Name: _____

Finance II (441) Professor Matsa

Corporate Finance Midterm: Winter 2014

1) Time limit. You have 1.5 hours to complete the exam.

2) The exam is closed book and closed notes. You may not use any outside materials. You may use a calculator or a blank excel spreadsheet. You may not use any information from your hard disk or the web. Potentially useful formulas, including the market risk premium, have been included on the last page of the exam.

3) Point totals for each question are specified in parentheses. There are 120 total points.

4) Circle your numerical answers. This makes it easier for me to find them. Show your work. If you get stuck on the math, tell me what the correct answer should be based on your intuition.

5) Clear and concise answers will be rewarded.

6) As always, I expect you to abide by the honor code. I trust that no one will give or receive assistance which gives them an unfair advantage over other students. You may not speak about the exam to anyone who has not yet completed it.

Good Luck!

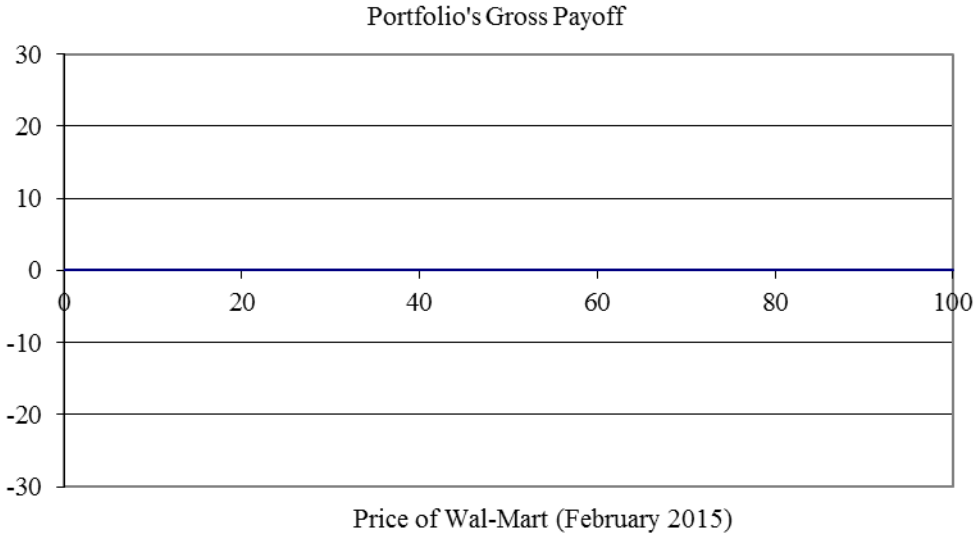
Midterm Exam

Question	Score
1 (30)	
2 (30)	
3 (30)	
4 (30)	
Total (120)	

1) Options on Wal-Mart stock.

A) On January 24, 2014, Wal-Mart announced that it is eliminating 2,300 jobs at Sam's Club. Nearly half the job cuts will target salaried assistant managers, and the remainder will be hourly employees at underperforming stores. Currently, the chain has the same number of management positions in every club, whether it generates, say, $50 million or $100 million in revenue. "Over the years, we've migrated to a top-heavy structure in our management," said Sam's Club Chief Executive Rosalind Brewer, in an interview. "What this does is align the number of assistant managers to the sales of the club and to where our growth areas are."

After investigating the Sam's Club restructuring plan and Wal-Mart's financials, you decide to invest by buying and selling two different American put options on Wal-Mart. You purchase a one-year put with a strike price of $55 and sell a one-year put with a strike of $45. Draw the gross payoff for this portfolio at expiration (assuming the options had not already been exercised). Label your diagram clearly. (10)



B) Assume that a share of Wal-Mart is trading for $51.50, and the price of the put option with the strike price of $45 is $0.50. What can you say about the price of the put option with a strike price of $55? (10)

C) Wal-Mart's beta is 0.64, and the risk free rate is 5.25%. What can you say about the expected return on your portfolio described in (A)? Be as specific as possible. (10)

