Name: _____

Finance II (441) Professors Matsa

Corporate Finance Midterm: Practice Exam A

1) Time limit. You have 1 hour and 30 minutes to complete the exam.

2) The exam is closed book and closed notes. You may not use any outside material. You may use a calculator. The last page of the exam contains a list of formulas taken from my lectures and the textbook. These formulas may or may not be useful for solving 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. Incorrect numerical answers based on the correct logic will receive partial credit.

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.

7) The characters and events depicted in this exam are fictitious. Any similarity to actual persons or firms, living or dead, is purely coincidental.

Good Luck!

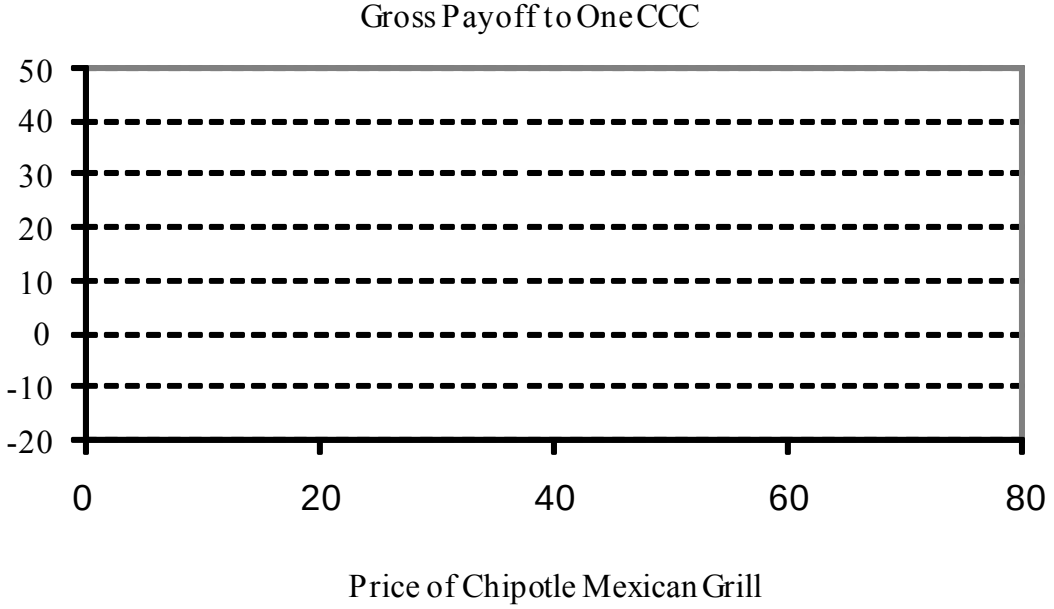
Midterm Exam

| Question | Score |
|---|---|
| 1 (40) | |
| 2 (20) | |
| 3 (25) | |
| 4 (35) | |
| Total (120) | |

1) Since being spun out of McDonalds, Chipotle Mexican Grill has been growing very rapidly. The high level of investment expenditure combined with declining sales and profitability from the economic slow down means Chipotle is short of cash. In an attempt to conserve cash, they have altered their compensation plan for top managers. Ten percent of your compensation will now come in the form of options on Chipotle stock. You will receive options on 500 shares of Chipotle stock for "free". The strike price for the option is 40 and the options have one year to expiration. The one year risk-free rate is 5%, and the current stock price is 48. Like a normal option, you will receive the stock and pay the strike price if you exercise the option. Unlike a normal option, if you do not exercise the option, you must pay $10 per option.[1] These options are called cash conserving calls (CCC).

A) If the price of Chipotle stock turns out to be 35 at the end of next year, will you exercise your CCC options? Explain briefly. (5)

B) Draw the gross payoff diagram for one CCC option as of February, 2010 (next year), as a function of next year's stock price. Make sure your diagram is well labeled. (15)




[1] Chipotle is short of cash and feels that if the stock price does poorly over the next year, they will need additional cash. Who better to get it from than their loyal employees. They will withhold the payment from your paycheck, so assume there is no probability of default.

