

**Quiz 2: Spring 1996**

1. AlumCare Inc, which maintains and runs health maintenance organizations, has a price/book value ratio of 4. It merges with HealthSoft Inc, a corporation that owns and runs hospitals, and has a price/book value ratio of 2. Assuming that AlumCare's equity value is thrice that of HealthSoft's equity value, and that the companies adopt pooling to account for the acquisition, estimate the price/book value ratio after the merger. (Pooling essentially means that the book values of the two firms are added up to arrive at the book value of the combined firm) (3 points)

2. Design Corp is a specialty furniture retailer with revenues of \$ 1.5 billion, and a book value of equity of 500 million. If the firm is in stable growth, growing 6% a year and has a payout ratio of 60%, estimate the price/sales ratio for this firm. The beta is 1.00, and the T.Bond rate is 6.5%. (3 points)

3. You have been asked to value Alcoa, and have come up with the following inputs.

- The stock has a beta of 0.90, estimated over the last 5 years. During this period, the firm had an average debt/equity ratio of 20% and an average cash balance of 15%.
- The firm's current market value of equity is 1.6 billion and its current market value of debt is \$800 million. The current cash balance is \$ 500 million.
- The firm earned earnings before interest and taxes of \$ 450 million, which includes the interest income on the current cash balance of \$ 50 million. The firm's tax rate is 40%.
- The firm is in stable growth, and its earnings from operations are expected to grow 5% a year. The net capital expenditures next year are expected to be \$ 90 million.
- The riskfree rate is 6% and the firm has a cost of debt of 7%.

Estimate the value of the non-cash assets of the firm, its total value, and the value of its equity. ( 4 points)

## Quiz 2: Equity Instruments and Markets – Fall 1996

1. You are trying to estimate the brand name value for Steinway, one of the world's best know piano manufacturers. You have the latest income statement –

Revenues	\$ 100.00 million
- COGS	\$ 60.00 million
- Depreciation	\$ 10.00 million
EBIT	\$ 30.00 million
- Interest Expense	\$ 10.00 million
EBT	\$ 20.00 million
Taxes	\$ 8.00 million
Net Income	\$ 12.00 million

The firm has \$ 100 million in debt outstanding, in both book value and market value terms, and expects to maintain a debt ratio of 40%. The beta of the stock is 1.10 currently, and the current long term bond rate is 7.5%. The firm is in stable growth and expects to grow 5% a year in perpetuity. The capital expenditures in the latest year were \$10 million, and there is no working capital requirement.

- a. Estimate the firm value/sales ratio for this firm. ( 2 points)
- b. Assume now that the operating profit margin (EBIT/Sales) for generic piano manufacturers is half of the operating profit margin for Steinway. Assuming generic piano manufacturers have the stable growth rate and cost of capital as Steinway, what is the value of the Steinway brand name? ( 2 points)

PART II ( 1 point each)

### PRICE/EARNINGS RATIOS

- a. To compare  $PE/g$  [where  $g$  is the expected growth] across firms to find under and over valued firms, you have to assume that these firms are of equivalent risk. (1 point)

TRUE                  FALSE

b. Firm A and firm B both had EBIT of \$100 million and have similar growth rates and costs of capital; they also have similar working capital requirements. Capital expenditures offset depreciation for both firms, but firm A which is more capital intensive has capital expenditures of \$150 million, whereas firm B has capital expenditures of only \$50 million. Choose the statement that you think best describes the firm value/EBITDA multiples of these two firms – (2 points)

1. Firm A has higher capital expenditures; it must therefore have a higher value/EBITDA multiple than firm B.
2. Firm A and B have similar characteristics; they must therefore have the same value/EBITDA multiples.
3. Firm B has lower capital expenditures; it must therefore have a higher value/EBITDA multiple.
4. Not enough information is provided to answer the question of which firm will have the higher value/EBITDA multiple.

#### PRICE/BOOK VALUE RATIOS

c. Hi-Ret Corp. which has a return on equity of 24% has a price/book value ratio of 3.0. The return on equity is expected to drop to 12%. Which of the following is most likely to happen to the price/book value ratio? ( 1.5 point)

1. The price/book value ratio will not change.
2. The price/book value ratio will increase by 50%.
3. The price/book value ratio will increase by more than 50%.
4. The price/book value ratio will drop by half (to 1.50).
5. The price/book value ratio will drop by more than half.
6. None of the above.

d. Target Corp. has a price/book value ratio of 2.5, but has a cash balance which is 30% of the market value of equity. It is planning to use all of the cash to pay a special dividend. What will the price/book value ratio be after the dividend? (1.5 points)

**Quiz 2 : Spring 1997**

**This quiz is worth 10% and you have 30 minutes.**

1. GenieSoft is a computer software manufacturer with earnings per share of \$ 0.50 and a stock price of \$ 25. The stock is expected to grow at 40% a year for the next 5 years, and has a beta of 2.0. AutoPred is a automobile part manufacturer, with earnings per share of \$ 1.50 and a stock price of \$ 30. The stock is expected to grow 10% a year for the next 5 years, and has a beta of 1.0. You have run a regression of PE/g ratios against betas, using all the companies in the market:

$$\text{PE/g} = 2.75 - 0.50 (\text{Beta})$$

Based upon this regression, which of the following statements about these companies would you agree with? (2 points)

- a. GenieSoft is overvalued, while AutoPred is undervalued.
- b. AutoPred is overvalued, while GenieSoft is undervalued.
- c. Both companies are undervalued.
- d. Both companies are undervalued relative to the market.
- e. Both companies are overvalued.
- d. Both companies are overvalued relative to the market.

2. Time Warner is considering a sale of its publishing division. The division had earnings before interest, taxes and depreciation of \$ 550 million in the most recent year (depreciation was \$ 150 million), growing at an estimated 5% a year (You can assume that depreciation grows at the same rate). The return on capital in the division is 15%, and the corporate tax rate is 40%. If the cost of capital for the division is 9%, estimate the following:

- a. the value/FCFF multiple based upon fundamentals
- b. the value/EBIT multiple based upon fundamentals
- c. the value/EBITDA multiple based upon fundamentals

3. Now assume that you have computed the average Value/EBITDA multiple for other publicly traded firms in the sector to be 6. The return on capital at these firms, on average, is 10%, while their cost of capital and expected growth are comparable to Time Warner's publishing division. If you were analyzing Time Warner's publishing division for sale, based upon comparables, which of the following would you use:

- a. A Value/EBITDA multiple of 6, because that is the average for comparable firms in the same business
- b. A Value/EBITDA multiple of more than 6
- c. A Value/EBITDA multiple less than 6

Explain briefly.

