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Spring 1999: Quiz 3

Answer all questions and show necessary work. Please be brief. This is an open books, open notes exam.

1. You note that HK Inc, a manufacturer of well-known brand name office supplies products is planning on going public. GenericOffice, which is a publicly traded firm that manufactures generic office supplies, is trading at a value to sales ratio of 1.5. Assume that both firms have stable long-term growth rates (in operating earnings) of 5%, costs of capital of 10% and sales to capital ratios of 2.0, and that GenericOffice is fairly priced. If HK Inc has an after-tax operating margin that is 5% higher than GenericOffice's margin, estimate the value to sales ratio for HK Inc. (4 points)

2. You are trying to value Broken Hill Inc., a gold mining company, with both developed and undeveloped reserves.

- It is anticipated that the developed reserves of the firm will yield 100,000 ounces of gold for the next 5 years, and that the price of gold will remain at the existing level of \$ 300/oz. Broken Hill Inc. has a cost of capital of 9%.
- In addition, the firm has undeveloped reserves containing 500,000 ounces of gold. The up-front cost of developing these reserves is estimated to be \$ 50 million, in present value terms, and the variable cost of extracting an ounce of gold, once the reserves are developed, is estimated to be \$ 200 an ounce in present value dollars. The firm has the rights to the undeveloped reserves for the next 15 years. The development lag is 1 year, and the annual production is expected to be 40,000 ounces of gold, if the reserves are developed.
- The historical standard deviation in gold prices is 20%, but the expected standard deviation, looking forward, in gold prices is 30%. The treasury bond rate is 6%.

a. Estimate the value of the developed reserves. (1 point)

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b. Estimate the value of the undeveloped reserves, on a discounted cash flow basis (i.e., with no option value assigned to it) (1 point)

c. Estimate the inputs you would have to the Black-Scholes model, to value these undeveloped reserves as an option. (3 points)

S =

K =

t =

σ^2 =

r =

y =

d. Now assume that gold prices drop by \$ 10, but the expected volatility in gold prices increases. Which of the following statements is most likely to describe what will happen to this firm. (1 point)

- The firm will become more valuable, since the volatility has gone up.
- The firm will become less valuable, since it is now a riskier firm.
- The developed reserves will become more valuable, while the undeveloped reserves will become less valuable.
- The developed reserves will become less valuable, while the undeveloped reserves may become less or more valuable.
- The developed reserves will become less valuable, while the undeveloped reserves will become more valuable.

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Spring 2000: Quiz 3: Equity Instruments

Answer all questions and show necessary work. Please be brief. This is an open books, open notes exam.

1. Cool Springs Inc. is a privately owned business that owns a number of small restaurants. The owner of the firm is considering an offer to buy the firm and has asked for your help in evaluating the offer. The income statement for the firm for the most recent year is reported below (in '000s):

Revenues	\$ 5,000
- Operating Expenses	\$ 3,500
EBIT	\$ 1,500
- Interest Expenses	\$ 300
- Taxes	\$ 480
Net Income	\$ 720

The owner did not pay herself a salary last year, but believes that \$ 100,000 would be a reasonable salary for a general manager. The firm is in stable growth, and is expected to grow 5% a year forever (with a 40% reinvestment rate). You estimate the unlevered beta of publicly traded restaurants to be 0.80 and the correlation coefficient with the market to be 50%. The average debt to capital ratio for these firms is 30%, and you believe that Cool Springs will have to operate at close to this average. If the riskfree rate is 6%, the market risk premium is 4% and the cost of debt is 7%, estimate the value of Cool Springs for sale in a private transaction (to an individual who will not be diversified).

2. You are valuing a mining company, with substantial undeveloped reserves. The firm has 100 million shares trading at \$ 25 per share, and \$ 1.5 billion in debt outstanding. The cost of equity for the firm is 12% and the after-tax cost of debt is 5%. If the existing reserves of

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the firm are expected to generate \$ 300 million in after-tax cash flows each year for the next

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10 years, estimate the value being attached to the undeveloped reserves by the market at existing prices. (2 points)

3. You are valuing the equity in a firm with \$ 800 million (face value) in debt with an average duration of 6 years, and assets with an estimated value of \$ 400 million. The standard deviation in asset value is 30%. With these inputs (and a riskless rate of 6%) we obtain the following values (approximately) for d_1 and d_2 .

$$d_1 = - 0.15$$

$$d_2 = - 0.90$$

Estimate the default spread (over and above the riskfree rate) that you would charge for the debt in this firm. (4 points)

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Spring 2002: Equity Instruments and Markets

Answer all questions and show necessary work. Please be brief. This is an open books, open notes exam.

1. You are comparing two firms- BigName Inc. and NoName Inc., both of which are mature and growing at a stable growth rate of 4%. Both firms have revenues of \$ 5 billion, book value of capital invested of \$ 2.5 billion and a cost of capital of 9%. BigName Inc., though, has an after-tax operating margin of 12%, whereas NoName Inc. has an after-tax operating margin of 6%. Estimate the value of BigName Inc.'s brand name. (4 points)

2. You are trying to value Hot Tickets, a private firm that stages concerts for purchase by a private individual (who is not diversified). The firm reported net income of \$ 2.6 million last year on a book value of equity of \$ 10 million. However, you note that this net income was before assessing a salary for the current owners of the business. You estimate that you would have to pay \$ 1 million as salaries to the managers you would have to hire to replace these owners; the firm's tax rate is 40%. Looking at all entertainment companies, you have come up with the following regression:

$$\text{Price to Book Equity} = 0.83 + 11.60 (\text{Return on Equity}) - 0.44 (\text{Beta})$$

(For example, the price to book ratio for a firm with a 10% return on equity and a beta of 0.80 would be $0.83 + 11.60 (.10) - 0.44 (0.80) = 1.64$)

Finally, you estimated the average levered beta of entertainment companies to be 1.10 and the average correlation of these firms with the market is 0.40. (You can assume that the debt to equity ratio of the private firm is similar to the average debt to equity ratio for the industry). Estimate the value of the equity in this firm (prior to any illiquidity discount). (3 points)

3. You are trying to value a young technology company with no existing products and a patent on a technology that may or may not be viable yet. You expect the technology to generate \$ 20 millions in cash flows every year for the next 8 years and your current analysis suggests a net present value (after subtracting out the initial investment) of - \$ 25 million. Your technology firm has been listed for only 1 year but it has call options traded on the Chicago Board of Options - the implied standard deviation² on these options is 15%. You have the exclusive rights to this technology for the next 12 years and the cost of

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capital for the firm is 10%. The treasury bill rate is 2% and the 12-year treasury bond rate is 5%. Estimate the value of the inputs to the option pricing model. (3 points)

² Implied variance is the variance that makes the market value of an option equal to the estimated value from the option pricing model.

