

Name: **Corporate Finance**

Question 1. Hardwood Factories, Inc.

Hardwood Factories (HF) expects earnings this year of \$6/share, and it plans to pay a \$4 dividend to shareholders this year. HF will retain \$2/share of its earnings to reinvest in new projects with an expected return of 15 percent per year. Suppose HF will maintain the same dividend payout rate, retention rate, and return on new investments in the future and will not change its number of outstanding shares.

a. (5 points) Use the dividend discount model to forecast a growth rate of earnings for HF.

b. (6 points) Using the same dividend discount model, if HF's cost of equity capital is 12 percent, what price would you estimate for HF stock?

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c. (8 points) Suppose HF instead plans to pay a \$1 dividend, retaining \$5 per share in earnings. Also suppose HF will maintain the same dividend payout rate of $1/6$, retention rate of $5/6$, and expected return of 15 percent per year on new investments. Continue to assume HF's cost of equity capital is 12 percent. According to the dividend discount model, what is the stock price? (The answer should be nonsensical.) What is a problem with the dividend discount model that this example illustrates?

Question 2. Portfolio theory

(10 points) Assume all investors want to hold a portfolio that, for a given level of volatility, has the maximum possible expected return. Explain why, when a risk-free asset exists, all investors will choose to hold the same portfolio of risky stocks.

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Question 3. Portfolio practice

Your investment portfolio consists of \$1 million invested in only one stock—Wharfin Enterprises. Suppose the risk-free rate is 3 percent, Wharfin stock has an expected return of 10 percent and a volatility of 50%, and the market portfolio has an expected return of 8 percent and a volatility of 16 percent. Under the CAPM assumptions,

a. (8 points) What alternative investment has the lowest possible volatility while having the same expected return as Wharfin Enterprises? What is the volatility of this investment?

b. (8 points) What investment has the highest possible expected return while having the same volatility as Wharfin Enterprises? What is the expected return of this investment?

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Question 4. Fuller Inc.

Fuller Inc. is currently an all-equity firm with an expected return of 10 percent. It is considering a leveraged recapitalization in which it would borrow and repurchase existing shares. For this question, assume perfect capital markets, including no taxes.

a. (6 points) Suppose Fuller borrows to the point that its debt-equity ratio is 0.6. With this amount of debt, the debt cost of capital is 6 percent. What will the expected return of levered equity be after this transaction?

b. (4 points) Suppose instead Fuller borrows to the point that its debt-equity ratio is 1.5. With this amount of debt, Fuller's debt will be much riskier. As a result, the debt cost of capital will be 8 percent. What will the expected return of levered equity be in this case?

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c. (7 points) A senior manager argues that it is in the best interest of the shareholders to choose the capital structure that leads to the highest expected return for the stock. How would you respond to this argument?

Question 5. Casper International

Casper International has \$20 million in debt outstanding. The debt is perpetual; in other words, the firm will pay interest only on this debt. CI's marginal tax rate is expected to be 30 percent for the foreseeable future.

a. (5 points) Suppose CI pays interest of 5 percent per year on its debt. What is its annual interest tax shield?

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b. (6 points) What is the present value of the interest rate tax shield, assuming its risk is the same as the loan? Also assume perfect markets except for corporate taxes.

c. (5 points) Suppose instead that the interest rate on the debt is 7 percent. What is the present value of the interest tax shield in this case?

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Question 6. Krieger, Inc.

Krieger, Inc has \$300 million of excess cash. The firm has no debt and 200 million shares outstanding with a current market price of \$20/share. Krieger's board has decided to pay out this cash as a one-time dividend. Assume a perfect capital market, including no corporate or personal taxes.

a. (4 points) What is the ex-dividend price of a share?

b. (4 points) If the board instead decided to use the cash to do a one-time share repurchase, what is the price of the shares once the repurchase is completed?

c. (4 points) Which policy (in part a or b) makes investors in the firm better off, and why?

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d. (5 points) Suppose the board decided to do the share repurchase, but you, as an investor, would have preferred to receive a dividend payment. How can you leave yourself in the same position as if the board had elected to make the dividend payment instead? I am looking for a precise mathematical description of what you will do.

Question 7. Google

Google has an enterprise value of \$130.3B. It has no borrowed funds and holds \$26.5B in cash. It has never paid a dividend, and it spends very little money buying back shares. The Wall Street Journal of May 7, 2010 reports “The company’s cash position is larger than any other tech company’s ... Google could pay out the whole pile, which amounts to more than \$80 per share. But tech companies don’t like to pay dividends. Google’s current acquisition efforts aren’t making a dent. So where else might Google put the money to work?”

a. (7 points) If Google decides to pay out a large amount of this cash, would a typical stockholder today prefer a dividend payment or a stock buyback, and why?

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b. (9 points) Now assume that Google management expects that two years from now, Google will have positive NPV opportunities in the future that require investments of close to \$30B. It can either hold on to its current cash until it is needed, or pay out its cash now, then raise additional funds in debt or equity markets if future projects require additional funds. Explain why Google likely prefers the first option to the second option. Three well-chosen sentences will suffice. (Hint: This question asks you to describe the pecking order theory.)

