Corporate Finance

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Question 1. Consider two bonds issued by the U.S. Treasury. Both have face values of $100. The first is a two-year zero-coupon bond and the second is a two-year bond with annual coupons of six percent.

1.a. (10 points) If the yield (EAR) on the zero-coupon bond is 6 percent and the yield (EAR) on the coupon bond is 9.3 percent, there **is** an arbitrage opportunity. Describe a portfolio that produces arbitrage profits. This is not an easy problem -- you'll have to do some calculations and figure out the mispricing implied by the yields.

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1.b. (3 points) If the yield (EAR) on the zero-coupon bond suddenly falls from 6 percent to 5 percent, what is the dollar change in the price of the bond?

1.c. (3 points) If the price of the coupon bond is $100, what is its EAR? When you explain your answer, you cannot write something like "because my calculator said so."

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Question 2.

You work for Xylophone Incorporated (XI). The company is considering a project with the following cash flows. In years 1 through 23, the cash flows are $1 MM (one million dollars). In years 24 through 98, the cash flows are -$2 MM (negative two million dollars).

2.a. (10 points) Your boss asks you to calculate the NPV of the project using a constant discount rate of 5%. When you show your work, that work must not involve adding up 98 separate numbers.

2.b. (7 points) Your boss is not sure what constant discount rate to apply to the project—he needs to think more about that issue. You calculate the internal rate of return for the project as R%. (Trust me—there is a single IRR for this project—do not bother figuring it out.) You are considering giving your boss the following advice: "Take on the project if the discount rate is less than R%." Is that correct advice? Why or why not? If not, is there better IRR-based advice you can give your boss?

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Question 3.

Hopkins Incorporated (HI) sells laser printers. Today (the end of year zero), it is considering cutting the price of its best laser printer from $150 to $120. The table below reports HI's forecast of sales with and without the price cut. Note that the figures in the table are in units sold, not revenue. HI expects that at the end of the next year, it will replace that printer with a new model. The cost of goods sold for each printer is $50.

For each printer sold, HI expects that it will sell a replacement printer cartridge in each of the next two years. For each printer sold in year one, it expects to sell a replacement cartridge in years two and three. Each cartridge sells for $40 and has a cost of goods sold of $10.

Year	**1**	**2**	**3**
Baseline sales forecast (units/year)	100,000	0	0
Forecast using lower price (units/year)	130,000	0	0
Discount rate	0.08	0.10	0.12

For simplicity, assume that HI can sell the additional printers and replacement cartridges without any increase in working capital or capital investment. The tax rate paid by HI is 40 percent.

3.a. (10 points) What are the incremental effects of the price cut on the firm's EBIT in years one, two, and three? (More space on next page.)

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3.b. (7 points) The opportunity cost of capital for HI is reported in the table. Note that the discount rates vary over time. Should HI cut the price of the printer? To solve this problem, assume that all of the revenue and costs for HI in year *t* are incurred at the end of year *t*. (This is the standard assumption we use in class.)

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Question 4.

Widgets Incorporated (WI) is considering two different projects. They are not mutually exclusive; WI's decision to take on one of the projects does not affect its decision to take on the other. Both projects require an initial investment of $1MM in equipment. Straight-line depreciation will be used for the equipment over a life of three years. Revenues and expenses for the first project are uncertain. The expected revenues and expenses are

Year	**0**	**1**	**2**	**3**
Equipment investment				
Revenue	0	1.5MM	1.8MM	1.0MM
Expenses excluding depreciation	0	0.9MM	1.08MM	0.6MM
Depreciation				
Interest expense				
Taxes				
Net Income				

If WI takes on this project, it will borrow the money for the initial investment, in the form of a zero-coupon bond issued by WI to be repaid at the end of year three. It will use its available cash to increase its working capital. Working capital equal to 20 percent of year-*t* revenues is needed at the end of year *t-1*. Since WI is a highly reputable and profitable company, it can borrow at default-free interest rates. Default free interest rates (quoted using EAR) on zero-coupon Treasury bonds are in the next table. The table also reports discount rates the firm applies to its typical projects.

Year	**0**	**1**	**2**	**3**
ZCB yield		5%	7%	6%
Firm discount rate		10%	12%	11%

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For simplicity, assume the tax rate faced by Widgets Incorporated is zero.

4.a. (10 points) Complete the top table on the previous page for the unlevered project. Fill in equipment investment, depreciation, interest expense, taxes, and net income. You do not need to show any work other than the numbers.