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S =

K =

Riskless rate =

Life of the option = t =

Standard deviation =

Dividend Yield (Cost of delay) =

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Fall 2002: Equity Instruments

Answer all questions and show necessary work. Please be brief. This is an open books, open notes exam.

1. You are analyzing Durasteel Products Inc., a steel company. The firm has 150 million shares outstanding, trading at \$ 20 per share, and it reports \$ 2 billion in debt on its consolidated balance sheet. On its consolidated income statement, Durasteel reported \$ 700 million in EBITDA in the most recent year. The firm has two cross holdings:
 - It holds 20% of Coleman Enterprises, a consumer product company, and accounts for these as minority passive investments. Coleman has 50 million shares outstanding, trading at \$ 50 per share and \$ 500 million in debt outstanding. Coleman Enterprises reported \$ 400 million in EBITDA in the most recent year.
 - It holds 60% of Silicon Technologies, a software firm, and accounts for these as majority, active investments (which are consolidated with Durasteel). Silicon Technologies has 80 million shares outstanding, trading at \$ 25 per share, and \$ 500 million in debt outstanding. Silicon Technologies reported EBITDA of \$300 million in the most recent year.

None of the firms have significant cash balances. Estimate the enterprise value to EBITDA multiple of Durasteel Products' steel business. (In other words, clean up the EV to EBITDA multiple for cross holdings). (4 points)

2. You are trying to estimate the value of Sephra Inc., a private company in the chemical business, for sale in a private transaction. The firm reported a loss of \$ 25 million on revenues of \$ 100 million last year. You decide to value the company by forecasting revenues five years from now and applying a multiple to these revenues and come up with the following estimates:
 - Sephra is expected to earn \$ 50 million in net income on \$ 500 million in revenues in year 5.
 - You run a regression of price to sales ratios against net profit margins across chemical companies and come up with the following result:

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$$PS = 1.5 + .20 (\text{Net Margin})$$

(The net margin is entered as an absolute value. For example a net margin is 5%,
would lead to $PS = 1.5 + .20 (5) = 2.5$)

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- The unlevered beta of publicly traded chemical companies is 0.90 and the average correlation with of these firms with the market is 0.40. Sephra has no debt outstanding.
- The riskfree rate is 5% and the market risk premium is 4%.
 - a. Estimate the value of equity for Sephra in year 5. (2 points)
 - b. Estimate the cost of equity for Sephra. (2 points)
 - c. Estimate the value of equity for Sephra today, assuming that there is only a 40% chance that Sephra will survive 5 years and that the equity will be worth nothing if the firm does not survive. (2 points)

Quiz 3: Equity Instruments

Answer all questions and show necessary work. Please be brief. This is an open books, open notes exam.

1. You are trying to value Spears Fragrances, a privately owned business in the business of manufacturing cosmetics for sale. You have collected the following information to do your valuation:
 - The company earned an after-tax margin of 14% on revenues of \$ 2 billion in the most recent year. The income is expected to grow 4% a year in perpetuity.
 - The book value of equity invested in the firm at the beginning of the year was \$1.6 billion and the firm has no debt outstanding. The firm expects to maintain its policy of not borrowing money.
 - The average levered beta of publicly traded cosmetics firms is 1.3; the average market debt to equity ratio of these firms is 50%. The average R-squared across these companies is 16%.
 - The tax rate for publicly traded companies is 40% but the tax rate for private business is only 30%. The riskfree rate is 5% and the market risk premium is 4%.
 - a. If you were valuing Spears for sale in a private transaction to an undiversified individual, estimate the value. (3 points)

 - b. If you were valuing Spears Fragrances for an initial public offering, estimate the value you would attach to the company. (2 points)
 - c. Considering the valuations in the last two parts, which of the following statements about the illiquidity discount would you subscribe to: (1 point)
 - There should be no illiquidity discount in either case (IPO or private valuation)
 - There should be an illiquidity discount in both cases
 - There should be an illiquidity discount in the IPO valuation but not in the private company valuation
 - There should be an illiquidity discount in the private company valuation but not in the IPO valuation

2. You are trying to value a bio-technology company with one commercial product, one patent that has not been commercially developed and a continuing R&D department. The following information pertains to each:
- The commercial product has been licensed to Merck, and Merck has guaranteed payments of \$ 10 million (after taxes) a year for the next 12 years. Merck's pre-tax cost of debt is 5%.
 - The patent is a new drug to treat sleeplessness. If you develop the patent today, you expect to generate \$ 20 million in after-tax cashflows every year for the next 20 years (the remaining life of the patent). It will cost \$100 million to develop the patent.
 - The firm had R&D expenses of \$ 15 million in the most recent year. These R&D expenses are expected to grow 5% a year forever and every dollar spent on R&D is expected to generate \$1.20 in value. (This is true in perpetuity)
 - The cost of capital for the firm (including R&D) is 12%.

The stock is currently trading at \$ 12 per share and there are 20 million shares outstanding and there is no debt outstanding.