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Question 8. Breakfast

You and your friend Olivia have a great idea for an additive for breakfast cereals. You want to calculate the project's NPV. Olivia says, "Our project has risk similar to projects of Flaxseed Enterprises. Our tax rate will be the same as that for Flaxseed. Like Flaxseed, we will issue default-free debt. But we prefer to use a larger fraction of debt than Flaxseed. Therefore we should discount our expected cash flows by

$$wacc = k \times r_{LE} + (1 - k)r_f(1 - \tau)$$

In this equation, r_{LE} is the expected return to Flaxseed's levered equity, r_f is the risk-free rate paid to debtholders, τ is the corporate tax rate, and k is **your** preferred ratio of $(LE/(LE+D))$.

a. (9 points) Assume a perfect market except for corporate taxes. Explain to Olivia why her formula will not produce the correct discount rate for your project. In your answer, be sure to say whether the formula Olivia proposes will produce a discount rate that is too high, too low, or whether it is not clear whether the formula's rate is too high or too low.

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b. (7 points) What alternative method can you use to calculate your project's NPV? (Just name it, do not go into detail.) What information from Flaxseed Enterprises do you need to calculate this NPV?

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Question 9. Steering Wheels

Hopkins Inc (HI) makes steering wheels for cars. It has no debt and 100 million shares outstanding. The current market value of the firm is \$1700MM, thus the current share price is \$17. The company has been experimenting with a cheaper production process. If it is successful, the market value will jump to \$1800MM, but if not, the market value will drop to \$1600MM. Outside investors believe that HI's managers know whether the process is successful, but that information is not yet public. Based on outsiders' information, the probability of success is 50 percent.

HI must raise \$400 million to build a new production facility. Because the firm would suffer a large loss of both customers and engineering talent in the event of financial distress, managers believe that if HI borrows the \$400 million, the present value of financial distress costs will exceed any tax benefits by \$15 million. At the same time, HI faces a lemons problem if it attempts to raise the \$400 million by issuing equity.

a. (8 points) Suppose that if HI issues equity, the share price will remain \$17. To maximize the value of current shareholders, would managers choose to issue equity or borrow the \$400 million if

i. They know the process is a failure? Make an explicit computation to answer this question.

ii. They know the process is a success? Again, make an explicit computation to answer this question.

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b. (4 points) Given your answer to part (a), what should investors conclude if HI announces it will issue equity? What will be the new share price?

c. (4 points) Given your answer to part (a), what should investors conclude if HI announces it will issue debt? What will be the new share price?

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d. (5 points) Suppose that managers know the process is successful. Moreover, assume managers can, if they choose, release test results to convince outside investors of this fact. Show that managers can make current shareholders better off by releasing this information just prior to raising \$400 million than just after raising the \$400 million. (Hint – if they release the information, will they choose to use equity or debt to raise the \$400 million?)

Question 10. HiTest

Suppose HiTest Industries has an equity cost of capital of 12 percent, market capitalization of \$10 billion, and an enterprise value of \$15 billion. Suppose HiTest's debt cost of capital is 4 percent and its marginal tax rate is 30 percent.

a. (4 points) What is HiTest's WACC?

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b. (4 points) If HiTest maintains a constant debt-equity ratio, what is the NPV of a project with average risk and the following expected cash flows?

Year	0	1	2	3
FCF	-100	30	70	50

c. (8 points) If HiTest maintains its debt-equity ratio, what is the debt capacity of the project in each year 0, 1, and 2?

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Question 11. LoTest

Suppose LoTest Industries has an equity cost of capital of 9 percent, a debt cost of capital of 3 percent, a marginal corporate tax rate of 25 percent, and a debt-equity ratio of 2.0. Suppose LoTest maintains a constant debt-equity ratio.

a. (4 points) What is LoTest's WACC?

b. (4 points) What is LoTest's unlevered cost of capital?

c. (4 points) Explain intuitively why LoTest's unlevered cost of capital is less than its equity cost of capital and higher than its WACC.

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Question 12. Computer manufacturing

Your firm is considering buying some equipment for \$50 million to speed up production of computers. You expect incremental operating profits (EBITDA) of \$24 million per year in years one through four. The equipment is a capital expenditure, and will be depreciated on a straight-line basis for four years. At that time it will be worthless; your firm will discard it. Because this project will increase your firm's sales of computers, it requires \$5 million of net working capital in year zero, to be recovered in year four when the equipment wears out. The corporate tax rate is 30 percent. All cash flows occur at year-ends. The risk-free rate is 4 percent per year.

a. (12 points) If the expected return to the stock market is 10 percent, and the asset beta for this project is 1.5, what is the NPV of the unlevered project?

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b. (12 points) Suppose that you can finance \$40 million of the project with a coupon bond. The bond sells for \$40 million, pays an annual coupon of 4 percent in years one through four, and also returns the principal of \$40 million at the end of year four. What is the NPV of the project, including the tax shield of the debt?