4.b. (10 points) What are expected cash flows in years zero through three for the unlevered project?

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4.c. (5 points) The firm's other project has revenues and expenses identical to those in the table above. However, unlike the first project, there is no uncertainty with the revenues and expenses of the second project. They are known for sure. Do the two projects have the same NPV? Why or why not? (You do not need to compute the NPVs – just explain whether they are the same.)

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Question 5.

DoGood Industries is expected to generate the following free cash flows over the next three years.

Year	1	2	3
FCF ($ million)	33	45	50

After then, the free cash flows are expected to grow at the industry average of 3 percent per year. Use the discounted free cash flow model and a weighted average cost of capital of 10 percent.

5.a. (12 points) Estimate the current (year-zero) enterprise value of DoGood Industries.

5.b. (4 points) If DoGood Industries has $5 million in excess cash, debt with a current market value of $150 million, and 20 million shares outstanding, estimate its current share price.

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Question 6. (7 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 riskfree asset exists, all investors will choose to hold the same portfolio of risky stocks.

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Question 7. (7 points)

Explain what is wrong with the following argument: "If a firm issues debt that is risk free, because there is no possibility of default, the risk of the firm's equity does not change. Therefore, riskfree debt allows the firm to get the benefit of a low cost of capital of debt without raising its cost of capital of equity."

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Question 8.

DoGood Industries has a current share price of $6.25 and 8 million shares outstanding. Suppose DoGood Industries announces plans to lower its corporate taxes by borrowing $22 million and repurchasing shares.

8.a. (5 points) With perfect capital markets, including no taxes, what will be the share price after this announcement?

Now suppose that DoGood pays a corporate tax rate of 35 percent, and that shareholders expect the change in debt to be permanent.

8.b. (8 points) If the only market imperfection is corporate taxes, what will the share price be after this announcement?

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8.c. (7 points) Suppose there are two market imperfections: corporate taxes and financial distress costs. If the share price rises to $6.50 after this announcement, what is the present value of financial distress costs DoGood will incur as a result of this new debt?

Question 9.

Consider a firm whose only asset is a plot of vacant land, and whose only liability is a debt of $14 million due in one year. If left vacant, the land will be worth $7 million in one year. Alternatively, the firm can develop the land at an upfront cost of $15 million. The developed land will be worth $30 million in one year. Suppose the riskfree interest rate is 7 percent, assume all cash flows are riskfree, and assume there are no taxes.

9.a. (5 points) If the firm chooses not to develop the land, what is the value of the firm's equity today? What is the value of the debt today?

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9.b. (4 points) What is the NPV of developing the land?

9.c. (7 points) Suppose the firm raises $15 million from equity holders to develop the land. If the firm develops the land, what is the value of the firm's equity today (after raising the $15 million)? What is the value of the firm's debt today?

9.d. (2 points) Given your answer to part (c), would equity holders be willing to provide the $15 million needed to develop the land?

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Question 10.

Suppose Costco has an equity cost of capital of 12 percent, market capitalization of $12 billion, and an enterprise value of $16 billion (including the tax shield). For simplicity, also assume it has no cash. Suppose Costco's pre-corporate-tax debt cost of capital is 6.1 percent and its marginal tax rate is 35 percent. Costco maintains a constant debt/equity ratio.

10.a.(5 points) What is Costco's unlevered cost of capital? For this question, show your calculations, and also state whether the validity of the calculation depends on Costco's choice of a constant debt/equity ratio. (You do not need to explain why or why not – just say whether it depends on this choice or not.)

10.b. (4 points) What is Costco's after-corporate-tax WACC?

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10.c.(7 points) What is the value of a project with average risk (i.e., risk equal to the risk of a typical Costco project) and the following expected unlevered free cash flows?

Year	0	1	2
FCF	-120	80	130

10.d. (7 points) Given Costco's constant debt/equity ratio, what is the debt capacity of the project in part (c) for years zero, one, and two? Assume that Costco does not retain the free cash flows, but instead pays them out in the form of dividends.

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10.e. (4 points) What is the unlevered value of this project?

10.f. (8 points) If Costco maintains is debt-equity ratio, what is the dollar amount of the interest rate tax shields from this project in years zero, one, and two? What discount rate should you use to compute their present values? Compute the present value of these tax shields.

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10.g.(2 points) Show that the APV of Costco's project matches the value computed using the WACC method.