2) Short discussion questions

A) When a firm repurchases equity, its stock price generally increases. Because there are fewer shares outstanding, each share must be worth more. True, False, or Uncertain? Explain. (10)

B) The current yield on one-year government bonds (T-bills) is 5.25%. The current yield on 10-year government bonds is 4.50%. You can purchase the 10-year government bond or you can purchase the one-year T-bill and roll it over (reinvest) in one year T-bills for the next 10 years. Which strategy has a greater expected return? Explain. (10)

C) Maria Henderson, an expert floral designer, is interested in opening her own flower shop. Without much capital or investment experience, Maria approaches her cousin's friend, real estate tycoon Sam Zell. Sam generates pro-formas for the new venture. Based on his discounted cash flow calculation using the appropriate CAPM discount rate, Sam finds the project to have a positive NPV, and he agrees to invest as long as Maria invests her personal assets in the business as well. Should Maria go ahead with the investment? Explain. (10)

3) Harrison Construction, LLC, is a general contracting company licensed to do both commercial and residential work. Their services include remodeling whole houses, kitchens, bathrooms, basements and attics, handicapped accessible design, ageing in place projects as well as exterior work like decks, porches and siding. Historic financial statements for 2013 and (partial) pro-forma estimates for 2014 are shown below. All numbers are in thousands of dollars.

Income Statement

	2013	2014
Sales	85,000	105,000
Operating and Administrative Costs	55,000	75,000
Depreciation	3,000	5,000
EBIT	27,000	
Interest	7,000	
Taxes	6,800	
Net Income	13,200	
Shareholder Distribution	5,000	
Capital Expenditure		12,000

Balance Sheet, Year-End

	2012	2013	2014
Total Assets	160,000	190,000	205,000
Long-term debt	50,000	70,000	
Retained Earnings	60,000	68,200	
Paid in Capital	50,000	51,800	
Total Equity	110,000	120,000	
Total Liabilities (including equity)	160,000	190,000	

A) Harrison's management is bullish about the economic recovery and has announced that it will expand into new markets in 2014. They would like to pay the same dividend as they did in 2013, maintain their debt at the 2013 level, and fund the expansion using any remaining internal funds and new equity issues. To achieve these plans, how much new equity must Harrison issue in 2014? Assume that taxes are 34% of EBIT minus interest, and that interest is 10% of the average debt balance. Hint: Complete the 2014 pro-forma statements displayed above. (10)

B) Provide an estimate of total Free Cash Flow for Harrison Construction for 2014. (10)

C) How much non-capital investment is Harrison Construction planning on making in 2014? (10)

4) Pick-Me-Up Inc. sells antidepressant pharmaceuticals over the internet. The current market value of their equity is $80M. They have 1.6M shares outstanding at $50 per share. In addition to a stable of brand name drugs for which they have the exclusive license to market in North and South America, they own some ultra-fast computer servers. Pick-Me-Up also has $20M invested in T-bills to finance future investments. Based on the last two years of data, Pick-Me-Up has an equity β which is 20% greater than the equity market's β.

A) Pick-Me-Up Inc. has a 6 month line of credit (loan) from Citicorp upon which they currently owe $15M. This is their only debt. Is it possible for the debt to be risky in this situation? Explain completely. (5)

B) The Citicorp line of credit limits Pick-Me-Up's ability to invest or expand their web-based drug business. Because Pick-Me-Up intends to invest $2M in an expansion of their business this spring, they have decided to pay off their debt which has a β of 0.25. What β should Pick-Me-Up use when evaluating an expansion of their web-based drug business? (15)

C) After using the T-bill investment to pay off their debt ($15M) and investing $2M in a business expansion, Pick-Me-Up is going to pay the remaining $3M out as a special dividend ($1.875 per share). When Pick-Me-Up announced the special dividend, they said this was to be a one-time payment. Because the market knew Pick-Me-Up had the money, the announcement should not move the stock price? True, False, or Uncertain. Explain completely. (10)