- a. Assuming that the market has correctly valued the company's existing commercial product and continuing R&D, estimate the value being attached to the patent by the market. (2 points)
- b. Assume that the company is forced, due to cash flow needs, to develop the patent immediately. Estimate the new value of the company if this occurs. (2 points)

Quiz 3: Equity Instruments

1. You have been asked to assess whether Midway Banks, a small banking company, is being valued correctly by the market. There are 10 million shares outstanding, trading at \$ 20 per share but the book value of equity in the company is \$250 million. The bank is expected to have net income of \$ 20 million next year and this income is expected to grow 3% a year in perpetuity (with the return on equity remaining unchanged at existing levels). The riskfree rate is 5%, the beta for small banks is 1.0 and the market risk premium is 4%.
 - a. Based upon the fundamentals, what price to book ratio should Midway Banks be trading at? (2 points)
 - b. If the market is correct in pricing this stock, estimate the cost of equity that the market is assuming for this bank. (1 point)

2. You are the retail analyst at a major investment bank and have been asked to assess whether DVD Depot, a retailer of videos and DVDs, is a good investment. DVD Depot has 20 million shares trading at \$ 10 a share and \$ 100 million in debt outstanding; the firm has \$ 50 million in cash and marketable securities. The company generated \$ 25 million in pre-tax operating income last year on revenues of \$ 100 million and expects income to grow 20% a year for the next 5 years; the corporate tax rate is 40%. The unlevered beta of publicly traded firms in the sector is 1.20. The average enterprise value/sales ratio for the sector is 3.50, but you have also run a regression of enterprise value/sales ratios against fundamentals in the sector: $EV/Sales = 0.30 + .08 (\text{After-tax operating margin}) - 1.2 (\text{Levered beta}) + .12 (\text{Expected growth rate in next 5 years})$
 The regression was run using absolute values growth rates and margins (a margin of 10% was entered as 10). Based upon this information, how under or over valued is DVD Depot relative to the sector? (2 points)

3. You have been asked to value a privately owned retail company for a sale transaction and have collected the following information on the firm. The firm is expected to earn after-tax operating income of \$1.5 million on revenues of \$ 10 million next year. It expects to earn a return on capital of 10% and income will grow 4% in perpetuity. The firm has no debt outstanding and the average unlevered beta of retail firms is 0.90; however, only 30% of the risk in this sector is market risk. The riskfree rate is 5% and the risk premium is 4%.
- a. Estimate the value of a 25% stake in this company in a private transaction (to an undiversified individual). (1.5 points)
 - b. Now assume that the company can double its return on capital on new investments, if run efficiently, while maintaining the same growth rate. Estimate the value of a 51% stake in a private transaction. (Existing assets will continue to earn a return on capital of 10%) (1.5 points)
 - c. Finally, assume that you can take this company public. If you plan to issue 2 million voting shares and 2 million non-voting shares, estimate the value of each type of share. (You can assume that there is a 20% chance of control changing in this public company) (2 points)

Quiz 3: Equity Instruments

Answer all questions and show necessary work. Please be brief. This is an open books, open notes exam.

1. Gloria Inc. is a publicly traded manufacturer of name brand perfumes that expects to report \$ 150 million in after-tax operating income on \$ 1 billion in revenues next year. Hong Kong Perfumes Inc. makes generic perfumes and is expected to report the same revenues as Gloria Inc next year but is expected to earn only \$75 million in after-tax operating income. Both firms have the same book value of capital of \$600 million today, are in stable growth and expect operating earnings to grow 5% a year in perpetuity. Both firms also have the same cost of capital of 10%.
 - a. Estimate the enterprise value/sales ratio for Gloria Inc., based upon its fundamentals. (2 points)
 - b. Estimate the value of Gloria Inc.'s brand name. (3 points)

2. You have been approached by valuation advice by the owner of CalMex Inc, a private restaurant chain that is planning on going public in the near future. You are provided with the following information on the firm:
 - CalMex is expected to generate \$ 5 million in after-tax operating income on revenues of \$ 100 million next year. The book value of capital invested in the firm is \$ 50 million and after-tax operating income is expected to grow 4% a year in perpetuity.
 - There are significant inefficiencies in the way the restaurant is run, entirely attributable to the owner's management style. If these inefficiencies are removed CalMex could generate \$ 6.5 million in after-tax operating income next year on the same revenues, though expected growth is unlikely to be affected.
 - The unlevered beta of publicly traded restaurants is 1.25, but the average correlation of the sector with the market is only 0.40. The treasury bond rate is

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5% and the market risk premium is 4%.

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- The firm will be all equity financed.
 - a. Estimate the value of the firm with existing management for a public offering. (2 points)
 - b. The owner is planning to issue 2 million voting shares and 3 million non-voting shares in the company. Estimate the value per share for each class if there is only a 20% chance that the management of the firm will change. (3 points)

Quiz 3: Equity Instruments

Answer all questions and show necessary work. Please be brief. This is an open books, open notes exam.

1. Triad Enterprises is a conglomerate that reported \$ 2.5 billion in revenues in the most recent year. The firm is expected to have after-tax operating income of \$250 million next year and expects earnings to grow 4% a year in perpetuity. The firm has \$1.2 billion in debt outstanding and trades at an enterprise value to sales ratio of 1.2. If the firm has a cost of capital of 9% and the market is pricing the firm correctly, estimate the return on capital for the firm in perpetuity. (4 points)

2. You have been asked to compare three banks, based upon their price to book ratios and have collected the following information on the three.

Bank	Price to Book Ratio	Return on Equity
Hibernia Bank	1.25	16%
Bancomer	1.10	14%
North Fork Bank	0.90	12%

- a. Assume that you have run a regression of price to book ratios against returns on equity for all banks and arrived at the following equation

$$\text{Price to Book Ratio} = 0.40 + 0.05 \text{ ROE}$$

(For example, a bank with a return on equity of 10% will have a predicted price to book ratio of $0.40 + 0.05 (10) = 0.90$)

Evaluate how under or over valued each bank is, using the regression. (2 points)

- b. If you are picking an undervalued stock using price to book ratios, you would want to pick a stock with (1 point)
 - i. Low price to book ratio, high ROE, high risk and high growth
 - ii. Low price to book ratio, low ROE, low risk and high growth
 - iii. Low price to book ratio, high ROE, low risk and high growth

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- iv. Low price to book ratio, high ROE, low risk and low growth
- v. High price to book ratio, high ROE, low risk and high growth

3. You have been called in to value a dental practice by an old friend and have been provided with the following information:

- The practice generated pre-tax income of \$ 550,000 last year for the dentist, after meeting all office expenses. The income is expected to grow at 2% in perpetuity, with no reinvestment needed. The tax rate is 40%.
- The dentist currently spends about 20 hours a week doing the accounting and administrative work. You estimate that hiring an external accounting service will cost you \$25,000 annually. As an alternative to private practice, the dentist could work at a dental hospital nearby at an annual salary of \$ 150,000. (Neither was considered when estimating the income above)
- The office is run out of a building owned by the dentist. While no charge was assessed for the building in computing the income, you estimate that renting the space would have cost you \$75,000 a year.
- The unlevered beta of publicly traded medical service companies is 0.80 but only one-third of the risk in these companies is market risk. The dental practice has no debt.