**Quiz 2: Equity Instruments and Markets – Spring 1998**

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

1. MidBank Inc. is a medium-sized commercial bank in stable growth, with earnings per share growing 5% a year. Its equity is currently trading at 1.5 times the book value. The cost of equity is 12%, and the stock is currently trading at its fair value. A new CEO has come in to run the firm, and he pledges to increase the return on equity (based upon forward earnings) by 3%. Estimate the new price to book value ratio..
2. You have run a regression of Value/Sales Ratio against operating margins for cosmetics firms:

$$\text{Value/Sales} = 0.45 + 8.5 (\text{ After-tax operating margin})$$

You are trying to estimate the brand name value of Estee Lauder. The firm earned \$ 80 million before interest and after taxes on revenues of \$ 500 million. In contrast, GenCosmetics, a manufacturer of generic cosmetics had an after-tax operating margin of 5%. Estimate the brand name value for Estee Lauder.

3. You have just completed a valuation of TechnoSoft, a software manufacturing firm, and have come up with a value of \$ 1 billion for the firm. The firm has
  - \$ 100 million in face value of 10-year straight debt outstanding, with a coupon of 10% trading at face value
  - \$ 250 million in face value of 10-year convertible debt outstanding, with a coupon of 5%, trading at 10% above face value
  - 10 million warrants trading at \$ 10 per warrant
  - 20 million shares currently outstanding

Estimate the total value of equity and the value of equity per share.

### Fall 1998: Quiz 2: Equity Instruments and Markets

1. Cephalon Inc. has 50 million shares outstanding, trading at \$ 20 per share. In addition, there are 10 million options<sup>1</sup> outstanding that the company has issued to its employees; these options have an average exercise price of \$ 10 per share and an average maturity of 3 years; while these options are not traded, you have valued them at \$ 15 apiece. Finally, the company has \$ 100 million (in face value) of 5-year 7% convertible debt outstanding, trading at a premium of 40% above face value, as well as \$ 50 million (in face value) of 5-year 7% straight debt, that is trading at par.

- a. Estimate the value of equity in the firm. ( 2 points)
- b. If Cephalon has a cash balance of \$ 250 million, estimate the value of the non-cash assets of the firm. ( 1 point)

2. You have been given a list of software firms and have been asked to analyze them based upon the PEG ratio, taking into account any fundamentals that might cause PEG ratios to vary across firms.

Company	PEG Ratio	Beta	ROE
AC Software	0.40	2.25	6.16%
Delphi Systems	0.44	1.05	22.55%
WorkSoft Inc.	0.50	1.00	3.17%
Connectix	0.98	1.55	5.33%
Visionary Systems	1.05	1.05	35.51%
New Wave Software	1.10	0.80	20.60%

- a. Based upon the PEG ratio and fundamentals, which of these companies is most undervalued<sup>2</sup> and why? (1.5 points)
- b. Based upon the PEG ratio and fundamentals, which of these companies is most overvalued and why? (1.5 points)

<sup>1</sup> Each option gives you the right to buy one share.

<sup>2</sup> Undervalued : Price is lower than value      Overvalued: Price is higher than value

3. C. Jones is a diversified firm with holdings in both the manufacturing and retail sectors. The firm has a cost of capital of 10% and it is a stable growth firm that expects to see after-tax operating income grow 5% a year in the long term.

- a. Estimate the Value/FCFF ratio for this firm. ( 2 points)
- b. If the firm earns a return on capital of 12.5%, and faces a 30% tax rate, estimate the Value/EBIT multiple for this firm. ( 2 points)



**Spring 1999: Quiz 2**

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

1. Netsoft is a company that manufactures networking software. In the current year, the firm reported operating earnings before interest and taxes of \$ 200 million (Operating earnings does not include interest income), and these earnings are expected to grow 4% a year in perpetuity. In addition, the firm has a cash balance of \$ 250 million on which it earned interest income of \$ 20 million. The unlevered beta for other networking software firm is 1.20, and these firms, have, on average, cash balances of 10% of firm value. If Netsoft has a debt ratio of 15%, a tax rate of 40%, a return on capital of 10% on operating assets, and a cost of debt of 10%, estimate the value of the firm. [The riskfree rate is 6% and you can assume a market risk premium of 5.5%.] ( 4 points)
  
2. First Bank is a financial service firm that is in stable growth. Its current earnings are expected to grow 5% a year in perpetuity, and its stock has a beta of 0.90. If the current treasury bond rate is 6%, the current estimate of the market risk premium is 5.5%, and the stock is trading at a PE ratio of 10.59, estimate First Bank's return on equity. ( 3 points)
  
3. You are an acquisitions analyst for Intel and have been asked to pass judgment on whether a potential target firm is under valued. The firm has 100 million shares outstanding, trading at \$ 50 per share, short term debt outstanding of \$ 1.5 billion and long term debt of \$ 1 billion. In the current year, the firm reported net income of \$ 250 million, after paying short term interest expenses of \$ 100 million and long term interest expenses of \$ 80 million, covering depreciation charges of \$ 250 million and paying taxes at a 40% tax rate. In addition, the firm earned interest income of \$ 125 million (before taxes) on a cash balance of \$ 1.75 billion. Estimate the Value/EBITDA multiple for the firm. (3 points)

**Spring 2000: Quiz 2**

1. Reliable Manufacturing is a steel company that reported earnings before interest and taxes of \$ 500 million in its consolidated income statement in the most recent financial year. The firm has two subsidiaries:
- It owns 10% of a chemical subsidiary. The subsidiary had earnings before interest and taxes of \$ 250 million in the most recent financial year and paid no dividends. (The accounts of this subsidiary are not consolidated with the parent company)
  - It owns 50% of an automobile products subsidiary. This subsidiary had earnings before interest and taxes of \$ 200 million in the most recent year. (The accounts of this subsidiary are consolidated with Reliable Manufacturing)

You can assume that Reliable Manufacturing and its two subsidiaries all have costs of capital of 10%, returns on capital of 12%, a tax rate of 40% and expected growth forever of 6%. Furthermore, none of the firms has any debt outstanding and the cash and marketable securities owned are negligible. If Reliable Manufacturing has 100 million shares outstanding, estimate the value per share. (4 points)

2. The following questions all relate to earnings or book value multiples. Parts a, b, c and d are worth 1 point each, and part e is worth 2 points.
- a. When interest rates decrease, the price earnings ratio for a firm
- will become more sensitive to changes in the expected growth rate in earnings
  - will become less sensitive to changes in the expected growth rate in earnings
- b. You are comparing the PEG ratios of two firms within the same sector with very different expected growth rates. Firm A has one of the lowest expected growth rates in the sector, with earnings expected to grow at 3%. Firm B has a growth rate close to the average for the sector, with earnings expected to grow at 12%. Assuming that both firms are fairly priced,

which firm would you expect to have the higher PEG ratio? (You can assume that both firms have the same risk characteristics and the same return on equity)

- Firm A will have the higher PEG ratio, because it has the lower expected growth rate
- Firm B will have the higher PEG ratio, because it has the higher expected growth rate
- Both firms should have the same PEG ratio, because they are fairly priced.

c. You are a potential buyer of a company with a very low Value to EBITDA multiple.