Facts and Formulas

Value of a growing perpetuity:

$$V_{\text{cashflows}} = \sum_{t=1}^{\infty} \frac{C_1(1+g)^{t-1}}{(1+r)^t} = \frac{C_1}{r-g}$$

Value of a growing annuity:

$$V_{\text{cashflows}} = \sum_{t=1}^{N} \frac{C_1(1+g)^{t-1}}{(1+r)^t} = \frac{C_1}{r-g}\left(1-\left(\frac{1+g}{1+r}\right)^N\right)$$

Asset β:

If Assets = Debt + Equity, then

$$\beta_{\text{Assets}} = \beta_{\text{Debt}} \frac{\text{Debt}}{\text{Debt+ Equity}} + \beta_{\text{Equity}} \frac{\text{Equity}}{\text{Debt+ Equity}}$$

Free Cash Flow to Assets:

FCF = Revenue – Costs – Depreciation – Taxes
+ Depreciation – Capital Expenditures – ΔNWC

Capital Asset Pricing Model:

$$r_A = r_{\text{risk free}} + \beta_A \, \text{E}[\, r_{\text{market return}} - r_{\text{risk free}} \,] + \varepsilon$$
$$\text{E}[\, r_A \,] = r_{\text{risk free}} + \beta_A \, \text{E}[\, r_{\text{market return}} - r_{\text{risk free}} \,]$$
$$\text{E}[\, r_{\text{market return}} - r_{\text{risk free}} \,] = 7.6\%$$
$$\text{E}[\, r_{\textit{Long-term Tresury}} - r_{\text{risk free}} \,] = 1.1\%$$

Payoff to a call option:

$$\text{Payoff} = \text{Max}\{0, \text{Price of Stock - Strike Price}\}$$
$$= \text{Max}\{0, S_t - X\}$$

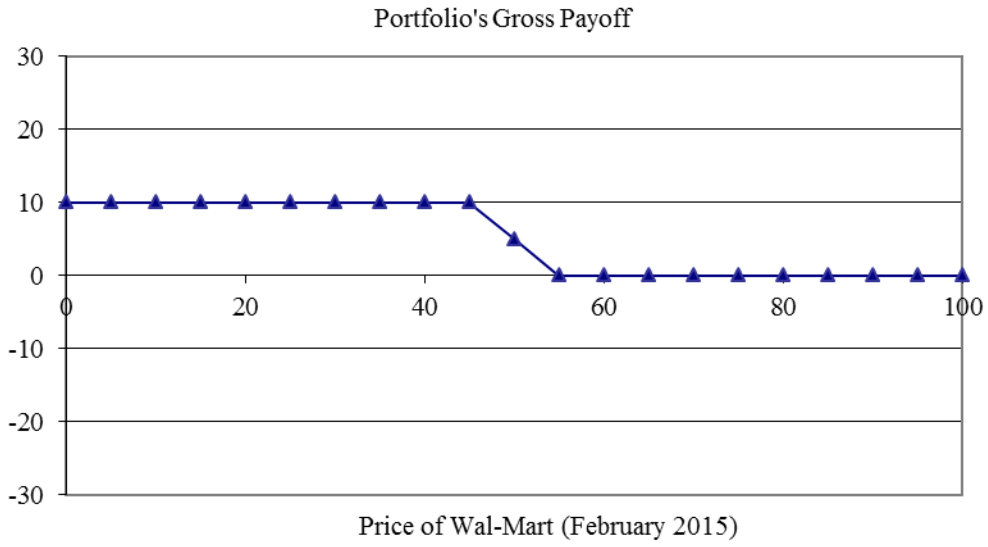
Payoff to a put option:

$$\text{Payoff} = \text{Max}\{0, \text{Strike Price - Price of Stock}\}$$
$$= \text{Max}\{0, X - S_t\}$$

Solutions to Corporate Finance Midterm: Winter 2014

1) Options on Wal-Mart stock.

