

# **FINAL EXAM SOLUTIONS**

Finance 70610 – Equity Valuation

Mendoza College of Business  
Professor Shane A. Corwin  
Fall Semester 2005 – Module 2

Wednesday, December 7, 2005

## **INSTRUCTIONS:**

1. You have 2 hours to complete the exam.
2. The exam is worth a total of 200 points.
3. You may use a calculator and a formula sheet. You must hand in the formula sheet with your exam (put your name on it).
4. Allocate your time wisely. Use the number of points assigned to each problem as your guide.
5. In order to get full credit on the problems, you must show ALL your work!

1. (20 points) Relative Valuation and the Price-to-Earnings Ratio:

- a) (8 points) Beginning with a constant-growth dividend discount model, derive an equation that shows the fundamental determinants of the Price-to-Earnings ratio.

$$P = \frac{Div_1}{K_e - g} = \frac{EPS_0(1+g)\left(1 - \frac{g}{ROE}\right)}{K_e - g}$$
$$\frac{P}{EPS_0} = \frac{(1+g)\left(1 - \frac{g}{ROE}\right)}{K_e - g}$$

- b) (8 points) Based on the equation you described above, estimate the expected PE Ratio for a firm with a cost of equity of 10%, an ROE of 18%, and an expected long-term growth rate of 7% (in perpetuity).

$$\frac{P}{EPS_0} = \frac{(1.07)\left(1 - \frac{.07}{.18}\right)}{.10 - .07} = 21.80$$

- c) (4 points) If the firm's actual PE ratio (based on the current stock price) is 16, would you conclude that the firm is correctly valued, overvalued, or undervalued?

The actual PE ratio of 16 is significantly below the estimated PE ratio of 21.8. This suggests that the company is undervalued.

2. **(12 points) Cost of Equity:**

You are valuing a division that is about to be spun off into a public company. The average levered Beta of firm's in the same industry is 1.24 and the average debt-to-equity ratio of firms in the industry is 65%. The marginal tax rate is 40% for both the new firm and the industry. Estimate the cost of equity for this firm assuming the firm has no debt, the risk-free rate is 4.5%, and the market risk premium is 4.84%.

$$\beta_L = \beta_U \left(1 + \frac{D}{E}(1-T)\right)$$
$$\beta_U = \beta_L \left(\frac{1}{1 + \frac{D}{E}(1-T)}\right) = 1.24 \left(\frac{1}{1 + .65(1-.4)}\right) = 0.892$$
$$K_e = 1.5\% + 0.892(4.84\%) = 8.818\%$$

3. **(12 points) Valuation Assumptions:**

You are reading an analyst report suggesting that Coca Cola stock is substantially undervalued. The analyst is using a two-stage FCFE model, with high growth at 10% for 7 years and stable growth at 4% thereafter. The analyst assumes that net capital expenditures and changes in working capital increase at the same rate as earnings during the high growth period and drop to zero during stable growth. The analyst also assumes that the firm's cost of equity equals 8.3% during the high growth period and drops to the Treasury Bond rate of 4.5% once the firm reaches stable growth.

Briefly describe the two most significant flaws in this analyst's reasoning and how you would fix them.

Growth cannot be 4% in stable growth with zero reinvestment. Either set growth to zero, or allow for some reinvestment.

You cannot discount risky cash flows at the risk-free rate of 4.5%. Use CAPM to determine the cost of equity.

4. **(10 points) The Implied Equity Risk Premium:**

The current level of the Russell 3000 Index is 736.99 and the long-term Treasury yield is 4.5%. The aggregate dividend yield (plus stock repurchases) on the Russell Index during the next year is expected to be 3.1% (of the current index value) and this payout is expected to grow at a rate of 5% in perpetuity. Use this information to calculate the implied equity risk premium for the U.S. market.

$$R = g + \frac{Div_1}{P} = .05 + .031 = 8.1\%$$

$$R - R_f = 8.1\% - 4.5\% = 3.6\%$$

5. **(16 points) Holdings in Other Firms:**

- a) (6 points) You are analyzing a firm that has increased its holding in a subsidiary from 30% to 60%. Briefly describe how this holding would be reflected in the parent firm's financial statements before and after the ownership change.