Which of the following combinations of fundamentals would make it most likely that you were getting an under valued company?

- High tax rate, high return on capital and low reinvestment rate
- Low tax rate, low return on capital and low reinvestment rate
- Low tax rate, high return on capital and low reinvestment rate
- Low tax rate, low return on capital and high reinvestment rate

d. A well-known brand name firm, in stable growth, has a book value of equity of \$ 100 million and a market value of equity of \$250 million. An increase in interest rates causes the cost of equity to increase by 1%. Because of its pricing power, the firm is able to increase its return on equity by 1% as well. What will happen to the price to book value ratio?

- The price to book value ratio will increase
- The price to book value ratio will decrease
- The price to book value ratio will remain unchanged

e. GV Enterprises has 150 million shares outstanding, trading at \$ 10 per share. The firm has \$ 400 million in short term debt and \$ 600 million in long term debt. The firm reported earnings before interest and taxes of \$ 250 million, after depreciation and amortization expenses of \$ 100 million. The firm also has cash and marketable securities of \$ 500 million. (None of the income from the cash and marketable securities is reflected in the

current earnings before interest and taxes). Estimate the Value to EBITDA multiple for this firm, making sure that you maintain consistency.

## 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 have been asked to examine a valuation done of Loden Construction, a real estate and construction company. You have been provided with the income statement for the last year:

Revenues	\$ 1000 million
- Operating Expenses	\$ 700 million
- Depreciation & Amortization	\$ 100 million
= EBIT	\$ 200 million

In the valuation, the analyst has assumed a growth rate of 5% forever in revenues, operating income and depreciation, and assumed capital expenditures of \$ 160 million (for next year). In addition, the analyst has assumed that non-cash working capital will be 26% of the change in revenues. (Tax rate = 20%)

- a. Estimate the expected free cashflows to the firm next year, based upon the assumptions listed above. (1 point)
- b. What is the return on capital being assumed in perpetuity by the analyst? (2 points)
- c. You believe that this firm is in a competitive business and will earn a return on capital equal to its cost of capital (which is 10%). What is the correct value of the firm assuming that the stable growth rate of 5% remains unchanged? (2 points)

2. Tevya Technologies is a company with 100 million shares outstanding (primary), trading at \$ 20 per share. The firm also has \$ 1000 million in debt outstanding, \$ 500 million in cash and 20 million options, which you have valued at \$ 5 an option. Assuming that the firm is fairly priced, estimate the value that is being attached to the operating assets of the firm. (2 points)

3. You are the sector analyst for software companies. There are 80 firms in your sector, and a regression of PE ratios against growth and betas yields the following:

$$\text{Trailing PE} = 12.13 + 1.56 (\text{Expected growth rate for next 5 years}) - 3.56 (\text{Beta})$$

{For example, the PE ratio for a firm with an expected growth rate of 20% and a beta of 1.5 would be =  $12.13 + 1.56 (20) - 3.56 (1.5) = 37.99$ }

You are looking at a young software firm that is not followed by analysts. The stock trades at \$ 48.00 and its earnings per share in the last 4 quarters is \$ 1.50. You estimate the stock's beta to be 2.00.

Quiz 2

Name:

- a. What is the expected growth rate that the market is anticipating for this firm, given how it is pricing other software companies? (1 point)
- b. If you expected a growth rate of 24% for this firm, what PEG ratio would you forecast for this firm, given how other software firms are priced? (2 points)

**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 trying to estimate an expected growth rate in operating earnings for Zordon Corporation, a chemical company for the next 5 years. In the most recent year, the firm reported after-tax operating income of \$ 100 million on a book value of capital of \$ 1 billion. The firm also had capital expenditures of \$ 150 million and depreciation of \$ 80 million during the year. The firm expects to maintain this reinvestment rate for the next 5 years and earn 15% on its new investments starting immediately and to gradually improve its return on capital on existing assets to 15% over the next 5 years.
  - a. Estimate the annual expected growth in operating income for the next 5 years? (2 points)
  - b. How much of the annual growth rate (estimated in part a) can be attributed to more efficient utilization of existing assets. (1 point)
2. You are trying to estimate the terminal value for Lowie's, a retail firm, at the end of year 5. The firm is expected to have after-tax operating earnings of \$ 250 million year 6 and these earnings are expected to grow 4% a year in perpetuity. The firm is also expected to have a return on capital of 12% and a cost of capital of 9% in perpetuity.
  - a. Estimate the terminal value of the firm at the end of year 5. (2 points)
  - b. How much of this terminal value can be attributed to your assumption that your firm will earn excess returns forever? (2 points)
3. Urban Savings Bank is expected to have net income of \$ 100 million and pay out dividends of \$ 60 million next year. The firm is a stable growth firm and the market value of equity is currently \$ 800 million. If you assume that the market is pricing the equity correctly today, estimate the new PE ratio for the firm if the riskfree rate increases by 1 percentage point? (You can assume that the growth rate and return on equity will not change) (3 points)

## Quiz 2: Equity Instruments

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

1. Hunt Technology is a company that manufactures liquid crystal displays. In the most recent year, the firm reported an operating loss of \$ 50 million on revenues of \$ 500 million ; the net operating loss carried forward is \$92.425 million. The firm is all equity funded and is expected to remain so in perpetuity.
  - The revenues are expected to grow 30% a year for the next 4 years and 3% thereafter forever.
  - The pre-tax operating margin is expected to improve from existing levels to -5% in year 1, 0% in year 2, 5% in year 3 and 10% in year 4 and stay at that level in perpetuity. The marginal tax rate for the firm is 40%.
  - The sales-to-capital ratio for the firm is expected to remain at 2.5 for the next 4 years. After year 4, the firm's return on capital is expected to converge on the industry average return on capital of 10%.
  - There are 10 million shares outstanding. There are also 5 million management options outstanding, with an average exercise price of \$ 5 per share.
  - The cost of capital for the firm is expected to be 15% for the next 4 years and then drop to 12% after year 4.

