

Corporate Finance

Name:

Question 1. The cost of capital (8 points)

St. Claire Enterprises is a levered firm. The equity cost of capital for St. Claire is 7%. The debt cost of capital for St. Claire is 2%. Assume the CAPM is correct and that the market risk premium is positive. Also assume the risk-free rate is positive, but do not make any assumption about the magnitudes of the market risk premium or the risk-free rate. Explain why it is highly unlikely that the stock return has a negative market beta.

Question 2. Volatility (8 points)

Safety First, Inc. has unlevered free cash flows of \$3MM per year. These cash flows will be received in perpetuity and are risk-free. SuperRisky, Inc. has expected unlevered free cash flows of \$3MM per year. Each annual cash flow has a standard deviation of 30%. The uncertainty in these cash flows is entirely idiosyncratic. The risk-free rate is 2% per year. The aggregate stock market has a standard deviation of 15% per year and has an expected return of 6% per year. What is the ratio of the unlevered value of Safety First to the unlevered value of SuperRisky? **SHOW YOUR WORK!**

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- c. (3 points) Does issuing this bond make equityholders better off, worse off, or are they indifferent to it? You can answer this question either by referring to your calculations in part (b) or making a more general argument. **SHOW YOUR WORK!**
- d. (4 points) Assume for part (d) that the firm has chosen to not issue the bond. Also assume that Hopkins, Inc. has an opportunity to modify its existing project. It can, without investing any resources, increase substantially the uncertainty in the project's future cash flow. If it chooses to do this, there is a 40% probability that the single cash flow equals \$200. There is a 60% probability that the single cash flow equals zero. This uncertainty is completely idiosyncratic. What is the NPV of increasing the uncertainty of the cash flows? Will the firm choose to increase the uncertainty of the cash flows? **SHOW YOUR WORK! REMEMBER TO ANSWER BOTH QUESTIONS!**

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- e. (12 points) Now repeat question (b), but assume that outside investors know that Hopkins has the option to modify its existing project to raise the cash flow's uncertainty, as described in part (d). What will be the sale price of the bond? **SHOW YOUR WORK!**

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- f. (6 points) Does issuing this bond make equityholders better off, worse off, or are they indifferent to it? You can answer this question either by referring to your calculations in part (e) or by making a more general argument. **SHOW YOUR WORK!**
- g. (5 points) What perfect-market assumption of Modigliani and Miller is violated in this problem?

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- h. (10 points) Now assume that the firm is considering issuing a one-year convertible bond. The bond promises to pay \$50 at maturity. But at maturity, bondholders can choose to trade in the bond for 8 (eight) shares of company stock. If it chooses the exchange, the bond obligation will be cancelled and the firm will issue eight new shares, raising the total number of shares to 18. The original shareholders will retain 10 of the shares, hence bondholders will own $\frac{8}{18}$ of the firm. Keep the assumption that outside investors know that Hopkins has the option to modify its existing project to raise the cash flow's uncertainty, as described in part (d). What will be the sale price of the convertible bond? Will bondholders ever choose to exercise their option to convert the bond into stock? **SHOW YOUR WORK! REMEMBER TO ANSWER BOTH QUESTIONS!**

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Question 4. Believe it or not

JHU Home Furnishings, Inc., is considering adding a new line of beds to sell in their stores. Adding this new line will have the same economic risk as JHU's existing business. Adding the line will require an immediate (year-zero) expenditure of \$10MM. The firm's expectation is that the new line will produce incremental EBIT of \$4MM per year forever (in perpetuity). For simplicity, assume that the first expected EBIT of \$4MM is received one year from today, and subsequent EBIT is received at annual increments. Also for simplicity, assume that capital expenditures are expected to exactly offset depreciation and that the firm expects no changes will be required in its level of working capital.

JHU's existing capital structure is composed of \$80MM in equity and \$30MM in net debt. It currently has 1MM shares of equity. The unlevered cost of capital is 8% and JHU's debt is risk-free with an interest rate of 2%. The corporate tax rate is 30%. There are no personal taxes.