Before the change, this would be a minority active investment recorded with the "equity method". After the change, this would represent a majority active investment and the financial statements would be fully consolidated.

- b) (10 points) Using a FCFF model, you estimate that the present value of operating cash flows for Buckeye Corp. is \$2.5 billion. The firm also reports a 35% minority stake in Big Ten International and a 90% stake in BCS Inc. Buckeye Corp's consolidated balance sheet reports a minority interest of \$14.5 million related to the holding in BCS Inc. You estimate the market value of Big Ten to be \$400 million and the market value of BCS to be \$200 million. What is the total firm value of Buckeye Corp. after accounting for holdings in other firms.

$$2500 + .35(400) - .10(200) = \$2620$$

---

**Taser Valuation Questions:**

Questions 6 through 11 are all related to the Valuation of Taser International. While some of the questions are linked, an error made on one question will not be compounded on subsequent problems. In other words, I will count a number wrong only once. If you are unable to answer any one of these questions, just make any assumptions necessary to complete the remaining questions.

---

**6. (8 points) Valuation of Taser International – Part I (Historical Growth):**

The table below shows Net Income for Taser International from 2001 through 2004.

Year	Net Income (thousands)
2001	515
2002	209
2003	4,454
2004	19,125

Calculate the geometric average annual growth rate during this period.

$$\bar{R}_G = \left( \frac{19125}{515} \right)^{\frac{1}{3}} - 1 = 233.63\%$$

*or*

$$\bar{R}_G = [(1 - .594)(1 + 20.311)(1 + 3.294)]^{\frac{1}{3}} - 1 = 233.63\%$$

7. **(20 points) Valuation of Taser International – Part II (R&D Adjustment):**

The table below shows annual R&D expenses for Taser International from 2000 through 2004.

Year	R&D Expense (thousands)
2000	0
2001	43
2002	137
2003	498
2004	824

- a) (10 points) Calculate the R&D Amortization amount for 2004, assuming a three-year amortizable life for R&D.

$$1/3(43) + 1/3(137) + 1/3(498) = \$226,000$$

- b) (10 points) Calculate the unamortized amount of R&D on the balance sheet as of year-end 2004.

$$100\%(824) + 66.67\%(498) + 33.33\%(137) = \$1,201,667$$

8. **(22 points) Valuation of Taser International – Part III (FCFE):**

Additional information from Taser's 2004 financial statements is shown below. Use this information and the R&D adjustments you estimated in the previous question to address the questions below.

	2004 (in thousands)
Net Income	19,125
Expenditures on PP&E	11,322
Depreciation	552
Change in Working Capital	6,926
Acquisition Costs	100

- a) (8 points) Calculate the adjusted Net Income for Taser in 2004 (after adjusting for the capitalization of R&D).

$$\begin{aligned}
 & \$19,125,000 \\
 & + 824,000 \\
 & - 226,000 \\
 & = \$19,723,000
 \end{aligned}$$

- b) (14 points) Calculate the Free Cash Flow to Equity (FCFE) for Taser in 2004 (including any necessary adjustments). Assume Taser has no debt.

$$\begin{aligned}
 & 19,723,000 \\
 & - (11,322,000 - 552,000) \\
 & - (824,000 - 226,000) \\
 & - 6,926,000 \\
 & - 100,000 \\
 & = \$1,329,000
 \end{aligned}$$

9. **(24 points) Valuation of Taser International – Part IV (Fundamental Growth):**

Use the information provided below and your answers to questions (7) and (8) to address the following questions.

- a) (8 points) The book value of equity was \$27.427 million as of year-end 2003 and \$97.122 million as of year-end 2004. Calculate the Return on Equity (ROE) for Taser in 2004 (including any necessary adjustments). For simplicity, assume that the R&D adjustments in 2003 are the same as those in 2004.

$$\begin{aligned} BkEquity_{2003} &= 27,427,000 + 1,201,667 = 28,628,667 \\ BkEquity_{2004} &= 97,122,000 + 1,201,667 = 98,323,667 \\ AvgBkEquity &= (28,628,667 + 98,323,667) / 2 = 63,476,167 \end{aligned}$$

$$ROE = \frac{NetIncome}{BkEquity_{2003}} = \frac{19,723,000}{28,628,667} = 68.89\%$$

or

$$ROE = \frac{NetIncome}{AvgBkEquity} = \frac{19,723,000}{63,476,167} = 31.07\%$$