(You can use a riskfree rate of 4.25% and a risk premium of 4%).

- a. Estimate the cost of capital that you would use in valuing this practice. (1 point)
- b. Estimate the value of the practice for sale in a private transaction to another dentist who is not diversified. (2 points)

Quiz 3: Equity Instruments

Answer all questions and show necessary work. Please be brief. This is an open books, open notes exam.

1. You have just run a regression of enterprise value to EBITDA multiples across all steel companies listed globally. Your regression is summarized below:

$$\text{EV/EBITDA} = 2.26 + .1513 (\text{Tax Rate}) + .2156 (\text{Return on Capital}) - .1335 (\text{Percent of Revenues from Emerging Markets})$$

The R squared of the regression is 41%. (All of the values were entered as absolute numbers. For example, a tax rate of 30% would be entered as 30)

 - a. Given the relationship between fundamentals and the EV/EBITDA multiple, which of the independent variables has the wrong sign on the coefficient in the regression above? (1.5 points)
 - i. Tax Rate
 - ii. Return on capital
 - iii. Percent of revenues from emerging market
 - iv. None of the above
 - b. Assume that you are trying to value a Spanish steel company with a tax rate of 38% and a return on capital of 15%, which derives 25% of its revenues from emerging markets. What enterprise value to EBITDA multiple would you expect this firm to trade at, given the regression above? (1.5 points)

2. State News Insurance company has a market value of equity of \$ 1.8 billion and is expected to report net income of 1.5 billion next year. The firm is in stable growth and is expected to grow 4% a year in perpetuity, with a cost of equity of 10%. Assuming that the market is pricing this stock correctly, what return on equity is the market assuming for the company in perpetuity? (3 points)

3. You have been asked to value Tiddly Winks Toys, a privately held firm. In the most recent financial year, Tiddly Winks Toys reported after-tax operating income of \$ 12 million and earned an after-tax return on capital of 12% on invested capital. Tiddly Winks has no debt, but the unlevered beta of publicly traded toy companies is

1.20 (and the average R-squared across these companies is 16%). The riskfree rate is 5% and the risk premium is 4%.

a. Value Tiddly Winks Toys for sale as a private business, run as is. (You can assume that the return on capital will remain unchanged and that the firm will grow 3% a year in perpetuity). (2 points)

b. Assume now that a publicly traded firm is considering bidding for 51% of Tinker Toys. Assuming that the public traded firm continues to fund its operations entirely with equity and that it can increase the after-tax return on capital to 18% on future investments (but not on existing investments), estimate the maximum price that can be paid for 51% of Tiddly Winks Toys. (2 points)

Quiz 3: Equity Instruments

Answer all questions and show necessary work. Please be brief. This is an open books, open notes exam.

1. Univac Inc. is a publicly traded appliance company with 100 million shares outstanding, trading at \$ 20 a share, \$ 1 billion in debt outstanding (book value and market value) and \$ 500 million in cash and marketable securities. Univac expects to generate after-tax operating income of \$ 150 million on revenues of \$ 2 billion next year. The operating income is expected to grow 3% in perpetuity.

- a. What is the current Enterprise Value/ Sales ratio for the firm. (1 point)
- b. Assuming that the market value for debt and equity are correct, estimate the imputed cost of capital for the firm. (2 points)

2. Vulcan Steel has 100 million shares outstanding, trading at \$ 10 a share, and has two cross holdings – 10% of United Transportation, a publicly traded company with a market capitalization of \$ 500 million and 75% of a Cyber Rentals, another publicly traded company with a market capitalization of \$ 400 million. Vulcan fully consolidates its Cyber Rentals holdings and you have the following information on the three companies:

Company	Debt	Cash	EBITDA
Vulcan (consolidated)	\$ 500 mil	\$ 150 mil	\$ 250 million
United Transportation	\$ 100 mil	\$ 60 mil	\$ 90 million
Cyber Rentals	\$ 200 mil	\$ 100 mil	\$ 100 million

Estimate the EV/EBITDA multiple for just the parent company in Vulcan Steel (without any cross holdings). (3 points)

3. Assume that you are an investor comparing banks and that you have collected the following information:

- a. Which of the above banks best fits the criteria for an “undervalued” bank? (Circle the bank that you feel fits best) (2 points)

Bank	Price/Book	Beta	Expected Growth	ROE
A.	1.25	1.50	15%	10%
B.	1.80	1.00	15%	20%
C.	1.20	1.00	15%	20%
D.	1.10	1.00	8%	20%
E.	1.75	1.50	8%	20%
F.	1.15	1.50	15%	20%

- b. Now assume that you have run a regression of Price to Book ratios against returns on equity and betas for banks and arrived at the following result

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Answer all questions and show necessary work. Please be brief. This is an open books, open notes exam.

$$P/BV = 0.80 + 0.075 (\text{Return on Equity}) - 0.50 (\text{Beta})$$

(Eg. For company with ROE=10% and Beta=1.00, $P/BV = 0.8 + 0.075(10) - 0.5(1.0) = 1.05$)

Based on this regression, estimate whether company A is correctly valued, relative to the sector. (1 point)

c. Using the same regression, estimate what the return on equity of company C would have to be for it to be fairly valued by the market. (1 point)

Quiz 3: Valuation

Answer all questions and show necessary work. Please be brief. This is an open books, open notes exam.

