

Name: _____

Yale School of Management

Corporate Finance and Options

Spring Semester 2000

Final Exam

Professor Matthew Spiegel

Instructions: This is a closed note closed book exam. You may use a calculator and its accompanying manual. You can also bring in notes that list up to 20 equations. To receive any credit answers *must* include the equations you used. Please write your answers in the space provided beneath each question. This test contains 11 pages.

Bonus Question 1: For a free bag of M&Ms who plays Iolaus in the TV show *Hercules the Legendary Journeys* **or** who plays Gabriel in *Xena Warrior Princess*?

Answer to bonus question 1: _____

Bonus Question 2: For a free bag of M&Ms who plays Xena in the TV show *Xena Warrior Princess*, **and** who plays Hercules in *Hercules the Legendary Journeys*? You must get both answers right to collect the M&Ms.

Answer to bonus question 2: _____

1. 5 points.

Suppose that a firm's bonds return 8%, its equity 14% and that it is in the 40% tax bracket. What is its weighted average cost of capital if it is financed 30% by debt and 70% by equity?

2. 5 points.

A firm produces \$40,000 in revenues per year. On an annual basis the fixed production costs equal \$10,000 and the expected variable costs come to \$15,000. There are no taxes. Assume that the variable costs move proportionately with the firm's revenues. Thus, if revenues increase by 10% then the variable costs increase by 10%. Assume that the revenues have a beta of 1.5, that the expected return on the market equals 15%, and that the risk free rate equals 5%. What is the beta of the firm's assets (i.e. profits).

3. 20 points.

Right now the stock market believes that Mega Toys is worth \$100,000, that its profits are growing at a rate of 4% and that it has an asset beta of .8. Mega Toys believes that they can expand into the home video game market with an investment of \$3,076.92. If they produce video games then they expect to earn \$3,000 next period and that their earnings will grow at a rate of 4% per year forever. Because video games are a luxury item Mega Toys thinks that the earnings will have a beta of 1.2. Mega Toys has a debt/asset ratio of .5 and its debt is risk free. There are no taxes.

- a. If the risk free rate equals 5% and the market return equals 15% how much will Mega Toys be worth if it produces the video game?
- b. What will the equity be worth?
- c. What is the beta of the firm's equity?

4. 20 points

A firm currently (period 0) has both senior and junior debt outstanding. Next period (period 1) the senior debt holders are owed 100 million, and the junior debt holders 50 million. After that the equity holders will receive any remaining funds. The firm will close down after period 1.

- a. Draw a picture that describes the payoff to each security class (senior debt, junior debt, and equity) as a function of the firm's period 1 profits.
- b. What combination of put and call options will duplicate the payoff to the junior debt holders. To answer this question you must list for each option its type (put or call), and strike price.

5. 25 points

Current Costs: You are part of a firm that produces computer chips. Your group believes that it may be able to replicate a computer video chip that is currently considered to be the “best on the market” by spending \$5 million in research and production facilities in period 0. If you go ahead with the research there is a 80% chance that you will succeed in creating a working product.

Market Forces: The stock market either has a low return of -5% with probability .4, or a high return 20% with probability .6. The risk free rate equals 5%.

Low return market: If your research succeeds and the economy does poorly you expect to earn \$6 million in period 1.

High return market: If your research succeeds and the economy does well you expect to earn \$10 million in period 1.

- A. What is the present value of the research project?
- B. What is the beta of the cash flows produced by this project?

6. 25 points.

The risk free rate equals 5% and the market return equals 15%. A company has an asset beta of .8. Assume that whatever debt-equity ratio the firm uses that it adjusts it debt to always keep this ratio at a constant level. Further assume there are no taxes in parts a, b, and c of this question.

- a. Suppose the firm finances its operations via 20% risk free debt. What is the equity beta?
- b. Instead suppose it uses 60% debt with a beta of .2. What is the equity beta?
- c. Next the firm decides to use 30% senior risk free debt, 40% risky junior debt with a beta of .4. What is the equity beta in this case?
- d. Finally the government steps in. The government announces that from now on taxes will equal 40% of the firm's profits after interest on the debt has been paid. If the firm is 1/3 debt financed and the debt beta equals .3 what is the equity beta in this case?

7. 35 points

Production: Iolaus, a friend of Hercules and Xena, has retired from fighting evil and opened a sandal shop called Hermes' Sandals. Total profits from the sale of sandals is expected to equal 5,000 drachmas next year. These profits have a beta of 1.2 and are expected to grow at a rate of 2% per year.

