

NAME: _____

ECONOMICS 422
MIDTERM EXAM 1

R. W. Parks

Autumn 1994

Answer all questions on the examination sheets. Weights are given in parentheses. In general you should try to show your work. If you only present a numerical answer and it is wrong, then you get no credit. If you show what you are doing and you make a numerical error you will receive some credit for a correct approach.

1.(30) Pandora lives in a two period Fisherian world. Her utility function for consumption streams can be written as $U(c_0, c_1) = c_0^2 c_1$, hence her marginal rate of substitution is

$MRS = -2c_1 / c_0$. Her endowment of present and future resources is (20,000, 144,200). She can borrow or lend at a market real interest rate of 3 percent.

a. What is her wealth?

b. What is her optimal consumption in the present and in the future?

b. What financial transactions are required to attain the optimal consumption stream? Indicate both the transaction and the amount involved.

2. (35) In a two period Fisher model assume that a person has
- an initial endowment that consists entirely of present resources
 - an investment function that gives the relationship between amounts invested in the present and the corresponding returns to be received in the future.
 - preferences regarding time dated consumption streams
- a. Initially assume that there are no capital markets. In a well labeled diagram show the elements listed above and indicate the person's optimal investment and consumption decisions.
- b. Now assume that the person can borrow or lend at a real rate of interest $r > 0$. Using a new diagram indicate the optimal investment and consumption decisions.
- c. Is the person better off under a. or b.? Explain.
- d. What happens to amount of real investment selected in part b if the real interest rate falls? Explain using a diagram.

3.(20) What is the value of the following cash flows:

- a. \$273,000 to be paid in five years
- b. \$11,760 per year to start next year and continue indefinitely.
- c. \$28,260 per year to start next year and continue for a total of 10 payments.
- d. \$6,300 to be paid next year, followed by annual payments that grow at 3 percent per year and continue indefinitely.

The interest rate is 6 percent. Show your work.

4.(15) Yields and prices of zero coupon bonds; forward interest rates.

- a. A nine year zero coupon (pure discount) bond sells for 50:04. What is its yield?
- b. The yield on a ten year zero coupon bond is 7.82 percent. What is its price?
- c. Based on the data given in parts a and b above, what is the implied forward interest rate ${}_9r_{10}$?

ECONOMICS 422
MIDTERM EXAM 2

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Autumn 1994

Answer all questions. Weights are given in parentheses. In general you should try to show your work. If you only present a numerical answer and it is wrong, then you get no credit. If you show what you are doing and you make a numerical error you will receive some credit for a correct approach.

1. (16) The following table gives the yields on four zero coupon Treasury bonds:

Maturity Date	Years from now	Yield
May 1995	0.5	5.88
Nov 1995	1.0	6.35
May 1996	1.5	6.77
Nov 1996	2.0	6.99

Note that the yields are annual yields, but they assume semi annual compounding.

a. What is the price of a two year, 6.5 percent coupon Treasury bond, paying semi-annual coupons?

b. Define the yield to maturity of a bond. Is the yield to maturity of the bond in part a higher or lower than the coupon rate? Explain.

2. (16) Your company is considering a project which requires the building of a warehouse. Warehouse A costs \$120,000 to build and lasts five years. It requires maintenance expenditures of \$4000 per year. An alternative, Warehouse B, costs \$180,000 to build, lasts 8 years, and requires maintenance expenditures of \$2200 per year. Both warehouses would provide the same stream of services in the context of the project. Neither has a scrap value at the end of its life.

Assuming that the opportunity cost of capital is 10 percent, which warehouse would you choose? Explain and show your work.

3. (24) A person whose utility of wealth function is $U(W)=\log_e(W)$, i.e. the person's utility associated with any given level of wealth is equal to the natural log of the wealth level.

If the person chooses occupation A his or her wealth is given by the following wealth distribution:

Wealth:	1,000,000	2,000,000
Probability:	0.8	0.2

If the person chooses occupation B his or her wealth is given by the following wealth distribution:

Wealth:	1,100,000	1,300,000
Probability:	0.5	0.5

a. Which occupation will the person choose and why? Or will the person be indifferent to the alternatives? Explain.

b. Compute the certainty equivalent wealth for occupation A.

4. (24) A stock currently sells for \$80 per share. The distribution of its price in one year is:

Price:	76	80	84	88
Probability:	.10	.20	.50	.20

a. What is the probability distribution of the stock's rate of return?

b. Compute the expected value of the rate of return over the next year.

c. Compute the variance of the rate of return.