1. First Safe Interstate Bank is a small, regional bank that is trading at a price to book (equity) ratio of 1.50. The bank is in stable growth, with earnings and dividends expected to grow 3% a year in perpetuity. The stock has a beta of 1, the riskfree rate is 5% and the equity risk premium is 4%.
 - a. Assuming that the market has priced this stock correctly, estimate the expected return on equity for the bank. (2 points)

 - b. Now assume that as a result of the banking crisis of the last few weeks, you expect the regulatory authorities to raise capital requirements immediately for banks by 20%. (Banks will need 20% more book equity to deliver the same net income). In addition, assume that the equity risk premium has risen to 6%. If the stable growth rate remains 3%, stimate the new price to book equity ratio for First Safe Interstate Bank.

(2 points)

2. You have been asked to analyze three technology companies and have been provided with the following information on the companies:

	<i>Primary shares</i>			<i>Number of Options</i>	<i>Value per</i>
Zap Tech	100	\$20	\$100	10	\$10.00
InfoRock	500	\$6	\$150	80	\$1.50
Lo Software	80	\$5	\$20	20	\$0.50

If you assume that the three companies have the same expected growth rate in net income and share the same return on equity and cost of equity, which of the three companies would you consider the cheapest? Explain why. (2 points)

3. You are reviewing the valuation of Vulcan Enterprises, a private business. The analyst has estimated a value of \$ 2.0 million for the company, which is in stable growth and expected to grow 3% a year in perpetuity. The firm has no debt outstanding and is expected to generate after-tax operating income of \$300,000 next year; the return on capital is anticipated to be 15%. The analyst valued the company for a private-to-private transaction, and the cost of equity he estimated is correct, given that setting. (He used a total beta to estimate the cost of equity, a riskfree rate of 4% and an equity risk premium

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of 5%).

However, the buyer is a publicly traded firm with diversified investors. The average R-squared across publicly traded companies in this business is 25%. Estimate the correct value of Vulcan Enterprises for sale to a public buyer. (4 points)

Quiz 3: Valuation

Answer all questions and show necessary work. Please be brief. This is an open books, open notes exam.

1. Kelko Stores is a publicly traded retailer that has historically adopted a high margin, low volume sales strategy. The firm reported an after-tax operating margin of 10% in the most recent time period and a sales to book capital ratio of 1.5. The firm is in stable growth, growing 3% a year and has a cost of capital of 9%.
 - a. Assuming that the firm maintains its current sales strategy, estimate the EV/Sales ratio for the firm. (2 points)
 - b. Now assume that Kelko is considering reducing prices on its products with the intent of increasing revenues; the action will reduce the after-tax margin to 8% and increase revenues by 33.33%. Assuming that the firm will stay in stable growth and that the cost of capital will be unchanged, what effect will this action have on the value of the firm? (2 points)

2. You are assessing the pricing of two regional banks and have collected the following information on them:

	<i>SunTrust Bank</i>	<i>SouthEast Bank</i>
Market value of equity	\$150.00	\$100.00
Book Value of equity	\$90.00	\$80.00
Expected Net income next year	\$18.00	\$12.00

Both banks are in stable growth, growing 3% a year, and have the same cost of equity. If you believe that SunTrust Banks is fairly priced by the market, make your best assessment of Southeast Banks. (3 points)

3. You are considering buying Cervelli Plumbing, a privately owned plumbing business and have collected the following information.
 - ➔ Francisco Cervelli, the owner, has provided you with the financial statements of the business that indicate that it generated after-tax operating income of \$200,000 last year on revenues of \$ 800,000.
 - ➔ Mr. Cervelli did not pay himself a salary and does much of the accounting,

Quiz 3: Valuation

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advertising and bill collection work himself. You believe that hiring an administrative service to do the same work will cost you \$ 50,000 a year (pre-tax).
→ The tax rate is 40%. The riskfree rate is 4% and the equity risk premium is 6%.
The firm is entirely equity funded and is expected to generate its current after-tax operating income in perpetuity (no growth). You believe that a fair value for the firm, if you sell it in a private transaction (to a completely undiversified investor) is \$850,000. Assuming that 40% of the risk in a plumbing company is market risk (correlation = 0.4), estimate the fair value of the firm if you were selling it to a publicly traded company. (3 points)

Quiz 3: Valuation

Answer all questions and show necessary work. Please be brief. This is an open books, open notes exam.

1. Slim Joe's, a manufacturer of processed meat snacks, trades at an enterprise value to sales ratio of 1.7. The firm is in stable growth, growing at 3% a year and is expected to generate a return on capital of 20% and a cost of capital of 9% in perpetuity.
 - a. Assuming that the firm is fairly priced, estimate the after-tax operating margin for Slim Joe's. (2 points)
 - b. Assume now that a generic firm in this business has roughly the same sales to capital ratio as Slim Joe's does but has half the after-tax margin of Slim Joe's. Estimate the EV/Sales ratio for the generic company, if it is also in stable growth, growing 3% a year with a cost of capital of 9%. (2 points)

2. You are comparing two firms and have compiled the following information, obtained from their consolidated financial statements (in millions):

	<i>Lugano</i>	<i>Stultz</i>
Market value of equity	9000	13000
Book value of equity	4000	6000
Market value of debt	5000	5000
Book value of debt	4500	4500
Cash	1500	2000
Market value of minority holdings	1500	1000
Book value of minority holdings	500	500
Market value of minority interests	1000	3000
Book value of minority interests	400	1000
Effective Tax rate	40%	20%
Net Income	600	1200
Interest expenses	500	500
Depreciation & Amortization	500	1000

On a consolidated EV/EBITDA basis, and incorporating whatever fundamentals you can, which of these firms is cheaper? (You can assume that the firms had no interest or other non-operating income. They are both in stable growth and have the same cost of capital.) (3 points)