A) A put option gives you a positive payoff when the stock price is below the strike price. When the stock price is above the strike price, the payoff is zero. Thus the value of the portfolio is zero when the stock price is greater than $55. When the stock price is less than the strike price and the stock price decreases by one dollar, the option payoff increases by one dollar. You own the put with a strike price of $55. Thus the value of the portfolio between $45 and $55 is a straight line with a slope of -1. You are short the put with the strike of $45, so when the stock price is below $45, the payoff to this investment decreases by one dollar for every dollar the decrease in the stock price (i.e., the payoff has a slope of +1). On net, when the stock price falls below $45, the value of the full portfolio is $10.



B) The price of an American put option with a strike price of $55 must be at least $3.50. An American option can be exercised at any time; therefore, it is worth at least its intrinsic value. Some students answered that the price must be greater than $0.50; this is true, but not sufficient for full credit. The logic behind this answer is that a put option must be worth at least as much as an otherwise identical put option with a lower strike price. Thus a put option with the strike price of $55 must be worth at least as much as a put option with a strike price of $45.

C) The expected return on the portfolio described in (A) is between 0.39% and 5.25%. From CAPM, we know that the expected return of the portfolio depends on the portfolio's systematic risk. Purchasing this portfolio is like shorting stock in Wal-Mart in the sense that you win when the stock price decreases and you lose when the stock price increases. Because Wal-Mart's stock has a positive beta (an expected return greater than the risk-free rate), the portfolio has a negative beta (an expected return less than the risk-free rate).

$$r_E < r_f = 5.25\%$$

We can also put a lower bound on the expected return. The portfolio's payoff is constant when the stock price is less than $45 or above $55, so it must have less risk than shorting one share of stock. The amount of the market risk premium was given on the formula sheet.

$$r_E > r_f - \beta_{WalMart}\left(r_m - r_f\right) = 5.25\% - 0.64(7.6\%) = 0.39\%$$

2) Short discussion questions

A) False. Each share may be worth more, but this is not always true. When a firm repurchases its equity, the value of the equity falls as money is paid out of the firm. In addition, there are fewer shares outstanding. Whether the shares are worth more after the equity repurchase depends upon whether the shares were repurchased for more or less than their true value. If the shares were repurchased for their true value, then the value of the shares held by the remaining shareholders will not change. If the firms paid more than true value to repurchase the shares, then the value of the shares held by remaining shareholders will decline. The remaining shareholders will suffer a loss. If the firms paid less than true value to repurchase the shares, then the value of the shares held by remaining shareholders will rise. The remaining shareholders will incur a gain.

B) The expected return on an investment depends on the holding period (e.g., the risk-free rate over the holding period) and the systematic risk. Because both investments have a ten year holding period, their expected returns will differ only if they have different systematic risk. The risk premium on T-bills (the risk-free investment) is zero. Thus rolling over T-bills for 10 years has an expected return equal to the ten year risk-free rate. Long government bonds have a positive β and a positive risk premium over T-bills (1.1% according to the formulas at the end of the exam). Thus the expected return on long government bonds is the ten year risk-free plus the risk premium of 1.1%. Long government bonds have a greater expected return than rolling over T-bills.

If you prefer the numbers, the ten-year risk-free rate can be extracted from the ten year government bond rate (4.5%) and the long bond risk premium (1.1%). The ten-year risk free rate is 3.4%. This is the expected return from rolling over T-bills for 10 years. The expected return on the ten-year bond is the ten-year risk-free (3.4%) plus the ten-year risk premium (1.1%). The expected return on long government bonds is 4.5%.

How can the ten-year risk-free rate (the expected return from rolling over T-bills for ten years) be 3.4%, when the current T-bill rate is 5.25%? This implies that the market expects short term interest rates (future T-bill rates) to decline over the next ten years.