5. (20) Two companies have stock for which the expected returns and standard deviations of return are forecast as:

Company:	A	B
Expected Return:	0.2	0.2
Standard Deviation of Return	0.3	0.3

The correlation coefficient between the two rates of return is 0.

a. What are the expected return and variance of returns for a portfolio made up, half of A and half of B?

b. Since the two stocks' returns and standard deviations are the same, does it make any sense to combine them in a portfolio, or would you be just as well off holding either one of the stocks separately? Explain.

Name: _____

ECONOMICS 422
FINAL EXAMINATION

R. W. Parks

Autumn 1994

Two hours. Answer all questions on these exam sheets. Question weights (total=120) are given in parentheses. In general you should try to show your work for the problems i.e. the non-multiple-choice questions. If you only present a numerical answer and it is wrong, then you get no credit. If you show what you are doing and you make a numerical error you will receive some credit for a correct approach.

1. (20) Provide brief definitions of the following:
 - a. The Fisher separation theorem.

 - b. The distribution of a random variable.

 - c. The expected utility hypothesis.

 - d. The duration of a bond

 - e. The yield to maturity of a bond.

2. (12) SeaStarCo. is considering a three year project that involves an initial outlay of \$10 million. The revenues from the project that will be received in years 1,2, and 3 are forecast at \$8,500,000 per year in real terms, but are expected to grow at 3 percent per year. The operating costs in years 1,2, and 3 are forecast at \$4,250,000 per year in real terms and are expected to grow at 3.5 percent per year.

SeaStarCo is a new company. The project is also a new venture but financial analysts think that its risk is comparable to that of another company. That company's common stock has a beta of 1.5, and it has a capital structure with 20 percent debt that is essentially risk free. The market risk premium is 8.4 percent, and the yields on 1,2, and 3 year zero coupon Treasury bonds are 5.10%, 5.75%, and 6.18% respectively.

- a. What are the appropriate discount rates for the cash flows of this project?
- b. Should SeaStarCo undertake this project? Why?

3. (10) If you buy a 9-month Treasury bill future, you undertake to buy a 3-month T-bill 9 months from now. Suppose that Treasury bills currently offer the following yields:

Months to Maturity	Annual yield %
3	6.0
6	6.5
9	7.0
12	8.0

What is the value of a 9-month bill future? Explain and show your analysis.

4. (25) Write a brief essay on the efficient market hypothesis for financial markets. Your essay should address the following issues. What is meant by the efficient market hypothesis? What are some of the major implications of financial market efficiency? What is meant by the distinction between the weak, the semi-strong, and the strong forms of the efficient market hypothesis? Briefly describe the logic and results for two tests designed to test two of the three forms of the hypothesis. Are there any important anomalies, that is observations that are at odds with the efficient market hypothesis? After considering the evidence, what is your personal view or evaluation of the efficient market hypothesis? (Continue on reverse side)

5. (15) BioGenCo's stock sells for \$83.125. It has a beta of 1.2, the standard deviation of the rate of return is 0.4, and it has not paid dividends. The risk free interest rate is 6.1 percent. Find the value of a one year European put option on BioGenCo with an exercise price of \$90. Would an American put option be worth more or less? Why?

6. (8) Use Bachelier position diagrams to compare the value at expiration of

- a long position in a futures contract at a price of X and
- the combination of a long position in a call option and a short position in a put option, where both options have an exercise price of X .

7. (25) Employee Options. Young companies often pay salaries that are relatively low but which are supplemented with stock options. Suppose that an employee of Imagioco is granted 500 American call options. Their exercise price is \$25, which is equal to the price of Imagioco's stock on the day of the grant. The options expire in ten years. Imagioco pays no dividends and the standard deviation of the rate of return on its stock is 0.347851. The yield on a ten year stripped Treasury bond is 5.75571 percent.

- a.) Use the Black-Scholes option pricing formula to estimate the value of the option grant.
- b.) What are the advantages and disadvantages to the company and to the employee of this form of compensation?
- c.) Employee options usually are not marketable and they become exercisable according to a vesting schedule e.g. 20 percent of the options become exercisable on the first through fifth anniversaries of the option grant. Would you expect these features to increase or decrease the value of the options relative to the value computed in part a above? Explain.
- d.) It has been observed that employees often exercise their options according to the vesting schedule when they are in the money even though by doing so they give up some of the options' value. What factors might explain this choice by the employees?

8. (5) The closing price on the 100 ounce gold futures contract for April (treat this as 0.333 years from now) was \$383.20 per ounce. The closing spot price of gold was \$378.20 per ounce. The April T-bill has a yield of 6.06 percent. If the convenience yield for gold is negligible and if the present value of the cost of storing an ounce of gold for four months is positive, are the spot and futures prices consistent? Explain. If you find that the prices are not consistent, explain how you could take advantage of the situation.

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