3. Seacrest Corporation is a privately owned chemical company, that is expected to generate a return on equity of 20% next period and is in stable growth, growing 4% a year in perpetuity. Publicly traded chemical companies in stable growth, growing 4% a year, have a return on equity of only 12% and trade at 1.6 times book value. If publicly traded chemical companies are fairly priced and only 40% of the risk in a chemical company is market risk, estimate the price to book ratio

for Seacrest. (The owner has his entire wealth invested in the company; the riskfree rate is 4% and the equity risk premium is 5%) (3 points)

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1. Lister Inc. is a stable growth, publicly traded company, expected to grow 2% a year in perpetuity. It is expected to pay out 60% of its earnings as dividends next year and has a cost of equity of 8%.
 - a. Estimate the “intrinsic” PE ratio for the company. (1 point)
 - b. The company has 100 million shares and 10 million management options outstanding; the options have a value of \$5/option. If the firm is expected to earn \$ 100 million in net income next year, estimate the fair value per share, based upon the PE ratio you estimated in part a. (3 points)

2. KMD Inc. is a publicly traded steel company that holds 60% of a RAD inc, a publicly traded chemical company. You have the following information on the two companies.

	KMD (Fully consolidated)	RAD (stand alone)
Market price per share	\$9	\$50
Number of shares	1 billion	100 million
Book value of debt	\$ 5 billion	\$ 3 billion
Cash	\$ 2 billion	\$ 1 billion
EBITDA	\$ 2.1 billion	\$ 700 million
Minority interest	\$1.2 billion	None

If you believe that the fair EV/EBITDA multiple for steel businesses is 5, is KMD’s steel business under, fairly or over valued? (3 points)

3. You have been asked to value a privately owned restaurant that generated \$ 150,000 in after-tax operating income on \$ 1 million of revenues last year and is expecting earnings to grow 10% a year for the next 5 years. However, the chef, who is also the owner, did not pay himself a salary last year and you estimate that you would have to pay a replacement chef \$100,000 each year (in after-tax dollars). You have run a regression of publicly traded restaurants to get the following:

$$\text{EV/Sales} = 1.0 + 10 (\text{After-tax Operating Margin}) + 5 (\text{Expected Growth in next 5 years}) - 0.5 (\text{Beta})$$
 (Margins and growth are entered in decimals; a 10% margin is input as 0.10)

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If the average beta across publicly traded restaurants is 1.2 and 40% of the risk in the restaurant business comes from the market (correlation = 0.40), estimate the value for the privately owned restaurant in a private transaction, assuming that the buyer is completely undiversified and does not care about liquidity. (3 points)

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1. Ledbetter Inc. is a publicly traded company that operates in three businesses and you have been provided with the following information (in millions):

Business	EBIT ¹	DA ²	Invested Capital ³	Median EV/EBITDA for sector ⁴
Real estate	\$150	\$50	\$500	6.00
Travel	\$35	\$5	\$240	10.00
Spa services	\$100	\$20	\$600	Not available

Ledbetter pays 40% of its income in taxes, and the company has 100 million shares trading at \$22/share, \$ 800 million in debt and \$ 500 million in cash.

- a. If you acquire this company at the current market price and the real estate and travel businesses are fairly valued at the median EV/EBITDA for their sectors, estimate the EV/EBITDA multiple that you are paying for the spa business. (1 point)
- b. Now assume that the Spa business is in stable growth, growing 2% a year, has a cost of capital of 8% and is expected to generate its current return on capital in perpetuity. On an intrinsic value basis, what EV/EBITDA multiple would you be willing to pay for just the spa business? (2 points)
2. Suzlon Technology is a small technology company with a single, patent-protected product that is extremely profitable. The company is in stable growth, with a 3% growth rate in perpetuity, trades at an EV/Sales ratio of 2.2, and is expected to have a return on capital of 25% and a cost of capital of 9% in perpetuity. Unexpectedly, the company has just lost a lawsuit and will no longer have exclusive rights to its product. This is expected to halve its after-tax operating margin, raise its cost of capital to 10% and bring its return on capital down to 10%. Estimate the EV/Sales ratio for Suzlon Technology with these changes, assuming it stays a stable growth company. (3 points)
3. Potemkin Inc. is a privately owned toy retail chain that is expected to generate \$ 20 million in net income next year. Publicly traded toy retailers trade at an average forward PE of 12.5, are in stable growth (growing 3% in perpetuity) and have an average (levered) beta of 1.00. If the correlation between public firm and market is 30%, and Potemkin has a return on equity twice as high as its public competitors, estimate the value of equity in Potemkin Inc. to an undiversified investor who does

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not care about liquidity. (You can assume that the riskfree rate is 3%, the equity risk premium is 6% and that Potemkin has the same debt ratio as the public retailers).

(4 points)

¹ EBIT = Earnings before interest and taxes

² DA = Depreciation and amortization

³ Invested Capital = BV of debt + BV of equity - Cash

⁴ EV = Enterprise value = Market value of equity + Debt - Cash

Quiz 3: Valuation

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1. Stryker Inc. is a farm equipment firm with a financing arm. In the most recent year, the firm reported the following breakdown of key operating items (in millions):

				Net	BV of	BV of		Cost of	Cost of
Farm									
Equipment	\$10,000	\$1,500	\$1,000	\$400	\$3,000	\$2,000	\$500	9%	7.50%
Financing	\$2,000	\$650	\$650	\$100	\$1,000	\$3,000	\$500	8%	6.20%
Entire firm	\$12,000	\$2,150	\$1,650	\$500	\$4,000	\$5,000	\$1,000	8.8%	7.00%

The company faces a 40% tax rate and is in stable growth, growing 3% a year. You have run a regression for the EV/EBITDA multiple across just farm equipment companies
 $EV/EBITDA = 3.5 + 26.5 (\text{After-tax return on capital}) + 41.3 (\text{Expected growth}) - 31.5 (\text{Cost of capital})$

You also have a regression of Price to Book equity ratios across financial service firms:

$$P/BV = 0.70 + 9.0 (\text{Return on equity}) - 5.0 (\text{Cost of equity})$$

The firm has 800 million shares outstanding. Estimate the value of equity per share in the firm, using relative valuation. (All percentages are entered as decimals in the regression. Thus, 15% would be 0.15) (3 points)