- a. Estimate the expected free cashflows to the firm for the next 4 years in the following table: (1 point)

	1	2	3	4
Revenues	\$650.00	\$845.00	\$1,098.50	\$1,428.05
Op Margin	-5%	0%	5%	10%
EBIT	-\$32.50	\$0.00	\$54.93	\$142.81
Taxes	\$0.00	\$0.00	\$0	\$29.122
EBIT(1-t)	-\$32.50	\$0.00	\$54.93	\$131.82
- Reinvestment				



FCFF				
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- b. Estimate the terminal value of the firm (at the end of year 4) (2 points)
- c. Estimate the value of equity per share for this firm, using the treasury stock approach. (2 points)

2. You have been asked to estimate the enterprise value to EBITDA multiple for Hollywood Holdings, a movie company. The company has 100 million shares outstanding, trading at \$ 20 per share, \$ 1200 million in debt and \$ 300 million in cash and marketable securities. Hollywood Holdings reported EBITDA of \$ 800 million in its consolidated income statement in the most recent year. It also has two cross holdings:

- A minority passive holding of 5% of Abigail Software, a firm that provides support software to entertainment companies. The stock is publicly traded and there are 200 million shares trading at \$25 per share, \$500 million in debt and no cash, and reported EBITDA of \$750 million last year.
- A majority active holding of 60% in Nuveen Theaters, a privately held chain of movie theaters with \$ 300 million in debt outstanding (and no cash). Hollywood Holdings reports a minority interest of \$ 240 million in this investment but the price to book value ratios of movie theater companies is 2.2. Nuveen reported EBITDA of \$400 million last year.

- a. Estimate the enterprise value/EBITDA for Hollywood Holdings without any cross holdings (i.e. just the parent company) (3 points)
- b. Now assume that the value to EBITDA multiple for Hollywood Holdings, with the cross holdings. ( 2 points)

**Quiz 2: Equity Instruments**

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

1. You have been asked to value Revox Inc., a cement company. The company reported \$ 5 million in after-tax operating income on revenues of \$ 100 million in the most recent year. It expects revenues to grow 20% next year as the economy comes out of the recession and the after-tax operating margin to improve to 10%. The firm expects capital expenditures of \$ 10 million and depreciation of \$ 4 million next year; there are no working capital requirements. After next year, the expected growth in operating income is 4% forever and the firm expects to maintain a return on invested capital of 12% in perpetuity. If the cost of capital is 10%, estimate the value of Revox Inc. today. (3 points)
  
2. You have been asked to value Ajax Corporation, a firm with significant cross holdings in other companies and a large cash balance. You have valued the operating assets of the firm, using the operating income from consolidated financial statements at \$1 billion but you want to consider the following:
  - a. The firm has marketable securities of \$ 150 million, invested in commercial paper, earning 2% a year.
  - b. The firm has a dozen minority, passive cross holdings in software firms. The book value of the equity in these investments is \$ 80 million but the typical price to book ratio at these firms is 2.5.
  - c. Ajax owns 60% of Ajax Leasing, an equipment-leasing firm which it is fully consolidated into its own financials. The minority interest in this holding is shown at a value of \$ 120 million in the balance sheet but equipment leasing companies typically trade at two times book value.
  - d. Ajax has debt due, with a market value of \$ 400 million.
  - e. There are 20 million shares outstanding currently, but there are 4 million management options outstanding with an estimated value of \$ 15 per option.

Estimate the value per share. (3 points)

3. You are trying to make an assessment of Vortex Technology, using PEG ratios. Vortex is trading at \$ 18 per share and reported earnings per share of \$ 1.50 over the last four quarters. Analysts are estimating that these earnings will grow 10% a year over the next 5 years. The rest of the sector trades an average PE ratio of 15 and sector earnings are expected to grow 12% a year over the next 5 years.
- a. Based purely on a comparison of PEG ratios, how under or over valued is Vortex? ( 1 point)
  - b. Which of the following would be a good explanation for why Vortex should have a lower PEG ratio than the sector? (1 point)
    - i. Vortex has a lower growth rate than the sector
    - ii. Vortex has a lower PE ratio than the sector
    - iii. Vortex is riskier than the average firm in the sector
    - iv. Vortex has a higher return on equity than the sector
    - v. None of the above
  - c. Now assume that you are told that Vortex will be in stable growth after year 5, growing 3% a year forever. Vortex is expected to have a return on equity of 12% and a cost of equity of 9% (for the next 5 years and beyond). Based upon these fundamentals, estimate the intrinsic PEG ratio for Vortex. (2 points)

**Quiz 2: Equity Instruments**

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

1. You have been asked to review a valuation of Springfield Foods, a food processing company, done by an analyst. The analyst has estimated a value per share of \$ 14 for the 10 million shares outstanding in the company; there is no debt outstanding. She assumed that the firm was in stable growth, growing at 3% a year with a return on capital of 10% (which is equal to the cost of capital for food companies). While you do not disagree with these assumptions, you notice that the analyst used the consolidated financial statements and that Springfield owns 50% of Nova Bottlers, a beverage company. The analyst subtracted the minority interest in Nova of \$ 20 million that was shown on Springfield's balance sheet to arrive at her estimate of value of \$14 per share. While Nova has the same growth rate in perpetuity as Springfield, its return on capital is 12%, its cost of capital is 8% and it generates 25% of the after-tax operating income in Springfield's consolidated statement.
  - a. Based upon her assessment of firm value, what after-tax operating income is the analyst estimating for Springfield next year? (2 points)
  - b. Estimate the value of Nova Bottler's as a standalone enterprise. (2 points)
  - c. Estimate the correct value of equity per share in Springfield Foods. ( 2 points)
2. Answer the following multiple-choice questions. Each question is worth 1/2 point.
  - a. Which of the following multiples is not consistently defined for a cable company?
    - i. Market value of Equity/ Book value of Equity
    - ii. Enterprise Value/ Net Income from continuing operations
    - iii. Market value of Equity/ Net Income from continuing operations
    - iv. Enterprise Value / Earnings before interest and taxes
    - v. Market value of Equity/ Cable Subscriber
    - vi. Enterprise Value/ Cable Subscriber

- b. You are trying to find undervalued firms, using EV/EBITDA ratios. Which of the following companies is most likely to be undervalued? (Undervalued = Stock you would buy)
- i. Stock with low EV/EBITDA, High Tax Rate, High Return on capital
  - ii. Stock with high EV/EBITDA, High Tax Rate, Low Return on capital
  - iii. Stock with low EV/EBITDA, Low Tax Rate, High Return on capital
  - iv. Stock with high EV/EBITDA High Tax Rate, High Return on capital
  - v. Stock with low EV/EBITDA, High Tax Rate, Low Return on capital
- c. You are comparing two bank valuations. Both banks have the same expected growth rate and are viewed as equally risky. Bank A, though, has a return on equity of 20% whereas Bank B has a return on equity of 15%. Which of the following is most likely to be true?
- i. They should trade at the same PE ratio
  - ii. Bank A should have the higher PE ratio
  - iii. Bank B should have the higher PE ratio
- d. The PE ratio is divided by the expected growth rate to estimate the PEG ratio. Which of the following statements relating to the PEG ratio is true?
- i. Stocks that trade at a PEG ratio less than one are undervalued.
  - ii. Riskier stocks will tend to trade at higher PEG ratios
  - iii. The PEG ratio will increase as interest rates increase
  - iv. Stocks with very low growth rates will tend to have high PEG ratios.