C) You want to know what you could sell your CCC options for (assuming this was allowed). To get an estimate of their market price, you looked up the price of Chipotle options on the web and found the following prices for one year options on Chipotle stock with different strike prices. Based on these prices, what can you tell me, if anything, about the price of one CCC. Hint: Think about how you could construct the payoff diagram in B). If you don't have enough information, tell me what else you would need to know. (10)

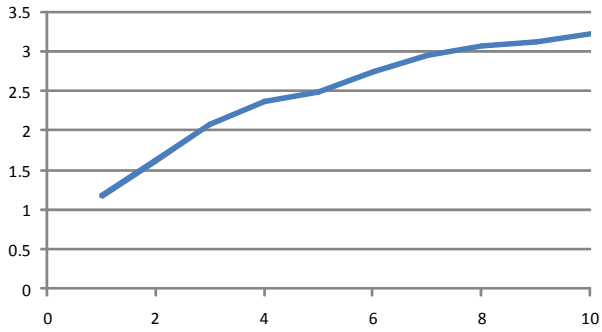
| Strike Price | 20 | 30 | 40 | 50 | 60 |
|---|---|---|---|---|---|
| Call Price | 29.0 | 19.5 | 10.4 | 3.8 | 1.0 |
| Put Price | 0.1 | 0.2 | 0.4 | 3.4 | 10.0 |

D) You have spent 7 years with Chipotle and really like the industry and the career path. Your plan is to continue to work at Chipotle and thus hope it does well. Why is the value of the CCC options to you different than the price of the CCC you estimated in part C). Explain. Don't calculate any numbers. (10).

2) Short Discussion Questions.

A) Carrefour Group operates 1,163 hypermarkets in 30 countries. In the face of extremely volatile commodity prices, Carrefour was still able to grow their sales from €82.1B in 2007 to €97.6B in 2008. The book value of their equity fell from €11.7B at the end of 2007 to €11.3B at the end of 2008. The equity value fell because Carrefour paid a dividend or repurchased stock. True, false, or uncertain? Explain. (10).

B) The current term structure of German government (default free) bonds is upward sloping. The one year rate is 1.18%, the two year rate is 1.61%, and the three year rate is 2.08%. Historically the term structure of German government bonds has sloped up, but the current slope (see figure) is steeper than the slope of the historic term structure. If you purchase a two year government bond for face value and sell it in one year, what can you tell me about your expected return. Be as specific as possible given your limited information. (10)



3) On December 9, 2008, the New York Mets announced that they signed all-star closer Francisco Rodriguez ("K-Rod") to a three-year (2009-2011) contract with a 2012 option. This move is expected to reestablish the Mets at the top of the National League and avoid a third-straight season-ending collapse. The contract guarantees Rodriguez $8.5M in 2009, $11.5M in 2010, and $11.50 in 2011, plus a signing bonus of $2M paid immediately. Rodriguez is also eligible for an annual performance bonus. In each of the first three years, Rodriguez will receive $0.15M for finishing 50 games, an additional $0.15M for finishing 55 games, and an additional $0.2M for finishing 60 games. Assume the Mets' owners are well-diversified.

A) When K-Rod pitches it increases the Mets expected cash flows. Professor Fishman, a diehard Cubs fan, estimates that the volatility of the return on the Mets team is twice the volatility of the market (e.g. 42% and 21% respectively). Thus when discounting the Mets cash flows you should use a $\beta$ of 2. True, False, or uncertain? Explain. (5)

B) Mets' General Manager Omar Minaya wants to value the total cost to the team of the first three years of Rodriguez's contract. He decides to split this calculation into the value of the base compensation and the value of the performance bonus. What discount rate should he use to calculate the present value of the base compensation? Assume that the risk-free rate is 5%. (10)

C) What discount rate should Minaya use to calculate the present value of the performance bonus payments? (10)

4) AirTran Airways provides everyday, affordable air travel to business and leisure travelers. Their business has declined along with the economy, but by a smaller percentage. The price and value of their stock has fallen to $6/share. There are 250 million shares outstanding. AirTran has an equity β that is 20% greater than the equity market's β. An analysis of AirTran's assets (airplanes, gates, brand name, customer loyalty, etc) by Kuhnen and Kondo Associates puts the current value of these assets at $4.5B. The risk free rate is 5%.

