Corporate Finance

Question 1. (2 points for each part; total 10 points) Balance sheet analysis

At the end of 2010, Duffee, Inc. had a book value of equity of $18MM, 2MM shares outstanding with a market price of $38 per share, cash of $2MM, and total debt of $50MM. Calculate the following values as of the end of 2010. SHOW YOUR WORK!

a. Market capitalization

Market cap is $38*2MM = $76MM.

b. Market-to-book ratio

ME/BE is $7.6MM/$18MM = 4.222

c. Book debt-equity ratio

Debt/BE is $50/$18 = 2.7777

d. Market debt-equity ratio

Debt/ME is $50/$76 = 0.6579

e. Enterprise value

ME+debt-cash is 124MM.

Question 2. No-arbitrage

Consider two securities that pay risk-free cash flows over the next two years and that have the current market prices shown here:

Security	Price today	Cash flow in one year	Cash flow in two years
#1	23	25	0
#2	56	0	75

a. (6 points) What is the no-arbitrage price of a security that pays cash flows of $100 in one year and $100 in two years? SHOW YOUR WORK!

We need 100/25 of security 1 and 100/75 of security 2. The total price is (100/25)*23 + (100/75)*56 = 166.667.

b. (6 points) Using the information and the principle of no-arbitrage, what is the annual interest rate on a two-year zero-coupon Treasury bond? SHOW YOUR WORK!

Security 2 is a two-year bond. It has an annual interest rate given by

56 = 75/(1+r)^2, or (75/56) = (1+r)^2, or 1.15728=1+r, or r = 15.728%.

Question 3. Ketchup

PGK (pretty good ketchup) had earnings of $140MM in 2010. Analysts predict that the company's earnings will grow at 15% per year for the next 2 years as the company expands into markets now dominated by Heinz Ketchup. After 2012, analysts predict the firm's earnings will grow at the rate of the economy as a whole, which is 3% per year. The opportunity cost of capital for investments such as PGK is 8% per year.

a) (2 points) What are expected earnings for PGK in 2011, 2012, and 2013? SHOW YOUR WORK!

Year 2011, expected earnings 140MM(1.15) = 161MM.

Year 2012, expected earnings = 140MM*(1.15)^2 = 185.15MM.

Year 2013, expected earnings = 140MM*(1.15)^2*(1.03) = 190.7045MM

b) (3 points) As of January 1 2011, what is the net present value of expected earnings in 2011 and 2012? Assume that earnings are all received at the end of the year. SHOW YOUR WORK!

NPV = 161/1.08 + 185.15/1.08^2 = 149.0741 + 158.7363 = 307.8104

c) (5 points) As of January 1 2011, what is the net present value of expected earnings in 2013, 2014, …, until the end of time? SHOW YOUR WORK!

First compute the NPV as of January 1 2013. These earnings can be valued as a growing perpetuity, with the first payment of 190.7045MM in one year, and payments growing by 3% per year forever. The formula is

NPV as of Jan 2013 = 190.7045/(0.08 – 0.03) = 3,814.09MM.

Now discount this back two years, to January 1 2011.

NPV = 3,814.09/1.08^2 = 3,269.9674MM.

Question 4. Retirement

You are 25 years old today. You are considering the following savings plan for retirement. Starting a year from today, you will deposit $10,000 in a bank account that pays 4% interest. You will continue to make annual deposits that will grow at 2% per year. The last deposit will be made when you are 65 (40 total payments). One year after you make the last deposit, you will withdraw an amount "X" from the account. The remaining amount continues to be invested at the 4% interest rate. Because you secretly plan to live forever, you choose "X" so that you can withdraw it annually in perpetuity.

a. (3 points) What is the value of the final payment you will make into the bank account? SHOW YOUR WORK!

10,000*1.02^39 = 21,647.40

b. (4 points) What is the net present value of the 40 annual deposits that you make into the account? SHOW YOUR WORK!

This is a growing annuity, with PV = (10K/(0.04 -0.02))*(1 – (1.02/1.04)^40) = 270,044.76.

c. (4 points) How much money will be in the bank account just after the final deposit at age 65? SHOW YOUR WORK!