3. Riberto Construction, a private construction company, is planning an initial public offering. The firm has a book value of equity of \$ 50 million and expects to earn \$ 10 million in net income next year. If the firm has a cost of equity of 12% and expects to grow 4% a year in perpetuity, what price to book value ratio would you expect the firm to trade at? (You can assume that the firm will maintain its return on equity and cost of equity in perpetuity) (2 points)

## Quiz 2: Equity Instruments

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

1. Yuvan Chemicals reported \$ 400 million in after-tax operating income on capital invested of \$ 5 billion in the most recent year. In the same period, capital expenditures amounted to \$ 250 million, depreciation was \$ 100 million and non-cash working capital increased by \$ 50 million. The company would like to maintain its existing reinvestment rate, but wants operating income to grow 30% next year. What return on capital will the firm have to generate to achieve this growth rate? (The return on capital will have to be the same on both new and existing investments).
2. You have been asked to review the terminal value calculation in a valuation done by another analyst. The analyst has the following estimates for net income and FCFE for the next 3 years:

	Year 1	Year 2	Year 3
Net Income	150	165	181.5
FCFE	50	55	60.5

To estimate the terminal value, the analyst has taken the FCFE in year 3 and grown it by 3% (the stable growth rate) and used a cost of equity of 8%. If the firm's return on equity will remain unchanged at current levels in perpetuity and the analyst's estimates of the FCFE for the high growth period are correct, estimate the correct terminal value of equity, using the perpetual growth rate of 3% and the cost of equity of 8%. (3 points)

3. Cryogenics Inc. has 100 million shares trading at \$ 5 a share. The firm has \$ 300 million in debt, \$ 150 million in cash and marketable securities and \$ 100 million in equity options outstanding. What value is the market attaching to the operating assets of the firm? (2 points)
4. VRW Inc. is an automobile company with a 60% holding in Centaur Steel. You have valued of the operating assets of the two companies as independent firms and also

collected the following information on the two companies (again as independent firms):

Company	Value of operating assets	Debt	Cash
VRW	\$ 1 billion	\$ 200 million	\$ 80 million
Centaur Steel	\$ 750 million	\$ 150 million	\$ 20 million

Estimate the value of equity in VRW Inc



## Quiz 2: Equity Instruments

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

1. You are valuing Valisco Enterprises, a troubled manufacturing firm and have projected out the following values for revenues, operating income and taxes for the next 3 years:

	1	2	3
Revenues	\$1,000	\$1,030	\$1,061
Pre-tax Operating Margin	-5.00%	1.00%	5.00%
EBIT	-\$50.00	\$10.30	\$53.05
Tax rate	0%	0%	40%

The firm has excess capacity in its manufacturing facilities and does not need to make any net capital expenditures or working capital investments for the next 3 years. Due to high leverage, the cost of capital for the next 3 years will be 12%. After year 3, revenues are expected to continue growing at the same rate as they did in the first 3 years, the pre-tax operating margin will stabilize at the 5% level, the tax rate will stay at 40% and the firm is expected to earn an after-tax return on capital of 10%, equal to its stable period cost of capital.

- a. Estimate the terminal value at the end of year 3. (2 points)
- b. Assume that the firm has \$25 million in cash and marketable securities, \$100 million in debt due and 10 million shares outstanding. Estimate the value per share today. (2 points)
- c. Now assume that part of the debt is in the form of publicly traded bonds, and that the firm has a 3-year zero coupon bond trading at \$600 (bond face value = \$1000). If the riskfree rate is 5%, estimate the value of equity per share allowing for the probability that the firm will not make it as a going concern. You can assume that the equity will be worth nothing in the event of default. (Hint: Global Crossing) (2 points)

2.. Zookin Technology is a gaming software company with no debt outstanding, after-tax operating income of \$ 100 million and a cash balance of \$250 million in the most recent year. The firm also has minority holdings in three entertainment software companies with a book value of \$ 50 million (reflecting what was originally invested in those companies). Entertainment software companies typically trade at 5 times book value.

- a. Assuming no growth in operating income and an 8% cost of capital, estimate the value of the operating assets at Zookin. (1 point)
- b. Factoring in the cash and minority holdings, estimate the value of equity at Zookin. (1 point)
- c. Zookin has 50 million shares outstanding. It also has 10 million options outstanding, with an exercise price of \$ 5 and 3 years left to expiration. Using the treasury stock approach, estimate the value per share. (1 point)
- d. Given the time premium on the option, using the treasury stock approach will lead you to
  - i. Understate the value per share
  - ii. Overstate the value per share
  - iii. Have no effect on the value per share

**Quiz 2: Equity Instruments**

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

1. Lodec Inc. is a small, publicly traded firm that is controlled and run by the Lodec family; they own the voting shares in the company and appoint all board members. Last year, the firm generated \$ 18 million in after-tax operating income on capital invested of \$ 300 million. The firm has a cost of capital of 10%.

a. Assuming that the current return on capital and cost of capital continue into perpetuity and that earnings will grow 3% a year forever, estimate the value of the firm today. (2 points)

b. Now assume that Lodic Inc. has \$ 50 million in debt outstanding, a cash balance of \$ 25 million and has a minority interest (recorded at book value) of \$ 20 million on the balance sheet. (The firm has consolidated financial statements and owns 60% of a publicly traded subsidiary with a market value of equity of \$ 100 million). Estimate the value of equity in Lodec Inc. ( 2 points)

2. You are valuing NuvoTel, a young, high growth technology company and have estimated the net income and cashflows to equity for the next 3 years. You also believe that the cost of equity (the firm is all equity funded), which is 20% today, will come down to 12% by the end of year 3.