2. You are examining the pricing of banks by the market. The current return on equity, based on aggregate net income and book equity, is 12.5% and the cost of equity for banks is 10%. Collectively, banks are in stable growth, growing 2.5% year. Banks are trading at a discount of 10% on book value and you believe that the main reason for the discount is that investors are expecting capital requirements to be increased for banks. If the net income, cost of equity and expected growth rate remain unchanged, estimate how much of a capital increase investors are expecting for banks. (3 points)
3. Mendenhall Inc. is a privately owned software company that is expected to generate the cash flows (in millions) shown in the table below:

	1	2	3	4	5
Revenues	\$5.00	\$7.50	\$10.00	\$12.00	\$12.50
After-tax operating income	\$2.50	\$0.75	\$1.25	\$1.80	\$2.00
FCFF	\$0.05	\$0.25	\$0.50	\$0.90	\$1.20

The market beta for software companies is 1.20 and the average correlation of

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software companies with the market is 0.40; the risk free rate is 3% and the equity risk premium is 6%. The company is fully owned by its founder who has all his wealth invested in the company. The founder expects to raise capital from a VC at the end of year 2; the VC is diversified across technology companies and the correlation of her portfolio with the market is 0.60. At the end of year 5, the company will be in stable growth, growing 3% a year in perpetuity (with a 12% return on capital) and will be taken public. (The firm plans to stay all equity funded in perpetuity.)

- a. What is the value of equity in the firm today? (2 points)

b. Now assume that Symbiosis, a publicly traded firm, has offered to buy Mendenhall for \$14 million. If the transaction is completed at that price, how much value will be gained or lost by the stockholders in Symbiosis? (2 points)

Quiz 3: Valuation

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1. Pollyanna Inc. is a publicly traded entertainment company with 100 million shares trading at \$10/share, \$250 million in total debt and no cash. The company is in stable growth, expecting to grow 3% a year in perpetuity, the cost of equity for the company is 10% and the after-tax cost of debt is 5%.
 - a. If the enterprise value to invested capital ratio for the company is 1.25, estimate the market's expectation of return on capital for the company. (2 points)
 - b. If you believe that the company is incapable of earning more than its cost of capital in the long term, how much (in percentage terms) is the equity in this company under or over valued? (1 point)

2. FinSafe is a publicly traded bank, with 300 million shares outstanding, trading at \$20/share. The book value of equity in the company is \$4 billion and the expected net income next year is \$500 million. You can assume that book value of equity is a good measure of regulatory capital in the bank. You have run a regression of price to book ratios at banks against return on equity and regulatory capital as a percent of risk adjusted assets and arrived at the following:

$$\text{Price to Book ratio} = 0.145 + 7.00 \text{ Return on Equity} + 6.00 (\text{Regulatory Capital} / \text{Risk Adjusted Assets})$$

[Thus, if your ROE is equal to 10% and your regulatory capital is 5% of risk adjusted assets, your price to book = $0.145 + 7.00 (.10) + 6.00 (.05) = 1.145$]

 - a. If you believe that FinSafe is correctly priced, relative to other banks, what is the value of the risk adjusted assets at the bank? (1.5 points)
 - b. Now assume that FinSafe expects to sell off its mortgage banking division, which has expected net income of \$200 million next year and a current book value of equity of \$2 billion. You expect to be able to sell the division at book value and pay the cash (\$2 billion) out as dividends. If the mortgage banking division accounts for 60% of the risk-adjusted assets in the bank, estimate the price per share after the sale. (2.5 points)

3. LookBack Inc. is a privately owned paper company with net debt of zero and an

Quiz 3: Valuation

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expected after-tax cash flow of \$10 million next year, anticipated to grow 3% a year in perpetuity. You are the owner of the firm and have been approached by a venture capitalist, offering you \$25 million for a 25% stake in the firm. You know that the venture capitalist has holdings primarily in manufacturing companies and that the correlation of the VC's portfolio with the market is 0.60. If you believe that the VC's offer is a fair one, estimate what the company would be worth if you decided to go public instead. (The risk free rate is 3% and the market equity risk premium is 5%) (3 points)

Quiz 3: Valuation

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1. Moana Foods is a snack food company that is planning a public offering. The company expects to be priced based on revenues and the competitors in the business are all generic snack food companies that are publicly traded and trade at 1.8 times next year's revenues. These generic companies are expected to have an after-tax operating margin of 8%, a sales-to-capital ratio of 1.5 and are expected to grow 3% a year in perpetuity. If the generic companies are correctly priced and Moana Foods is expected to generate twice the operating margin of and the same cost of capital, sales to capital ratio and growth rate as the generic companies, what percentage of Moana Food's value can be attributed to brand name? (4 points)

2. Crocia Inc. is a company that operates in two businesses and you are trying to do a sum-of-the-parts valuation of the company. You have been provided the following information on the businesses:

	Revenues	Next year's EBIT	Expected growth	Best---fit regression (using comparable companies in sector)
Technology	\$1,000	\$400	15.00%	EV/Sales = 1.25 + .5(EBIT/Revenues) + 12.0 (Expected Growth Rate)
Hotels	\$2,000	\$200	4.00%	EV/EBIT= 3.30 +42.5(EBIT/Revenues) + 30.0 (Expected Growth Rate)
Corporate Expenses	\$0	\$75	2.50%	Growth rate in perpetuity. Expenses are legitimate & reasonable

If Crocia has an cost of capital of 7.5%, a cash balance of \$400 million, debt of \$1 billion and 200 million shares outstanding trading at \$20/share, would you support breaking up this company (please provide details of why or why not)? (The corporate tax rate is 40%) (3 points)

3. You work for an appraisal company, whose primary business is appraising privately owned retail stores. You estimate that stable growth, publicly traded retailers trade at a PE of 15 and are trying to come up with a reasonable PE ratio to use in valuing privately owned retailers, and have collected the following

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information on

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	Stable-growth Private retailer	Stable-growth Public retailer
Price Earnings Ratio	NA	15.00
Correlation with the market	NA	0.45
Return on equity	20%	10%
Expected growth rate	2.5%	2.5%
Illiquidity Discount	15%	NA