Calculate the future value of the above PV, as of 40 years from time zero. The result is 270,044.76*1.04^40 = 1,296.490.48.

d. (5 points) What is "X"? SHOW YOUR WORK!

X satisfies the equation 1,296,490.48 = X/0.04, or X = 51,859.62.

e. (3 points) Now assume you choose a different value of "X" such that the money in the account runs out after 25 annual withdrawals. If you happen to live beyond 90, you'll simply beg your kids to take you in. What is the new value of "X"? SHOW YOUR WORK!

X satisfies the equation 1,296.490.48 = (X/.04)*(1 – (1/1.04)^25), or X = 82,990.90.

Question 5. Multiple projects

You are deciding between two mutually exclusive investment opportunities. Both require the same initial investment of $18MM. Investment "A" will produce $3MM per year forever, starting at the end of the first year. Investment "B" will produce $2MM per year at the end of the first year and the payments will grow at 5 percent per year forever.

a. (5 points) Which investment has the higher internal rate of return? SHOW YOURWORK!

The IRR of the first one satisfies the equation 18MM = 3/IRR, so IRR = 0.16667. The IRR of the second one satisfies the equation 18MM = 2/(IRR – 0.05), so IRR = 0.16111. The first one has the higher IRR.

b. (4 points) Which investment has the higher NPV when the cost of capital for both investments is 8 percent per year? SHOW YOUR WORK!

The NPV of the first is (3/.08) – 18 = 19.5. The NPV of the second is 2/(.08 – 0.05) – 18 = 48.6666. The second has the higher NPV.

c. (4 points) Explain which of the two projects you will adopt (recall they are mutually exclusive), or, if you do not want to adopt either of them, explain why not. SHOW YOUR WORK!

I will adopt the second one. NPV is equivalent to cash in your pocket. Since I can only choose one, I prefer 48.6667MM in my pocket to 19.5MM in my pocket.

d. (3 points) Now use a cost of capital of 4 percent. What are the NPVs of the two projects? SHOW YOUR WORK!

The NPV of the first is 3/.04 – 18 = 57. The NPV of the second is infinite since the growth rate of the cash flows exceeds the discount rate.

Question 6. Toasters

BuyMore sells toasters per year for $10 per toaster. It currently buys the toasters from MakeStuff, Inc., which sells them to BuyMore for $5 per toaster. A vice president of BuyMore recommends that the BuyMore instead manufacture the toasters in-house. If they are produced in-house, the manufacturing and operational expenses would be $3 per toaster. Manufacturing requires equipment that costs $3MM. The equipment lasts for five years. BuyMore uses straight-line depreciation. Manufacturing in-house also requires $500,000 in net working capital for inventory expansion. The vice president's plan is to manufacture the toasters in-house for five years, then switch back to MakeStuff in year six. In the fifth year the net working capital is recovered. The equipment will be worthless at the end of the five years.

BuyMore anticipates sales of 1MM toasters per year for each of the next five years. BuyMore's corporate tax rate is 35% and the opportunity cost of capital for this investment is 12%. Assume that all cash flows are received at year-ends, and that the equipment and net working capital are needed at the end of year zero, one year before any cash flows are generated from sales. BuyMore currently does not have any cash, so it must borrow the funds to both buy the equipment and increase inventories. BuyMore will pay only the interest on the loan for the first four years. In the final year it will pay both interest and the entire principal.

a. (8 points) Complete the spreadsheet on the next page for the **incremental** values of revenues, costs, net working capital, capital expenditures, and cash flows of the unlevered project. Just to be clear, the project is to replace buying toasters from MakeStuff with in-house manufacturing of toasters.

   NO EXPLANATIONS ARE REQUIRED AND ANY EXPLANATIONS GIVEN WILL BE IGNORED.

   ANY BLANK SPACES WILL BE INTERPRETED AS MISSING ANSWERS THAT RECEIVE ZERO CREDIT.

   Therefore if you believe one of the spaces should have a zero in it, explicitly write in zero.