Projected Cashflows (in Millions)

	1	2	3
Net Income	- 10	-5	+10
- Reinvestment	10	5	5
= FCFE	-20	-10	5
Cost of equity	20%	16%	12%

a. After year 3, you expect the firm to stay all equity funded with a cost of equity of 12% and anticipate the net income to grow 4% a year in perpetuity. If you believe that the firm cannot generate excess returns (i.e, will earn zero excess returns) in perpetuity, estimate the terminal value of equity. (2 points)

b. Given the expected cashflows and the terminal value of equity (from part a), estimate the value of equity today. (2 points)

c. Now assume that the firm has 10 million shares outstanding today, and has granted 2 million options to its top management; the exercise price of the options is \$ 2/share. Furthermore, analysts are predicting that they will have to issue 8 million additional shares over the next 2 years (to cover their reinvestment needs). Using the treasury stock approach, estimate the value of equity per share today. (2 points)

## Quiz 2: Valuation

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

You have been asked to value Ruiz Enterprises, a small publicly traded retail company, and have been provided with the following estimates of earnings and cash flows for the company for the next 3 years:

<i>Expected growth</i>		8%	8%	8%
EBIT (1-t)	\$300.00	\$324.00	\$349.92	\$377.91
+ Depreciation	\$50.00	\$54.00	\$58.32	\$62.99
- Cap Ex	\$175.00	\$189.00	\$204.12	\$220.45
- Change in WC	\$75.00	\$81.00	\$87.48	\$94.48
FCFF	\$100.00	\$108.00	\$116.64	\$125.97
Cost of capital		12%	11%	10%

- a. Assuming that the firm has a stable return on capital, estimate the return on capital that the analyst is assuming for the first 3 years. (2 points)
- b. Now assume that cash flows after year 3 will grow 4% a year forever and that the return on capital used for the first three years will be earned in perpetuity on new investments. Estimate the terminal value for the firm. (2 points)
- c. Ruiz Enterprises owns 75% of a Cora Inc, a private retail business, and the numbers in the table provided on the last page reflect full consolidation. Ruiz Enterprises does show minority interests of \$ 250 million on its balance sheet; the typical price to book value ratio for retail firms is 2.0. Assuming that Ruiz has \$ 1 billion in debt and \$ 400 million in cash outstanding currently, estimate the value of equity in the company. (2 points)
- d. Finally, assume that Ruiz has 80 million shares outstanding today, and 20 million options that it has issued to managers over time, with an average strike price of \$ 20 and 3 years left to expiration. If each option has a value of \$10, estimate the value of equity per share. (1 point)
- e. Ruiz Enterprises has its cash balance of \$ 400 million invested in treasury bills, earning 2% a year. An analyst argues that the market will discount the cash because the returns on cash are much lower than the returns that the firm is generating on its operating assets. Do you agree? (1 point)
  - i. Yes
  - ii. No

Explain:

- f. As a final iteration, Ruiz is considering selling off some its more unprofitable stores to a competitor for \$ 250 million. The stores account for 10% of the current after-tax operating income but the earnings at these stores are flat (there is no growth expected, but the earnings will continue in perpetuity). Assuming that the cost of capital for these stores is 10% forever, what effect will this divestiture have on the value per share? (2 points)

## Quiz 2: Valuation

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

1. You have been asked to value a Genius Media, a high growth technology firm, and have been able to estimate the expected revenues, EBIT and reinvestment (includes net cap ex and working capital changes) for the next 3 years (in millions):

	1	2	3
Revenues	\$600	\$900	\$1,000
EBIT	-\$100	\$100	\$150
Reinvestment	\$100	\$150	\$50

- a. Assuming that the firm currently has a NOL (Net Operating Loss Carried forward) of \$ 50 million and that it faces a marginal tax rate of 40%, estimate the free cash flows to the firm each year for the next 3 years. (2 points)
- b. The firm is all equity funded and is expected to have a cost of capital of 15% in year 1, 12% in year 2 and 10% thereafter (forever). Estimate the present value of the expected cash flows for the next 3 years. (1 point)
- c. The firm is expected to be in stable growth after year 3, growing 3% a year thereafter. Assume that the book value of capital invested in the firm right now is \$ 472.50 million and that the return on capital in year 4 (based on your after-tax operating income in year 4 and capital invested at the start of that year) will be sustainable forever after year 3. Estimate the terminal value of the firm (at the end of year 3). (3 points)
- d. Genius Media has a cash balance of \$ 80 million and also owns 10% of an entertainment software firm. This 10% holding is recorded at its book value of \$ 40 million and the average price to book ratio of entertainment software firms is 2.5. Finally, a competitor has sued Genius Media, claiming patent infringement; there is a 25% probability that Genius Media will lose the lawsuit, in which case it will have to pay out \$ 100 million in damages. Estimate the value of equity in the firm today. (3 points)
- e. The firm has 100 million shares outstanding and 10 million options outstanding, with a strike price of \$ 6. Using the treasury stock approach, estimate the value of equity per share. (1 point)

## Quiz 2: Equity Instruments

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

1. Maple Telecom is in significant financial trouble. It reported operating losses of \$ 20 million in the most recent year on revenues of \$ 100 million. The total book value of capital invested in the firm today is \$ 190 million. Assuming that the firm will revert back to health in 3 years, you have forecast revenues, after-tax operating income and reinvestment, as well as the cost of capital:

	Year 1	Year 2	Year 3
Revenues	\$150	\$160	\$180
EBIT (1-t)	-\$15	\$15	\$25
+ Depreciation	\$15	\$20	\$25
- Cap Ex	\$5	\$25	\$40
FCFF	-\$5	+\$10	\$10
Cost of capital	14%	12%	10%

- a. Estimate the present value of the free cash flows to the firm over the first 3 years. (1 point)
- b. Estimate the after-tax return on capital in year 3 (Return on capital in year 3 is defined as  $EBIT(1-t)$  in year 3 / Book value of capital at the end of year 3). (1 point)
- c. Estimate the terminal value of the firm at the end of year 3, assuming that the firm will be able to grow at 2.5% a year and maintain the return on capital and cost of capital it had in year 3. (2 points)
- d. Maple Telecom has \$ 25 million in cash and debt with a market value of \$ 75 million. If there are 20 million shares outstanding, estimate the value of equity per share. (1 point)

2. You are analyzing Valero Oil, a Venezuelan oil company that is expected to generate \$ 120 million in free cash flow to equity next year; the cost of equity is 10% and the expected growth rate in perpetuity is 4%. The company has 100 million shares, trading at \$15 a share. Assuming that both your estimate of equity value and the market price are right, estimate the probability that Valero Oil will be nationalized (with the assumption that the equity will be worth nothing in the event of nationalization). (2 points)

3. Opportunities Fund is a closed end mutual fund that holds marketable securities of \$ 200 million and has 20 million shares outstanding. The fund has consistently earned 2% less than its risk-adjusted required return in the past and you expect it to continue to deliver these sub-par returns in perpetuity. If the fund has a beta of 1.5, the riskfree rate is 3% and the equity risk premium is 6%, estimate the discount on this fund (assuming the fund will stay at its existing size forever). (1 point)

4. Gerlach Chemicals is a chemical company that owns 70% of Adler Steel, a publicly traded steel company. Using the consolidated financial statements for Gerlach Chemicals, you have estimated a present value of the free cash flows to the firm of \$ 1500 million; the firm reported \$ 200 million in cash, \$ 300 million in debt and \$ 150 million as a minority interest on its (consolidated) balance sheet. Assuming that steel companies trade at 1.6 times book value, estimate the value of equity in Gerlach Chemicals. (2 points)



