(9.42)} - 1 = \frac{12.25}{9.42} - 1 = 30\% \qquad \textbf{(1)}$$

The return on your portfolio is greater than 30%. The final payoff of your portfolio is the same as the payoff from owning 500 shares, since the 400 options are out of the money (when the stock price is less than12.50). However, the cost of your portfolio is less than the cost of 500 shares. Remember, you are long (paid for) 500 shares of CEMEX and are short (sold and thus were paid for) 400 call options. Without knowing the price of the options, we can't calculate the exact return on your portfolio, but we know it is more than 30%.

$$r_{Portfolio} = \frac{500(12.25)+400(0)}{500(9.42)-400(P_{Call})} - 1 = \frac{(12.25)}{(9.42)-0.8(P_{Call})} - 1 > \frac{(12.25)}{(9.42)} - 1 = 30\% \qquad \textbf{(2)}$$

2) Short Discussion Questions

A) True. Increases in uncertainty over the probability of success lowers the value of the land. The value of the land is greater, the longer it is optimal to drill (e.g. the longer the expected probability of success is greater than the cost of a well divided by the payoff). When the uncertainty is great (think the probability of success is 0 or 100), we learn very quickly and thus it is optimal to stop drilling after very few failures. In the extreme case (0 or 100), we drill only once. If the uncertainty is smaller, the

expected probability of success falls more slowly. Drilling subsequent oil wells (the 2nd, the 3rd, the 4th, etc) are still positive NPV. Since these additional projects (e.g. the second well) add to the value of the land, it is worth more the less uncertain the probability of success. This is the rare case where learning slowly is better.

B) False. Both the systematic and the idiosyncratic risk of Bessimer's equity will rise when their leverage increases. This is true if the debt is risky (the debt holders bear on some of the risk of the firm) or the debt is risk-free (the debt holders bear none of the risk of the firm). In the case of risk-free debt, the equity holders still bear all of the risk of the firm' assets, but now the risk is concentrated on a smaller equity base. The variance of equity returns and the β of equity will both rise.[1]

3) Gap Cash Flows

A) GAP's accounts receivable are about 1.4% of their sales. Converting this number into days receivable (multiply by 365), we see that GAP collects its accounts receivables in about 5 days. Some of their customers pay with cash and the rest pay with credit cards and debit cards. So a low number for days receivable makes sense given some payments are in cash (zero days receivable) as long as they receive their funds from the credit cards companies relatively quickly.[2]

B) GAP had no debt on January 2, 2011. Since they paid no interest at the end of 2011, they must have had no debt outstanding during the year. They must have issued 1,275 in short term debt and 3,497 in long term debt on December 31st, 2011.

C) The cash flow to assets is $896M. This is the cash flow (money) you could remove from the firm if you owned all of the assets. If you owned all of the debt (and received the interest and principal repayments) and all of the equity (and received the dividends), you would own the asset and could receive 896. The cash flow to assets is the after-tax profits minus net investment. For Gap, net investment includes net investment in PPE (154 = 3,351 - 3,197), net investment in goodwill (451 = 1,144 - 693), and net investment in NWC (165).[3] Sixty percent of the cash is included in NWC (40% is excluded) because this cash is part of the production process. To close

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[1] You can see this in the example from Lecture 7. When we lever the firm up with risk-free debt ,both the β of equity rose and the standard deviation of equity returns rose. The standard deviation of equity returns rose from about 29% (when the firm was all equity) to 51% (when the firm had 30 of debt). The equity is worth 39.6 this year and will be worth 28 or 68 next year. Thus the realized return will be about -29% or +72% which gives us a standard deviation of equity returns of about 51%.

[2] The numbers imply that the credit card and debit card payments take more than 5 days on average to collect. To know the exact number, we would need to know what fraction of purchases are on cash (which is different than what fraction of cash is in the retail outlets). If 20% of purchases are in cash, then the average collection period on credit cards and debit cards is 6.4 days (5.1/0.8). The actual collection period from credit card receivables varies across the industry and by the credit quality of the firm (more important), but for firms with high credit quality it is relatively quick.