C) Uncertain. Because Sam Zell is a diversified investor, he uses the appropriate CAPM discount rate to evaluate the project's NPV. Maria, on the other hand, is not diversified and cares about exposure to idiosyncratic risk. Because of her exposure to idiosyncratic risk, Maria should use a greater discount rate than Sam to calculate the NPV of the project. The project's NPV for Maria will be less than its NPV for Sam. Maria should only go ahead with the investment if the NPV of the project using her discount rate is greater than zero.

3) Harrison Construction cash flow estimation

A) To achieve these plans, Harrison Construction must issue $8,120K in new equity in 2014. Debt is fixed by the company's plans, and they will use equity to cover any financial shortfall. Completed pro-forma estimates for 2014 are shown below.

Income Statement

	2013	2014
Sales	85,000	105,000
Operating and Administrative Costs	55,000	75,000
Depreciation	3,000	5,000
EBIT	27,000	25,000
Interest	7,000	7,000
Taxes	6,800	6,120
Net Income	13,200	11,880
Shareholder Distribution	5,000	5,000
Capital Expenditure		12,000

Balance Sheet, Year-End

	2012	2013	2014
Total Assets	160,000	190,000	205,000
Debt	50,000	70,000	70,000
Retained Earnings	60,000	68,200	75,080
Paid-in capital	50,000	51,800	59,920
Total Equity	110,000	120,000	135,000
Total Liabilities (including equity)	160,000	190,000	205,000

The values on the Income Statement are calculated as follows:

EBIT = Sales – Operating and Administrative Costs – Depreciation = 25,000

Interest = 0.10 x 70000

Note that calculating interest is straightforward, because debt remains constant. In this case, we do not have a circular calculation.

Taxes = 0.34 x (EBIT – Interest) = 6,120

Net Income = EBIT – Interest – Taxes = 11,880

Shareholder Distribution (Dividends) is held constant at 5,000.

The values on the Balance Sheet are calculated as follows:

Debt remains constant at 70,000.

$$\text{Retained Earnings}_{2014} = \text{Retained Earnings}_{2013} + \text{Net Income} - \text{Dividends}$$
$$= 68{,}200 + 11{,}880 - 5{,}000 = 75{,}080$$

We have solved for all values on the Balance Sheet, except for Paid-in capital. Because the Balance Sheet must balance (i.e., A = L + E), we can use that fact to solve for Paid-in capital.

$$\text{Total Assets} = \text{Debt} + \text{Retained Earnings} + \text{Paid-in capital}$$
$$205{,}000 = 70{,}000 + 75{,}080 + \text{Paid-in capital}$$

Therefore, Paid-in capital must be 59,920.

The increase in Paid-in capital between December 31, 2013 and December 31, 2014 represents required net equity issues in 2014. Harrison Construction must issue 59,920 – 51,800 = 8,120 in new equity.

B) The free cash flow to assets is $3,880K. We can calculate free cash flow where it is paid (i.e., using the "alternate" method).

$$\text{FCF} = \text{Dividends} - \Delta \text{ Paid-in Capital} + \text{Interest} + \text{Net Loan Repayments}$$

Harrison Construction paid 5,000 in dividends, 7,000 in interest, and issued 8,120 in new equity. Their debt balance did not change.

$$\text{FCF} = 5{,}000 - 8{,}120 + 7{,}000 + 0 = 3{,}880$$

C) Harrison Construction is planning $8 million in non-capital investment in 2011. Free cash flow is the cash flow a business generates that can be paid out to investors. It is the excess cash flow generated by operations that is not spent on investment. We can calculate free cash flow where it is generated (i.e., using the "standard" method):

$$\text{FCF} = (\text{Revenue} - \text{Costs} - \text{Depreciation}) - \text{Taxes} + \text{Depreciation}$$
$$- \text{Capital expenditures} - \text{Non-capital investment}$$

Applying our answers from parts A and B, we find

$$3{,}880 = (25{,}000) - 6{,}120 + 5{,}000 - 12{,}000 - \text{Non-capital investment}$$

Thus Harrison Construction must be planning $8,000K in non-capital investment in 2011. This $8 million is reflected on the balance sheet as an increase in asset items, such as inventory and accounts receivable, which contribute to working capital.