**Quiz 2: Valuation**

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

1. Limroth Enterprises is a family-run, publicly traded company that expects to generate \$ 60 million in after-tax operating income next year on capital invested of \$ 1 billion. The firm has a cost of capital of 10% and expects to maintain its current return on capital, while growing 2% a year in perpetuity.
  - a. Estimate the value of the operating assets of the firm. (2 points)
  - b. Now assume that Limroth Enterprises has \$ 100 million in cash and marketable securities and that you believe that there is a 60% chance that management will reinvest this cash to generate returns to similar to what they are earning on their existing operating assets (in investments with a similar risk profile); there is a 40% probability that the cash will remain invested in commercial paper and T.Bills, earning 1%. How much value would you attach to the cash? (2 points)
  
2. You have just valued the operating assets of Giovanni Inc. to be \$ 1.2 billion, using its consolidated financial statements to estimate free cash flows to the firm and discounting back at the appropriate cost of capital. You have been provided with the following additional information:
  - Giovanni owns 75% of Lonza Enterprises; this is the holding that is fully consolidated in Giovanni's financials and the minority interest in this holding, reported on the balance sheet, is \$ 100 million. Lonza Enterprises is expected to generate \$ 40 million in after tax cash flow next year, growing at 2% a year, with a cost of capital of 10%.
  - Giovanni has \$ 300 million in debt outstanding and a cash balance of \$ 100 million; both items are from the consolidated financial statements.
  - Giovanni has 100 million shares outstanding. It also has 20 million employee options that are outstanding, with an estimated value of \$5/option.Estimate the value per share at Giovanni Inc. (3 points)
  
3. You are trying to value Drake Drugs, a pharmaceutical company, and have computed the value for the operating assets to be \$ 1 billion, based upon the assumption that the firm is in stable growth, growing 2% a year, with a cost of capital of 10% and a return on capital of 20%. For the cash flows and the growth rate, you used conventional accounting statements to estimate a reinvestment rate and the return on capital. If you capitalize R&D, you expect your reinvestment rate to double and your return on capital to drop to 12.5%. What effect will R&D capitalization have on the estimated value of the operating assets, assuming that the firm is still in stable growth?

## Quiz 2: Valuation

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

1. Black Reed Inc. is a publicly traded company that reported an operating loss on revenues of \$ 1 billion in the most recent time period. You expect revenues to grow at 2% a year in perpetuity and you also expect the firm to turn from operating losses to operating profits over the next 5 years:

	1	2	3	4	5
Revenues (in millions)	\$1,020.00	\$1,040.40	\$1,061.21	\$1,082.43	\$1,104.08
Pre-tax Operating margin	-3.00%	-1.00%	2.00%	5.00%	8.00%

The firm has a net operating loss of \$30 million to carry forward and expects to pay a marginal tax rate of 40%, once it has absorbed these losses. If the sales to capital ratio on incremental revenues is expected to be 2.00 for the next 5 year, **estimate the free cash flows to the firm for each of those years.** (3 points)

2. Litfast Technology is a small software company that has 100 million shares trading at \$9/share, \$300 million in debt outstanding and \$100 million in cash & marketable securities. The company also has 20 million options that you have valued at \$5/option; you used an option pricing model to arrive at this estimate. Assuming that the company's shares and options are fairly valued, that it has a cost of capital of 10%, a return on capital of 20% and an expected growth rate of 2% in perpetuity, **estimate the expected after-tax operating income next year.** (3 points)

3. Juno Enterprises is a publicly traded company that owns 60% of Vellum Inc., another publicly traded company. They are both stable growth companies, growing 2% a year in perpetuity, with a cost of capital of 10%. The table below lists key numbers for Juno (consolidated) and Vellum:

	Juno (consolidated)	Vellum (stand alone)
Operating income (after-tax)	\$ 110 million	\$20 million
Book value of Equity	\$ 1000 million	\$ 100 million
Debt	\$225 million	\$ 50 million
Cash	\$100 million	\$ 25 million

Assuming that Juno has 100 million shares outstanding, **estimate the value per share for Juno.** (4 points)

**Quiz 2: Valuation**

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

1. You have been asked to value Cyriac Inc., a young, high growth company and have been provided with the following estimates for revenues, operating income, cash flows and cost of capital for the company:

	1	2	3	4	5
Revenues	\$500	\$750	\$1,000	\$1,200	\$1,250
Operating Income after taxes	\$10	\$23	\$35	\$40	\$50
- Reinvestment	\$30	\$25	\$25	\$20	\$20
= FCFF	-\$20	-\$3	\$10	\$28	\$30
Cost of capital	12%	11%	10%	9%	8%

The firm currently has a book value of equity of \$250 million, debt outstanding of \$150 million and \$20 million as a cash balance. Assuming that the return on capital that the firm earns in year 5 (obtained by dividing the after-tax operating income in year 5 by the invested capital at the end of year 5) will be the return on capital in perpetuity and that the cost of capital in year 5 will be the stable period cost of capital, estimate the present value of the terminal value (at the end of year 5) for the firm with a 3% growth rate in perpetuity. (3 points)

2. You are reviewing the valuation of Simca Inc., a beverage company with a 75% cross holding in a LightEat Inc, a restaurant chain. Using Simca's parent company financials (not consolidated) and LightEat's financials, you have obtained the following:

	Simca (Parent)	LightEat
DCF value of the operating assets	\$1,500.00	\$600.00
Debt	\$500.00	\$300.00
Cash	\$200.00	\$100.00
Number of shares	100.00	50.00

Estimate the value per share in Simca. (2 points)

3. Raza Automobiles is an auto parts company that reported an operating loss of \$20 million on revenues of \$ 1 billion, largely due to the economy being in recession. The company is a mature company, with revenues growing at 3% a year in perpetuity and a cost of capital of 9%; it has debt outstanding of \$ 250 million and a cash balance of \$100 million. There are 30 million shares trading at \$20/share. If the market is pricing the stock correctly assuming that the company will return to earnings its "normal" after-tax operating margin over the economic cycle next year and that the company will generate no excess returns in perpetuity, estimate that "normal" after-tax operating margin. (2 points)

4. Cosli Inc. is a mature company with “bad” management in place, with the possibility of a management change. You have the following information:
- a. With existing management in place, the company expects to generate \$25 million in after-tax operating income next year, reinvest \$10 million of that income and generate a growth rate of 2% a year in perpetuity. It has a cost of capital of 8%.
  - b. With “new” management in place, the company expects to generate the same after-tax operating income next year and have the same growth rate in perpetuity, but to double its return on capital from existing levels. Its cost of capital will stay at 8%.