[3] The book value of PPE rises with capital expenditure and falls with depreciation. Thus the increase in the book value of the PPE is the net investment in property plant and equipment. 154 in this case. Given depreciation expense of 400 in 2012, this means GAP is expected to spend 554 on capital expenditure.

The intuition for goodwill (a long term asset) is it is like inventory (long term liabilities like pension liabilities would have the same intuition as accounts payable). Buying inventory and goodwill both consume cash today. When they are "used", their balance value will be reduced and this reduction will be reported as a cost. Ideally, this "cost" will generate sufficient future revenue and thus the investment will have been worthwhile.

a sale, GAP needs fashionable t-shirts, trendy jeans, and dollar bills for making change. This portion of the cash is equivalent to inventory. We can't pay this cash out to capital providers and still run the business.

$$\begin{aligned}\Delta NWC &= \Delta\left(\left[CA - Cash\,in\,bank\right] - \left[CL - STD\right]\right) \\ &= \left[\left(4,320 - 0.4\{2,235\}\right) - \left(1,949 - 850\right)\right] - \left[\left(4,367 - 0.4\{2,425\}\right) - \left(2,510 - 1,235\right)\right] \\ &= 2,327 - 2,162 = 165\end{aligned} \quad \textbf{(3)}$$

Thus cash flow to assets is earnings before interest and taxes minus taxes minus net investment. We do not subtract off interest because this is part of cash flow to debt.[4]

$$\begin{aligned}CF_{Asset} &= EBIT - Taxes \\ &\quad - \left(Capital\,Expenditure - Depreciation\right) - Increase\,in\,Goodwill - Increase\,NWC \\ &= 2,062 - 396 - 154 - 451 - 165 = 896\end{aligned} \quad \textbf{(4)}$$

D) GAP is funding their \$70M dividend from cash. The first step is to figure out how much the dividend is expected to be. Shareholders should expect a dividend of \$70M.[5] We start with the cash flow to assets (cash generated by the business) and subtract off the cash flow to debt. Cash flow to debt is interest paid plus net principal payments (principal payments minus debt issuances).

$$\begin{aligned}CFD &= Interest + Net\,STD\,payments + Net\,LTD\,payments \\ &= 477 + \left(850 - 1,275\right) + \left(3,497 - 3,497\right) \\ &= 477 + 425 = 902\end{aligned} \quad \textbf{(5)}$$

Cash flow to assets minus cash flow to debt is –\$6M [896-902 = -6]. This would be cash flow to equity (net dividends) if there were no changes in cash. In our example, GAP's surplus cash balances beyond what's needed for operations drop by \$76M [0.40 * (2,235 - 2,425)], so the expected dividend is \$70M. Because the CFA was not sufficient to finance the payment to the capital markets, GAP used \$6M of cash to pay debt holders and \$70M to fund the dividend payment.

E) Whether you should sell your stock on Thursday (the cum-dividend day) or Friday (the ex-dividend day) depends upon your tax rates on dividend income and capital gain income. By holding the stock from Thursday to Friday, you will receive the dividend of 0.60, but you will reduce your capital gain by 0.50. Thus you want to sell on Thursday only if the one day expected return is negative.[6] If the tax rates are the same, then you want to sell your stock on Friday (because 0.60 is greater than 0.50

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[4] Several of the answers commented on the inclusion of the reduction in the tax payment due to Gap paying interest (GAP's taxes would be more than 396 if they did not have any interest expense). The tax savings due to interest payments is a valuable asset whose cash flows accrue to the capital providers. If you own all of the assets (all the debt and all of the equity) you received the cash flow from all of the firm's assets – its operating assets and it interest tax shield asset.

[5] Using the method below (CFA - CFD), you can determine both the amount of the dividend and source of the cash. You could also calculate the amount of the dividend by taking the net income and subtract off the increase in the book value of equity [1,189 - (3,369-2,250) = 70]. From this approach, it isn't clear from where the money is coming.