A) AirTran has an outstanding zero-coupon bond. It was initially sold for $2.9B, had a face value of $4B, and an original maturity of five years. It currently has two years of remaining maturity. If the debt β is 0.65, what is the promised rate of return on AirTran's debt today? (10).

B) AirTran is considering selling some of their airplanes to raise cash. The discount rate they will use to evaluate the assets sales is equal to the firm's cost of capital and thus based on AirTran's asset β. What is AirTran's asset β? Show your work. (10)

C) The asset sale may not generate enough cash to meet the firm's obligations, thus the CFO Mr. Thain is considering a debt for equity swap. For each $6,000 of debt an investor owns, they will receive 1000 shares (based on the stock price of $6/share). This plan will reduce the firm's leverage and the risk of the equity. How will it change AirTran's costs of capital ($r_{Asset}$)? Explain complete (10).

D) Mr. Thain met with the debt investors and they are demanding 1,050 shares for every $6000 of debt (5.71/share). If Mr. Thain agrees to their terms and swaps their debt ($6,000) for equity (1,050) shares, how will this change the discount rate that AirTran uses to value its projects? Explain completely. (5)

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:

$$r_A = r_{\text{risk free}} + \beta_A \, \text{E}[\, r_{\text{market}} - r_{\text{risk free}} \,] + \varepsilon$$
$$\text{E}[\, r_A \,] = r_{\text{risk free}} + \beta_A \, \text{E}[\, r_{\text{market}} - r_{\text{risk free}} \,]$$
$$\text{E}[\, r_{\text{market}} - r_{\text{risk free}} \,] = 7.6$$
$$\text{E}[\, r_{\text{long-term treasury}} - r_{\text{risk free}} \,] = 1.1$$

Payoff to a call option:

$$\text{Payoff} = \text{Max}\{0, S_t - X\}$$

Payoff to a put option:

$$\text{Payoff} = \text{Max}\{0, X - S_t\}$$

**Solutions to Corporate Finance Midterm: Practice Exam A**

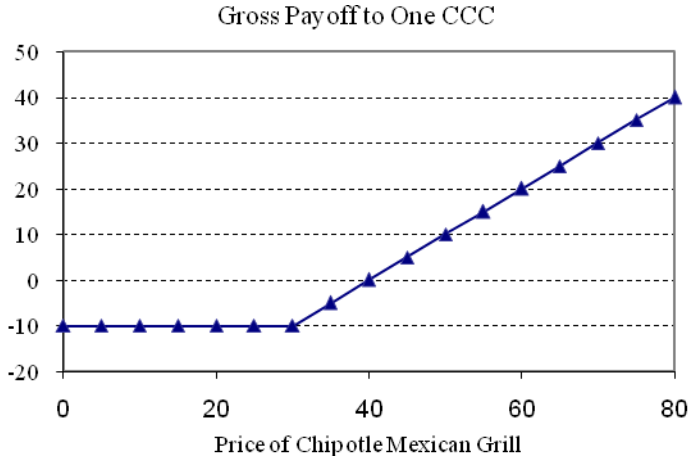
1) Chipotle's CCC options

A) The payoff to the CCC is the maximum of the stock price minus the strike price (40) and minus 10. If you don't exercise, you must pay 10.

$$\begin{aligned} CCC\ Payoff &= Max\left[S-40,-10\right] \\ &= Max\left[S-30,0\right]-10 \end{aligned}$$

Thus if the stock price is 35, you are better off exercising the option and losing 5, than not exercising the option and losing 10. Since not exercising costs you 10, you would choose to exercise the option anytime the stock price is above 30.