Alternatively, some students calculated non-capital investment directly. The change in total assets from 2010 to 2011 equals total investment (on capital and other investments) minus depreciation:

$$\Delta \text{ Total assets} = \text{Non-capital investment} + \text{Capital expenditures} - \text{Depreciation}$$
$$205{,}000 - 190{,}000 = \text{Non-capital investment} + 12{,}000 - 5{,}000$$

Solving for non-capital investment finds an answer of $8 million.

4) Financing Investments at Pick-Me-Up Inc.

A) Pick-Me-Up has a $15M line of credit (loan) from Citicorp and $20M invested in T-bills. Because Pick-Me-Up has more money in T-bills than is outstanding on the credit facility, one may believe the loan is risk-free. This assumes, however, that Pick-Me-Up keeps the $15M invested in T-bills until they payoff their loan. If Pick-Me-Up has the power to sell the $15M in T-bills and pay it out to shareholders or invest it in risky projects, then the Citicorp line of credit is no longer risk-free. In this case, the loan can be risky. It matters not just how much and the type of assets Pick-Me-Up has today, but also the type of assets into which they can convert the T-bills.

B) When evaluating an expansion of their web based drug business, Pick-Me-Up should use the β of their real assets (web based drug business) after they payoff their debt and liquidate part of their T-bill portfolio. We don't know Pick-Me-Up's equity β after the debt is paid off and the drug investment is made, so we can't use this to get the β of Pick-Me-Up's operating assets. But we do know the β of their debt and equity prior to the debt repayment and expansion. We can use these numbers to calculate the β of all of Pick-Me-Up's assets (including both the operating assets and the T-bill portfolio). This is 1.05.

$$\begin{aligned}\beta_{Total\ Assets} &= \beta_{Debt}\left(\frac{D}{D+E}\right)+\beta_{Equity}\left(\frac{E}{D+E}\right)\\ &= 0.25\left(\frac{15}{15+80}\right)+1.20\left(\frac{80}{15+80}\right)\\ &= 1.05\end{aligned}$$

Given the overall β of both the financial and operating assets, we can use this to determine the β of the operating assets (the drug business). Just as the firm's assets can be viewed as a portfolio of their debt and equity, they can also be viewed as a portfolio of their different assets – in this case T-bills and their drug assets. Thus the β of all assets can also be written as:

$$\begin{aligned}\beta_{Total\ Assets} &= \beta_{T-bills}\left(\frac{V_{T-Bills}}{V_{T-Bills}+V_{Drugs}}\right)+\beta_{Drugs}\left(\frac{V_{Drugs}}{V_{T-Bills}+V_{Drugs}}\right)\\ &= 0.0\left(\frac{20}{95}\right)+\beta_{Drugs}\left(\frac{95-20}{95}\right)\\ \beta_{Drugs} &= 1.33\end{aligned}$$

Solving for the β of the drug business, we find 1.33. This is a measure of the systematic risk of the drug business and should be used to calculate the cost of capital for the expansion of this business. How does this compare to the β of the drug business after the debt is paid off – which is when we are going to make the investment? It is the same. If you change the capital structure (less debt and less cash), the systematic risk of the drug assets do not change.[1]

C) If the market already knows about the cash, then the dividend payment can't communicate this information to the market. For the stock price to change, the dividend payment must communicate other information. One possibility is the market may

[1] The firm's asset beta (i.e., the systematic risk of all of its assets) will change if the firm changes its assets. In this case, it is converting T-bills into drug assets, thus the beta of all its assets will increase. The beta of its T-bills will not change, and the beta of its drug assets will not change, but the weighted average of those two βs—the β of total assets—will change.

interpret from the payout that the firm has fewer projects than the market expected. The firm had $5M after paying off its debt. If the market expected Pick-Me-Up to invest the whole $5M in positive NPV projects and instead they payout part of it, this would be seen as bad news.