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Revenues from sale of toasters	0	0	0	0	0	0	0
Manufacturing and operating expenditures	0	2M	2M	2M	2M	2M	0
Depreciation	0	(0.6)	(0.6)	(0.6)	(0.6)	(0.6)	0
Earnings before interest and taxes	0	1.4	1.4	1.4	1.4	1.4	0
Change in net working capital	(0.5)	0	0	0	0	0.5	0
Capital expenditures	(3)	0	0	0	0	0	0
Interest expense	0	0	0	0	0	0	0
Tax expense	0	(0.49)	(0.49)	(0.49)	(0.49)	(0.49)	0
After-tax profits	0	0.91	0.91	0.91	0.91	0.91	0
Free cash flow	(3.5)	1.51	1.51	1.51	1.51	2.01	0

b. (4 points) BuyMore discovers that it has a five-year contract with MakeStuff, Inc. that states BuyMore must pay MakeStuff an immediate lump sum of $500,000 if BuyMore either switches toaster suppliers or makes toasters in-house. Is this a sunk cost or should it be included in the spreadsheet? SHOW YOUR WORK!

It should be included in the spreadsheet, since the cost is not incurred unless the in-house production is adopted.

Question 7. Cookies

ChocoChips Inc. expects annual earnings in 2011 of $8 per share, and it plans to pay a $5 dividend to shareholders at the end of 2011. The firm will retain $3 per share of its earnings to reinvest in new projects with an expected return of 12% per year. Suppose ChocoChips plans to maintain the same dividend payout rate indefinitely. Also assume that ChocoChips return on new investment will remain at 12% regardless of the amount of investment that it makes. Finally, assume that ChocoChips will not change its number of outstanding shares.

a. (5 points) What is your prediction of ChocoChips' growth rate of annual earnings? SHOW YOUR WORK!

The ROI is 0.12 and the payout rate is d=5/8. The growth rate is ROI*(1 – d) = 0.12*(3/8) = 0.045 = 4.5%.

b. (5 points) If ChocoChips opportunity cost of capital is 9% per year, what is your estimate of the company's stock price at the **end of 2011**, just after the company pays the $5 dividend? SHOW YOUR WORK, AND MAKE SURE YOU ARE ESTIMATING THE PRICE AS OF YEAR-END 2011!

As of the end of 2011, the most recent dividend paid is $5, and the expected dividend in one year is $5(1.045). The dividend-discount formula for the stock price is

5(1+g)/(r – g) = 5(1.045)/(0.09 – 0.045) = 116.1111

c. (6 points) You are hired by ChocoChips to determine what will happen to its stock price if the company instead pays a dividend of $4 at the end of 2011 and retained only $4 in earnings for reinvestment, and maintained this new, lower payout ratio forever. What is your estimate of ChocoChips stock price at the end of 2011, just after the company pays the $4 dividend? SHOW YOUR WORK!

The new growth rate would be ROI*(1 – d) = 0.12*(4/8) = 0.06. The new stock price formula is 4(1+g)/(r-g) = 4(1.06)/(0.09 – 0.06) = 141.333.

Question 8. (5 points) A possibly tricky question, saved for last in case you have extra time.

Hopkins, Inc. is a software company. The only asset on its balance sheet is $1MM in cash. It will spend all of the cash in the next year to research a potential software project. One year from today (March 1st 2012), the firm will decide whether to adopt the new project, or whether the firm should shut down. Its decision will be based on the project's NPV as of March 1st 2012. Refer to this value as the 3/2012 NPV, to distinguish it from an NPV calculated as of March 2011. Today, the 3/2012 NPV is uncertain, but everyone today knows that there are two possible values of the 3/2012 NPV. It will be either $10MM or $-2MM, both with a 50% probability, and the outcome is uncorrelated with anything else in the economy. The project's expected cash flows are discounted at 20% per year; this discount rate is used in calculating the 3/2012 NPVs listed above. The risk-free rate is 5% per year. What is the market value of Hopkins, Inc today (March 2011), assuming that if it adopts the project, it will shut down immediately after the project is completed? SHOW YOUR WORK!

The current market value is $5MM/1.05 = 4.7619MM. If the realized value of NPV is $10MM, Hopkins will do the project. That will be the only value to the firm. If the realized value is $-2MM, Hopkins will shut down and its value will be zero. The expected value in one year is therefore $5MM. The uncertainty in this $5MM is purely idiosyncratic, therefore the expected $5MM is discounted at the riskfree rate of 5%.