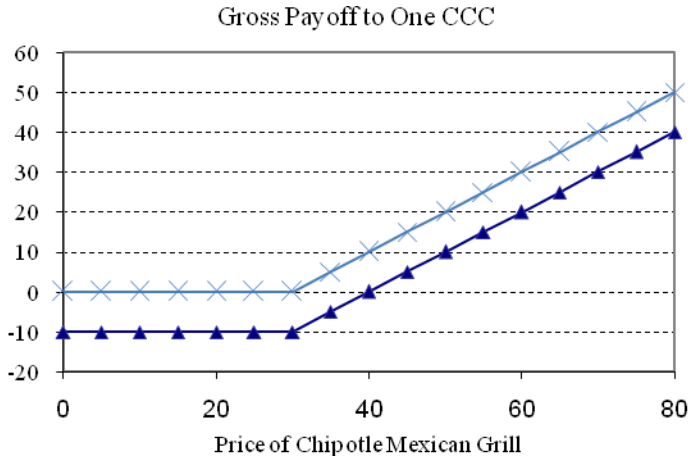
B) Since it makes sense to exercise the option only when the stock price is above 30, the payoff to the CCC is minus 10 when the stock price is below 30 and the stock price minus 40 when the stock price is above 30. Above 30, the payoff rises dollar for dollar with the stock price and becomes positive once the stock price is above 40.




C) Based on the answer to B) the payoff to the CCC has the same shape as a call option on Chipotle stock with a strike price of 30 (not 40). Although the payoffs to the two portfolios have the same shape, the payoff to the CCC is always 10 lower than the payoff off to the call. This means that the price of the CCC is equal to the price of a call with a strike price of 30 minus the present value of 10. The 10 cash outflow is risk-free. The difference is not just expected to be 10, it is always 10. Thus we discount 10 at the risk-free rate of 5%. The price of the CCC is 10.0.

$$\begin{aligned} Payoff\ CCC &= Payoff\ Call - 10 \\ Max\left[S-40,-10\right] &= Max\left[S-30,0\right]-10 \\ P_{CCC} &= P_{Call\ option} - PV(10) \\ &= 19.5 - \frac{10}{(1+.05)} = 10 \end{aligned}$$

The figure below may be helpful. I have graphed the payoff to the CCC (triangles) and to a standard call option with a strike price of 30 (Xs). The CCC diagram is the same as the call option diagram, only moved down by 10 next year.




D) The Chipotle options are worth less to you than their market price. Market participants who are setting the prices of Chipotle options are well diversified. Thus they will value the options based only on the systematic risk of the Chipotle options. Since a large portion of your wealth, your human capital (e.g., future wages and bonuses), is "invested" in Chipotle your portfolio is less diversified. Since you are less diversified you will find Chipotle specific risk more costly to bear, and will use a higher discount rate. Thus the value of the Chipotle options to you will be less than the value to a well diversified investor (i.e., the market price). This difference in value is why managers such as yourself have an incentive to sell their options (even without non-public information), and why many incentive contract prohibit selling them.

2) Short discussion questions

A) Uncertain. The change in the book value of equity depends on the firm's profits and its payments to/from equity holders. Thus if the firm paid a dividend or repurchased stock in an amount that was greater than their profit, the book value of equity would fall. If the firm lost money and did not pay a dividend or repurchase stock, the book value of equity would also fall. The fall in equity value could arise from the firm having losses, paying a dividend, repurchasing stock, or combination of these three.

$$BVE_{2008} = BVE_{2007} + \text{Net Income} - \text{Dividend}_{2007} - \text{Net Stock Repurchases}_{2007}$$

B) Your expected return is between 1.18% and 1.61%. The expected return on any asset is the maturity matched risk-free rate (one year in this case) plus the risk premium on the asset. We know that the term structure slopes upward on average. Historically, two-year German government bonds have had a higher return than one-year government bonds. This difference is the positive risk premium on two-year governments bonds. Thus the expected return is greater than 1.18% (the return on one year government bonds).