If there is a 40% chance that there will be a management change, estimate the expected value of the operating assets today. (3 points)

## Quiz 2: Valuation

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

1. You are valuing HikeMeet Inc., a social media site for people who like the outdoors (Ironic, right?). The company had revenues of \$10 million in the year that just ended, but has projected revenues and pre-tax operating income (in millions) for the next three years:

	1	2	3
Expected revenues	\$40	\$75	\$100
Pre-tax Operating Income	-\$10	\$10	\$30

- The company currently has a NOL (Net Operating Loss carried forward) of \$20 million and a book value of equity of \$15 million, no debt outstanding and a cash balance of \$10 million. If the company maintains its current sales to invested capital ratio for the next 3 years and faces a tax rate of 25% (both marginal & effective), estimate the free cash flow to the firm each year for the next 3 years. (3 points)
2. Capri Inc. is a beverage company that holds a 75% stake in a TrueSmoke, a tobacco company. In Capri's consolidated financial statements, the company is expected to generate an after-tax operating income of \$25 million next year, which it expects to grow 2% in perpetuity thereafter. The return on capital, from the consolidated statements, is 10% and the cost of capital for the consolidated company is 7%. You are also provided with the following additional information:
- The net debt (debt minus cash) outstanding at the consolidated company is \$100 million, of which \$25 million is TrueSmoke's debt.
  - You don't have access to TrueSmoke's financials but the company is publicly traded and has a total market value of equity of \$200 million.
  - Capri has 25 million shares outstanding and 10 million options (with an estimated value of \$2.5/option).
- Estimate the value per share of equity in Capri. (4 points)
3. Domino Media is a highly levered telecomm company that is expected to generate \$30 million in free cash flow to the firm next year, growing at 3% a year in perpetuity with a cost of capital of 9%. The company has debt outstanding of \$350 million, a cash balance of \$50 million and 10 million shares outstanding. If the shares are currently trading at \$15/share and you believe that the market is correctly pricing the shares, given the risk that Domino Media will go bankrupt, estimate the probability of bankruptcy. (You can assume that the equity will be worth nothing in the event of bankruptcy). (3 points)

## Quiz 2: Valuation

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

1. You have been given the free cash flows for the next three years for Postum Inc., a firm that is expected to have three years of high growth:

	Base year	1	2	3
Expected growth		6.00%	6.00%	6.00%
EBIT (1-t)	\$100.00	\$106.00	\$112.36	\$119.10
- Reinvestment	\$40.00	\$42.40	\$44.94	\$47.64
FCFF	\$60.00	\$63.60	\$67.42	\$71.46

Assuming that the company's return on capital will stay unchanged forever and that the cost of capital is 8%, estimate the terminal value for the firm, i.e., the value at the end of year 3, if the growth rate beyond year 3 is 3% in perpetuity. (3 points)

2. You are trying to value Xena Inc, a firm with cross holdings, and are trying to derive the value of its equity;
- It owns 25% of Clio Inc. and this investment is recorded as a minority passive investment.
  - It owns 75% of Lomax Inc., and this investment is fully consolidated into Xena's financials.

Assume that you discount free cash flows to the firm at the cost of capital and arrive at the following valuations for the three companies:

	PV of FCFF @ WACC	Cash	Debt
Xena (consolidated)	\$1,500.00	\$300.00	\$500.00
Clio	\$750.00	\$200.00	\$150.00
Lomax	\$1,000.00	\$100.00	\$200.00

Estimate the value of equity in Xena Inc. (3 points)

3. You have been asked to value Clarion Bank, a publicly traded bank that generated \$100 million in net income in the most recent year on a regulatory capital base of \$1 billion (you can assume that this is also the book value of equity). Over the next three years, you expect net income to grow 10% a year and regulatory capital (and book equity) to increase 5% a year.
- Estimate the FCFE each year for the next three years. (1.5 points)
  - At the end of year 3, you expect the bank to be in stable growth, growing 3% a year, while maintaining the return on equity it generated in year 3. If the cost of equity is 8%, estimate the value of equity at the end of year 3. (2.5 points)

## Quiz 2: Valuation

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

1. You are valuing GeneTech, a very young biotechnology firm, with no revenues. The company has a blockbuster drug working its way through the pipeline and if it is approved (approximately 5 years from now), it expects to generate \$1 billion in after-tax cash flows from the drug every year for the following 15 years. The cost of capital of small pharmaceutical companies is 10% and there is only a 60% chance that the drug will be approved. GeneTech has very little cash, no debt and 100 million shares outstanding. Estimate the value per share today, assuming that the blockbuster drug is its only potential product. (2 points)

2. You have just completed an intrinsic valuation (discounting FCFE at the cost of capital) of the operating assets of Magna Inc., a battery manufacturer, and arrived at a value of \$500 million. You have a few loose ends that you have to take into account:

- Cash balance: The current cash balance is \$50 million. The company historically has earned roughly its cost of capital on investments.
- Debt and other liabilities: There are two liabilities on the balance sheet: accounts payable of \$25 million (which you included in your working capital computation for cash flows) and interest bearing debt of \$100 million (in market value terms).
- Lawsuit: The company is the target of a lawsuit. The lawyers assess a 25% chance that you will lose this suit and a \$160 million payout if you do.
- Cross holdings: Magna owns 80% of Electra Retail, a small retail chain, and consolidates its financials (which you used in your valuation). Electra Retail is publicly traded and has 40 million shares trading at \$10/share.
- Shares outstanding: There are 70 million shares outstanding as well as 5 million employee options; the average strike price on the options is \$4/share, the average expiration is in 3 years and the value per option is \$2).

Estimate the value of equity per share in Magna. (3 points)

3. Allwyn Housing is a construction supplies company that has been hit by the slowing down of the housing market. The company has been losing money for a while and has accumulated a net operating loss carry forward of \$40 million (including the most recent year's loss). In the most recent year, the company reported EBITDA of \$12.5 million on revenues of \$500 million and had a depreciation charge of \$40 million. Over the next 3 years, the company expects the following:

- Sales will increase 5% a year for the next 3 years
- The EBITDA margin (EBITDA/Sales) will double each year for the next 3 years.
- The company has excess capacity and will not make any capital expenditures for the next 3 years and depreciation is expected to remain \$40 million each year for this period.
- The company currently has inventory of \$50 million (and no other working capital). This inventory will decrease \$10 million each year for the next 3 years.
- The marginal tax rate that the company will face when it has taxable income is 40%.

- a. Estimate the free cash flows to the firm each year for the next 3 years. (2 points)
- b. Now assume that at the end of 3 years, the company will be mature and that its operating income will grow 2% a year in perpetuity, while earning its cost of capital. If the cost of capital in stable growth is 8%, estimate the terminal value. (1.5 points)
- c. Assume that the cost of capital for the next 3 years is 12%. How much value would you attach to having the NOL carry forward of \$40 million? (1.5 points)