

## Economics 136. Financial Economics

Sample midterm 1A, Fall 2009

Read through the entire exam carefully, and then do all questions. Please explain your work as you will be graded on the quality of your explanations as well as the numerical accuracy of your answers. Be sure to write your name and section time on your blue book. You may use a calculator and one double sided sheet of handwritten notes.

### 1. True or false. (18 points, 6 each)

Are the following statements true or false? Explain your answer in no more than two sentences. You will be graded on the quality of your explanation.

(i) You have initial wealth \$500. You borrow an extra \$300 at a 5% annual rate, and invest all of this in Vitamin stock. If Vitamin earns a net simple return of -8% during the next year, then your net simple portfolio return (after paying off the debt) is -20%.

(ii) The price of Goland stock is \$33, the price of a one-year put option on Goland with strike \$35 is \$2.50, and the price of a call option for the same strike and expiration is \$3. If the annual riskfree return is 5%, there is an arbitrage opportunity. (Note: Goland does not pay dividends during the next year).

(iii) The price of a bond is always less than its face value.

### 2. Portfolios. (18 points, 6 each)

Suppose you are constructing a portfolio of two companies. The first has 10,000 shares outstanding at a current price of \$100 per share, while the second has 60,000 shares outstanding at a current price of \$50 per share. You have \$10,000 to invest.

a) How many shares of each company would you buy if you want to construct an equal-weighted portfolio? How many shares of each company would you buy if you want to construct a value-weighted portfolio?

b) A year later, company 1's share price has risen to \$150 while company 2's share price is unchanged at \$50. Neither company has paid a dividend. What are the returns on the equal-weighted portfolio and the value-weighted portfolio you constructed in part a)? Explain the difference.

c) How must you trade a year later to keep the equal-weighted portfolio equal-weighted? How must you trade to keep the value-weighted portfolio value-weighted? Explain. (Note: It is sufficient to explain whether you need to buy or sell the shares of either company. You do not need to calculate the exact amounts.)

**3. Evaluating salaries.** (12 points, 6 each)

A famous quarterback just signed a \$20 million contract providing \$4 million a year for 5 years. A less famous receiver signed a \$19 million 5-year contract providing \$4 million now and \$3 million for 5 years. Who is better paid if

- (a) the rate of interest  $R$  is 5% a year,
- (b) the rate of interest  $R$  is 8% a year? Explain.

**4. Diamonds.** (28 points, 7 each)

Your company, Diamonds, Inc, owns a stock of diamonds which you would like to sell next year. The value of your diamonds next year depends on consumer demand, which is determined by the state of the economy (recession or boom). There are two traded financial assets in this economy, a stock index and a Treasury bond. You have the following economic data:

	Value of your diamonds	Stock index	Treasury
State 1: Boom	10	14	10
State 2: recession	4	8	10
Price today		10	9

- (a) Assume LOOP holds. At what price could you sell your diamonds today?
- (b) What is the price of a European call option on the stock index that has a strike price of 4 and expires next year?
- (c) What is the price of a European put option with the same strike price and expiration? Explain your answer.
- (d) Downhill, an investment management company is selling call options on the stock index with strike \$11 expiring next year, for a price of \$1.20. Can you make money? What is your arbitrage trade? What do you expect Downhill to do?

**5. Football.** (24 points, 8 each)

In the Berkeley-Stanford football game, the possible outcomes are as follows. In the first half, Berkeley can go ahead by 10 points or Stanford can go ahead by 10 points. In the second half, the change in the score can be 10 points in Berkeley's favor or 10 points in Stanford's favor.

Suppose there are bookmakers who allow you to bet at the start of the game on the half-time score. The cost of a bet that pays \$1 if Berkeley is ahead at half time is \$0.70. The cost of a bet that pays \$1 if Stanford is ahead at half time is \$0.30. These bookmakers also operate at half time, and allow you to bet on the final outcome. The cost of any bet at half time is \$0.50 (E.g., if Berkeley is ahead at half time, the cost of a bet that pays \$1 if the score will move in favor of Stanford is \$0.50. Similarly for all other bets).

a) Draw the event tree. At each node of the tree, enter the Berkeley lead (the number of points that Berkeley is ahead, a negative number if Stanford is ahead). On each branch, write the price of a bet that pays \$1 if events unfold along that branch. If we only care about the final score, how many states of the world are there at the end of the game?

(b) Show that you can use a sequence of bets, starting at the beginning of the game, to obtain \$1 if and only if (Berkeley wins the game; or \$1 if and only if Stanford wins; or \$1 if and only if the game is a tie. How much does it cost to obtain each of these payments (i.e., what are the prices of Arrow-Debreu securities)?

(c) Does your answer to (b) depend on the probabilities of the various outcomes? Why or why not?