The term structure is steeper today than it has been historically. This means the difference between the two-year and one-year yields (i.e., 1.61% - 1.18% = 43 basis points) is greater than the risk premium. This means that short-term rates are expected to rise. If

interest rates are expected to be higher next year, you will suffer a capital loss on your bond (i.e., you will sell it for less than the face value you paid). Thus you will receive a return of 1.61% in interest and expect to suffer a capital loss. Your expected return is thus less than 1.61%.

3) Valuing compensation plans

A) False. The risk of an asset, including the Mets, consists of systematic and idiosyncratic risk. The Mets' $\beta$ measures its systematic risk (i.e., the covariance of its return with the market return, divided by the variance of the market return):

$$\beta_A = \frac{\text{cov}(r_A, r_m)}{\text{var}(r_m)}$$

The total volatility of the Mets (42%) comes part from its systematic risk (measured by $\beta$) and part from its idiosyncratic risk (variance of $\varepsilon$). Since at least some of its risk is idiosyncratic, the systematic risk of the Mets is less than 42%, and its $\beta$ must be less than 2.

In what way is the risk of the Mets idiosyncratic? If they win or lose, another team loses or wins. If winning affects cash flows (it does), the risk is idiosyncratic. If baseball becomes more or less popular relative to other sports, or relative to other forms of entertainment (basketball, opera, movies, reading, studying for Fin 2), this is also idiosyncratic risk. A portion of the Mets' risk is systematic (e.g., fans are willing to pay less for tickets when their income and the market portfolio declines), but a large portion is idiosyncratic. The idiosyncratic portion is diversifiable, and therefore not priced by a diversified investor.

B) These are promised payments made by the Mets to Mr. Rodriguez. They will be paid as long as the Mets are solvent.[1] The appropriate discount rate for the promised payments is the current yield or current promised rate on the Mets' unsecured borrowing (i.e., debt of similar default risk). Given the implicit assurances of Major League Baseball to back up the Mets' obligations, this borrowing rate is likely to be very close to the risk-free rate. This also implies that the payments Mr. Rodriguez expects to receive are only slightly less than the promised payments.

C) In addition to the risks to Mr. Rodriguez's base compensation (small default risk), the bonus payments are also affected by how he pitches. This risk is completely idiosyncratic. Thus you can calculate the expected bonus payments and discount them at the same discount rate which you used for the base compensation (i.e, the discount rate from part B). You need to discount the expected bonus payments (not the promised bonus payments) to account for the fact that Mr. Rodriguez may or may not pitch the required number of games.

It is true that Mr. Rodriguez's performance will affect how many games the Mets win and thus the firm's cash flows, but this risk is completely idiosyncratic. Mr. Rodriguez's athletic performance is uncorrelated with the market return. Because the Mets' owners are well-diversified, they do not price this risk.

[1] Granted Mr. Rodriguez might worry about this after the Mets' owner Fred Wilpon lost a small fortune with Bernard Madoff

4) AirTran Airways

A) The promised return on AirTran's debt is 15.5%. We know that the bond has two years of maturity remaining, makes no payments in one-year (it is a zero-coupon bond), and then makes a final payment in year two of \$4B (the bond's face value). If we discount the promised payment of \$4B at the promised rate of return, we get the value of the debt.

$$V_{bond} = \frac{4.0}{\left(1 + r_{promised}\right)^2}$$

Thus to calculate the promised return, we need to know the value of the debt. The value of the assets is \$4.5B. The value of the equity is \$1.5B (i.e., 250M shares times \$6/share). Thus, the value of the debt is \$3.0B, and the promised return is 15.5%.

$$3.0 = \frac{4.0}{\left(1 + r_{promised}\right)^2} \rightarrow r_{promised} = 15.5\%$$