- a. (8 points) JHU plans to pay for the initial investment by selling new shares of stock. When the firm announces its plan to sell additional shares, it also announces the new project and the expected cash flows. Assume that outside investors were not expecting the additional product line from the firm. If outside investors believe the firm's projections, what will be the new stock price immediately after the announcement? **SHOW YOUR WORK!**

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- b. (5 points) Given the assumptions of part (a), how many shares will JHU sell? Immediately after the firm makes the initial investment, what will be the enterprise value of the firm? **SHOW YOUR WORK! REMEMBER THERE ARE TWO QUESTIONS TO ANSWER!**
- c. (6 points) Suppose that after hearing JHU's announcement, outside investors believe the incremental EBIT from JHU's new product line will be only \$1MM/year. What will be the new stock price immediately after the announcement? **SHOW YOUR WORK!**

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- d. (4 points) Given the assumptions of part (c), how many shares will JHU sell? Immediately after the firm makes the initial investment, what will be the enterprise value of the firm? **SHOW YOUR WORK! REMEMBER THERE ARE TWO QUESTIONS TO ANSWER!**
- e. (6 points) Assume that part (c) describes outside investors' initial expectations, and that the firm issues shares as in part (d). Within a few days after the initial investment of \$10MM, new information reveals to outside investors that the firm's projections of future EBIT are accurate. What is the stock price when this information is revealed? What is the enterprise value of the firm? **SHOW YOUR WORK! REMEMBER THERE ARE TWO QUESTIONS TO ANSWER!**

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- f. (8 points) Suppose JHU instead pays for the initial investment by issuing \$10MM in perpetual risk-free debt. After the new information discussed in part (e) is revealed, what is the firm's stock price? What is the enterprise value of the firm? Comparing your answers with those in part (e), what are the two advantages of debt financing in this case? **SHOW YOUR WORK! REMEMBER THERE ARE THREE QUESTIONS TO ANSWER!**

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Question 5. Chaska Bricks

Chaska Bricks Inc. is a levered firm. The expected return to its equity is 12% per year and the expected return to its debt is 8% per year. The market capitalization of its equity is \$200MM. The firm has an enterprise value of \$300MM. The firm is profitable and has a corporate tax rate of 35%. There are no personal taxes.

- a. (4 points) What is the firm's weighted average cost of capital? **SHOW YOUR WORK!**
- b. (5 points) Chaska Bricks is considering expanding its production of a special type of brick used in the Olympics. The expected cash flows of this project are listed in the following table. The numbers are in millions of dollars.

Year	0	1	2	3
Unlevered free cash flow	-20	2	20	10

Calculate the NPV of this project, assuming that Chaska Bricks maintains its current debt/equity ratio. **SHOW YOUR WORK!**

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- c. (6 points) What is the expected debt capacity of this project in years 0, 1, and 2, evaluated immediately after the cash flow in the table? In other words, calculate the debt capacity in year zero immediately after the firm spends 20 on the project, then calculate the debt capacity in year one immediately after the firm receives the year-one cash flow, and so on. **SHOW YOUR WORK!**
- d. (5 points) Assume that Chaska Bricks takes on the project. At year zero, how much equity should the firm issue (or buy back) and how much debt should it issue (or repay) to maintain a constant D/E ratio, taking into account the funds required for the initial investment? **SHOW YOUR WORK!**

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- c. (5 points) What is the time-zero present value of the project's tax shield? **SHOW YOUR WORK!**
- d. (5 points) The CEO of Minnesota Moccasins tells you that she wants to have a somewhat different capital structure for this project, relative to the other projects of the firm. Since the firm has no cash, its net debt (borrowing minus cash) currently equals its gross debt (borrowing). The CEO wants to finance the project using a ratio of (gross debt)/equity equal to 0.6. However, to cover any unexpected situations, she also wants to have \$2MM in cash available. This cash will be invested at the risk-free rate in perpetuity unless it is needed in an emergency. You believe the cash is not needed, but she's the boss. What is the NPV of the project with this altered capital structure? **SHOW YOUR WORK!**

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- e. (5 points) When the capital structure of the project is described by part (d), you expect the project's weighted average cost of capital to decline over time. Explain why, keeping in mind that the cash flows are expected to increase over time.

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Question 7. The U.S. Congress (6 points)

In the wake of the financial crisis, many legislators are concerned about excessive leverage. One way to reduce leverage is to set the corporate tax rate to zero to increase the incentive to finance with equity rather than debt. Of course, that lowers tax revenue, which will increase the deficit. Therefore legislators are considering cutting corporate tax rates by the minimum amount necessary to eliminate the tax advantage of debt. Assume the tax rate on interest income is 30 percent and the tax rate on equity income is 5 percent. Adopt all of the perfect-market assumptions of Modigliani and Miller except the no-tax assumption. What is the highest corporate tax rate that does not encourage firms to issue debt? **SHOW YOUR WORK!**