[6] Technically, you want to sell on Thursday if the one day expected return is less than the daily required rate of return on GAP stock based on the current risk-free rate and its β (about 1.2). These numbers were not given, but the one day expected return is very close to zero.

and so are the after tax amounts). Selling your stock on Thursday will only make sense tax if the capital gains tax rate is sufficiently below the dividend tax rate, so that your after tax profit from holding one more day (Thursday to Friday) is negative.

$$\text{Profit}_{\text{Thur->Fri}} = (1-\tau_{\text{Div}})0.60-(1-\tau_{\text{CG}})0.50<0 \quad \textbf{(6)}$$

You weren't expected to figure out a precise tax rate (I didn't give you any tax rates), but for the purpose of illustration assume your dividend tax rate is 25%. In this case, you would sell on Thursday only if the capital gains tax rate is below 10%.

$$\begin{aligned} &\text{Profit}_{\text{Thur->Fri}} = (1-0.25)0.60-(1-\tau_{\text{CG}})0.50<0 \\ &(1-\tau_{\text{CG}})0.50 > (1-0.25)0.60 = 0.45 \\ &\tau_{\text{CG}} < 1-\frac{0.45}{0.50} = 0.10 = 10\% \end{aligned} \quad \textbf{(7)}$$

4) Bond Returns, Systematic Risk, and Holding Period.

A) The expected return on the five-year bond investment (0.94%) is greater than the expected return on the one-year bond investment(0.21%). The expected return on an investment depends upon the holding period (e.g. the risk-free rate over the holding period) and the systematic risk. Since both investments have a one year holding period, their expected returns will differ only if they have different systematic risk. The risk premium on T-bills (the risk-free investment) is zero. Thus, its expected return is 0.21%. The risk-premium on 5-year government bonds can be estimated using the β on 5-year government bonds (which we don't have) or by using the difference in historic returns (as we did in Lecture 2). Using the information from the question, the risk-premium on 5-year government bonds is 0.73% (i.e., 8.19%-7.46%). Thus the expected return on the five year government bond is 0.94% (i.e., 0.21% + 0.73%). The return on the five year government bond is greater than the return on the one year government bond because it has higher systematic risk (a β greater than zero).

B) The annual expected return would be less if you hold the five year bond for five years as opposed to for one year. The expected return from holding the five year bond over the next year is 0.94% (the answer to A). The expected return from holding the five year bond over the next five years is 0.78% (on an annualized basis). The security (and thus the systematic risk of the bond) is the same, but the holding period is not (one year versus five years). The risk-free benchmark differs when we change the holding period. The risk-free rate which is expected over the next five years is less than the risk-free rate we expect over the next year. Put differently, the market is expecting one year t-bill rates to decline. This is a product of the current slope of the term structure (0.57 = 0.78 - 0.21) being less steep than the historic yield curve (0.73 = 8.19 - 7.46). Another way to look at this is the one-year risk-free rates is 0.21, but the five year risk-free rate is 0.05% (i.e., 0.78% - 0.73%).

If you prefer equations, what are the expected returns on the one year government bond (held for one year) and on the five year government bond held for five years? We can then use the difference in these two expressions to bifurcate the slope of the current term structure in to the risk premium and the difference between the fives and the one year risk-free rate.

$$
\begin{aligned}
\mathrm{E}\left[\text{return}_1\right] &= \text{risk-free}_1 + \text{risk premium}_1 = \text{risk-free}_1 + 0 \\
\mathrm{E}\left[\text{return}_5\right] &= \text{risk-free}_5 + \text{risk premium}_5 \\
\mathrm{E}\left[\text{return}_5\right] - \mathrm{E}\left[\text{return}_1\right] &= \left(\text{risk-free}_5 - \text{risk-free}_1\right) + \text{risk premium}_5 \\
\left(0.78\% - 0.21\%\right) &= \left(0.05\% - 0.21\%\right) + 0.73\% \\
&= 0.57\%
\end{aligned}
\tag{8}
$$