B) The asset $\beta$ is 0.83. It measures the systematic risk of the firm's assets. We calculate it as a weighted average of the debt and equity $\beta$, where the weights are the fraction of the firm's market value which is debt or equity. Because the value of the equity is \$1.5B and the value of the debt is \$3.0B, the firm is one-third equity and two-thirds debt. The debt $\beta$ is 0.65 and the equity $\beta$ is 1.2 (the market's $\beta$ is 1.0, and AirTran's $\beta$ is twenty percent greater). This gives an asset $\beta$ of:

$$\begin{aligned}\beta_A &= \beta_D \frac{D}{D+E} + \beta_E \frac{E}{D+E} \\ &= 0.65\frac{3.0}{3.0+1.5} + 1.2\frac{1.5}{3.0+1.5} = 0.83\end{aligned}$$

An asset $\beta$ of less than one is consistent with the observation that AirTran's business has fallen by less than the economy. Their equity $\beta$ is greater than one, but this is because of leverage. Their asset $\beta$ is below one.

C) The debt for equity swap will have no effect on AirTran's asset $\beta$ or their cost of capital. The debt for equity swap will convert debt to equity. It will not change the total value of the assets, or the risk of the assets. The debt for equity swap will lower AirTran's leverage, and thus their equity will become less risky (the equity $\beta$ will fall). Their debt will also become less risky (their debt $\beta$ will fall). However, if you don't change the assets, then you also don't change the risk of the assets – the asset $\beta$ is unchanged.

Let's consider a numerical example. If \$2.8B of the debt is converted to equity, then the firm has \$0.2B of debt (which I will assume is risk-free) and \$4.3B of equity. The equity $\beta$ would have to be 0.87 in this case. The debt $\beta$ and equity $\beta$ are both lower, but the asset $\beta$ is the same – because the assets are the same.

$$\begin{aligned}\beta_A &= \beta_D \frac{D}{D+E} + \beta_E \frac{E}{D+E} \\ &= 0.00\frac{0.2}{0.2+4.3} + .087\frac{4.3}{0.2+4.3} = 0.83\end{aligned}$$

The wealth of debt and equity holders is also unchanged in this case. If the \$2.8B in debt is exchanged for shares at \$6/share, the debt holders receive 467M (i.e., \$2,800M/\$6) new shares and will still own \$0.2B in debt. The total number of shares outstanding will rise to 717M (i.e., 250M + 467M). This means the price per share after the swap will be

$6 (i.e., ($4,500M - $200M) / 717M). The debt holders will thus have $0.2B in debt and $2.8B in equity (i.e., 467M * $6). Their total wealth will remain unchanged at $3.0B. The old equity holders will still have 250M shares worth $6 each for a total wealth of $1.5B (i.e., 250M * $6). Their wealth has not changed either.

D) Even though it is no longer correctly priced, the debt for equity swap will have no effect on AirTran's asset $\beta$ or their cost of capital. Because the debt for equity swap does not change the firm's assets (it only re-arranges the equity and debt claims on those assets), it does not change the value of the assets, the risk of the assets, or the correct discount rate used in valuing the assets.

Because the debt for equity swap is not correctly priced (the debt holders are effectively buying stock for less than it is worth), the transaction will transfer wealth from equity holders to debt holders. If debt holders have bargaining power (for example, if the firm must execute the transaction to maintain the value of the assets), then debt holders can use their bargaining power to extract a better than fairly priced deal.

To see that this does not affect AirTran's asset discount rate, let's work through the numbers. If the 2.8B in debt is exchanged for shares at $5.71/share (i.e., $6,000/1,050), the debt holders receive 490M (i.e., $2,800 / $5.71) new shares and retain $0.2B in debt. The total number of shares outstanding will rise to 740M (i.e., 250M + 490M). This means the price per share after the swap will be $5.81 (i.e., ($4,500M - $200M) / 740M). The debt holders will thus have $200M in debt and $2,847M in equity (i.e., 490M * $5.81). Their total wealth will rise to $3,047M, an increase of $47M. The old equity holders still own 250M shares, but now these are worth only $5.81/share. Their wealth has fallen to $1,453M, a fall of $47M. The value of the firm is unchanged at $4,500M (i.e., $3,047M + $1,453M), which is not surprising because the assets did not change.