- b) (8 points) Calculate the Equity Reinvestment Rate for Taser in 2004 (including any necessary adjustments). Again, assume the firm has no debt.

$$\begin{aligned} EquityReinvestmentRate &= \frac{(11,322,000 - 552,000) + (824,000 - 2226,000) + 6,926,000 + 100,000}{19,723,000} = 93.26\% \end{aligned}$$

- c) (8 points) Based on your answers to parts (a) and (b), estimate the expected fundamental growth rate in Net Income. Assume that ROE is not expected to change in the future.

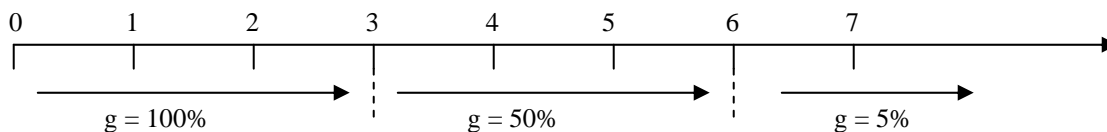
$$Growth = .6889 \times .9326 = 64.2\%$$

or

$$Growth = .3107 \times .9326 = 28.98\%$$

10. **(36 points) Valuation of Taser International – Part V (Discounted Cash Flows):**

You decide to value Taser using a three-stage FCFE model. During the first stage, you expect FCFE to grow at the extraordinary rate of 100% per year. You expect this stage to last for three years. This will be followed by a second stage of more moderate growth of 50% per year. This second stage will also last for three years. Finally, you expect the firm to reach stable growth starting in year seven, with FCFE growing at a stable rate of 5% in perpetuity.



Enter your FCFE estimate from question (8b) here (or assume a value): \$1,329,000

Using this value as your year 0 cash flow, estimate the present value of Taser's equity cash flows. Assume that Taser's cost of equity is 12.2% and is not expected to change.

$$CF_1 = 1329000(1 + 1) = 2658000$$

$$PV_{HighGrowth} = 2658000 \left( \frac{1 - \left( \frac{1+1}{1+.122} \right)^3}{.122 - 1} \right) = 14,119,000$$

$$CF_4 = 1329000(1 + 1)^3 (1 + .5) = 15,948,000$$

$$PV_{Stage2} = 15948000 \left( \frac{1 - \left( \frac{1.5}{1.122} \right)^3}{.122 - .5} \right) \div (1.122)^3 = 41,503,000$$

$$CF_7 = 1329000(1 + 1)^3 (1 + .5)^3 (1 + .05) = 37,677,150$$

$$TV_6 = \frac{37677150}{.122 - .05} = 523,293,000$$

$$PV_{TV} = \frac{523293000}{(1.122)^6} = 262,294,000$$

$$TotalValue = 14,119,000 + 41,503,000 + 262,294,000 = \$317,916,000$$

11. **(16 points) Valuation of Taser International – Part VI (Price Per Share):**

Taser has cash and marketable securities worth \$31.96 million, no debt, and 57.2 million shares outstanding. The firm also has a total of 5.645 million employee options outstanding, with an average exercise price of \$3.19. The firm's tax rate is 39%.

- a) (8 points) Estimate the price per share for Taser using the "Fully-Diluted" method to incorporate employee stock options.

$$\frac{317,916,000}{(5,645,000 + 57,200,000)} = \$5.059$$

Note : This assumes that income from cash and marketable securities was included in Net Income (and cash flows). If this income was not included, then the value of cash and marketable securities (31.96) would be added to the numerator.

- b) (8 points) Using the Black-Scholes model, you estimate that each employee option is worth \$5.20. Estimate the price per share for Taser based on this estimate of option value.

$$\frac{317,916,000 - (5,645,000)(5.20)(1 - .39)}{57,200,000} = \$5.245$$

Note : This assumes that income from cash and marketable securities was included in Net Income (and cash flows). If this income was not included, then the value of cash and marketable securities (31.96) would be added to the numerator.