Financial Policy: Iolaus has financed the firm by floating 20,000 drachmas worth of perpetual debt in period 0. Iolaus adjusts the firm's total outstanding debt every other year in order to restore the debt-equity ratio back to what it is in year 0. Assume the debt has a beta of .1.

Taxes: The Athenian government imposes a tax of 40% on a firm's operating profits (revenues minus costs minus any interest paid) each year. Iolaus being an honest sole always pays what he owes.

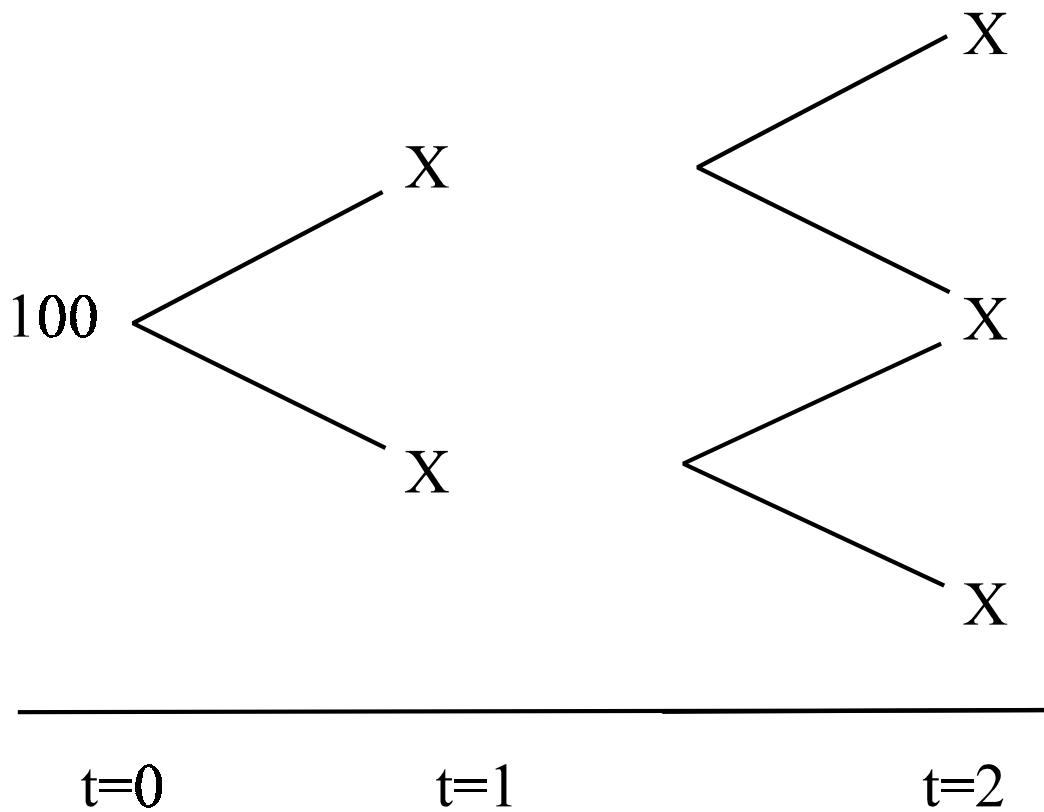
Market Statistics: The expected return on the market equals 15%, and the risk free rate equals 5%.

Question: How much is the equity in Hermes' Sandals worth?

8. 35 points.

Shares of the Almost Done Company (ADC) sell for \$100. Each period there is a 60% chance the price will go to 1.1 times the previous price and a 40% chance it will decrease to the previous price divided by 1.1. You own a call option on the stock with an exercise price of \$102 that expires in two periods. There also exists a risk free security that you can buy or sell that returns 1% per period.

a. In the tree given below fill in the stock price next to the x's.



- b. Calculate the period 1 replicating portfolio if the stock price goes up to $1.1(100)$. What is the option worth if you get to this point? (The replicating portfolio is a portfolio that combines the stock with the risk free security to produce the same payoffs as the option.)
- c. Calculate the period 1 replicating portfolio if the stock price goes down to $100/1.1$. What is the option worth if you get to this point?
- d. Calculate the period 0 replicating portfolio. What is the option worth?

Essay Section

Remember if there are a number of reasons for something and you only explain one, you will not receive as much credit as somebody who analyzes all of them.

9. 10 points.

The following is true: Some mutual funds have higher expected returns than the market portfolio. You can identify these funds in advance. Their performance is not due to luck. Does this prove that the markets are not efficient? If so why? If not what other explanation can you provide.