Assuming that public retailers are fairly priced (at 15 times earnings), what PE ratio would you use for a stable-growth private retailer? (The risk free rate is 3%, the equity risk premium is 5% and you can assume that all retailers, private and public, have the same debt ratios.) (3 points)

Quiz 3: Valuation

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1. Suffolk Manufacturing's most recent balance sheet is below (in millions):

<i>Assets</i>		<i>Liabilities</i>	
Cash	\$100	Debt	\$200
Other current assets	\$150	Equity	\$800
Fixed assets	\$650		
Equity investment in Caligula	\$100		
Total Assets	\$1,000	Total	\$1,000

Suffolk has 100 million shares trading at \$12.50/share and the market value of its debt is equal to the book value of that debt. Caligula is a publicly traded company and has a market value of equity of \$ 750 million, a book value of equity of \$500 million and a book value of net debt of \$500 million; Suffolk owns 20% of Caligula and is using the equity approach to record its ownership.

- a. Estimate the parent company Enterprise Value/ Invested Capital ratio for Suffolk Manufacturing. (2 points)
 - b. Now assume that Suffolk's operating assets are correctly valued by the market and that its cost of capital is 8%. Estimate the expected return on capital on Suffolk's operating assets, assuming that the company is in stable growth, growing 2% a year in perpetuity. (2 points)
2. Intrepid Enterprises is in three businesses and you have collected the following information on them (in millions):

<i>Division</i>	<i>Sales</i>	<i>EBITDA</i>	<i>Net Income</i>	<i>BV of Equity</i>	<i>Debt (Book & Market)</i>
Steel	\$800	\$200	\$80	\$300	\$200
Chemicals	\$600	\$200	\$120	\$200	\$300
Finance	\$600	\$350	\$100	\$250	\$500
Total Company	\$2,000	\$750	\$300	\$750	\$1,000

For the steel and chemical divisions, you have run regressions for EV/Sales against EBITDA/Sales and arrived at the following:

$$\text{Steel: EV/Sales} = 0.80 + 4.80 (\text{EBITDA/Sales})$$

$$\text{Chemicals: EV/Sales} = 1.30 + 3.60 (\text{EBITDA/Sales})$$

For the financing division, your best regression is of PBV against return on equity:

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Finance: Price/Book value = $1.00 + 7.5$ (Return on Equity)

Based on these regressions, estimate the value of equity per share in Intrepid, if the company has 150 million shares outstanding and no cash balance. (3 points)

3. You are a private investor who is considering using all of your wealth to buy two privately owned businesses (each of which is owned by owners with their entire wealth tied up in these businesses). Both are mature businesses, expected to grow 2% a year in perpetuity and both are 100% equity funded.

			<i>Comparable (public) companies</i>	
		<i>Expected FCFF</i>	<i>Market</i>	<i>Correlation with</i>
Sigma Inc.	Technology	\$80.00	0.8	0.4
Precision Mfg.	Manufacturing	\$25.00	0.8	0.2

How much of a total premium would you be able to offer the current owners (over and above what they would estimate the value to be), if you believe that the combined businesses would have a correlation of 0.50 with the market? (You can assume that there is no cash flow synergy, that the companies will continue to be mature, that the risk free rate is 2% and the equity risk premium is 5%). (3 points)

Quiz 3: Valuation

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1. You are trying to value CommerzBank, a small, privately owned bank, for an IPO, and are using the information that you have on SunClaims Bank, a publicly traded bank that you believe is fairly valued by the market, given its fundamentals. You have the following information on the two banks:

	<i>CommerzBank</i>	<i>SunClaims</i>
Net Income (in millions)	\$80	\$120
Book Value of Equity (in millions)	\$500	\$1,000
Price/Book Value	NA	1.25

Assuming that both banks are in stable growth, growing 2% a year, and have the same cost of equity, estimate a fair value for the equity of CommerzBank. (2.5 point)

2. You are trying to price SpeedApp Inc., a young software company and have the following numbers on the company:

	<i>Most Recent year</i>	<i>In Year 5</i>
Revenues	\$50	\$1,000
EBITDA	\$(30)	\$80
Debt Outstanding	\$0	\$500
Expected growth rate in revenues	80.00%	15.00%

You have a regression of EV/EBITDA ratios against expected growth rates across software companies (with growth rates entered in decimals, i.e., 10% is .10):

$$\text{EV/EBITDA} = 13.00 + 80.00 (\text{Expected growth rate in revenues})$$

Using this regression, estimate the value of equity for SpeedApp today, assuming that the company is expected to have a cost of equity of 20% for the next 5 years. (2.5 points)

3. You are trying to value/price Velcomm Inc., a company that operates in two businesses, telecom and hotels, and are trying to do a sum of the parts pricing/valuation. You have the following information on the company and its businesses:

	<i>Steel</i>	<i>Hotels</i>	<i>Corporate G&A</i>
Revenues (in millions)	\$1,000	\$1,500	\$-
EBITDA (in millions)	\$150	\$300	\$(50)
EBIT (1-t) (in millions)	\$75	\$150	\$(30)

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The company in stable growth, with all businesses growing 2% a year and has an overall cost of capital of 8%, but you don't have access to the information on returns on capital at the steel and hotel businesses. However, you have estimated that mature steel companies trade at 6 times EBITDA and mature hotel companies at 8 times EBITDA. Estimate how much you would be willing to pay for the company's operations today, making reasonable assumptions about corporate expenses. (2.5 points)

4. You are trying to value the Somerset Patriots, a semi-professional baseball team, for sale. The company is expected to generate after-tax operating income of \$10 million next year on invested capital of \$50 million and is expected to grow 2% a year in perpetuity. Estimate the value of the team to a buyer who is totally undiversified, fully equity funded and applies a 20% illiquidity discount to value. (You can assume a risk free rate of 2%, an equity risk premium of 6%, and that the sports business has an unlevered beta of 1.20 and a correlation with the market of 60%). (2.5 points)