AUTUMN 2000 MIDTERM AND FINAL EXAMS

NAME:_____

Economics 422
Midterm Exam

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Answer all questions on the examination sheets. Weights are given in parentheses.

1. Fisher Model: Consumption (20)

***In order to eliminate ambiguities in the following question and in your answers to it, I have followed, and you must follow, the following conventions:
      Single letters denote points or locations but not quantities.
      Lines are identified by two letters located on the line.
      Pairs of letters on horizontal or vertical axes represent quantities on that axis.
      (For example AP denotes a given quantity of present consumption;
            HI denotes an amount of future consumption.)***
*****If you do not understand these conventions, please ask me!!]*****

The diagram in Figure 1 refers to a two-period Fisher model with the standard assumptions. Point E represents a person's initial endowment. The line IF through E represents the person's initial budget constraint, and the point C* represents the optimal consumption stream for the initial situation.
a. How is the real interest rate represented in the diagram?_____
b. What is the significance of the quantity OF?_____
c. In what financial transactions does the person engage to reach C*?_____
_____
[Be clear and indicate the quantities of both present and future resources that are involved .]
d. What are the optimal amounts of present and future consumption?_____and _____

The line JK through E represents a new budget constraint, and LM is parallel to it.
e. How has the real interest rate changed?_____
f. Which of the four points E, X, Y, and Z could be the new optimum consumption stream? And which points could not be the new optimum? [Take into account the budget constraint, assumptions about non-satiation and about the direction of wealth effects.]
      Could:_____
      Could not:_____

g. If the new optimum point (one of the feasible points in f above) involves less present consumption and more future consumption, indicate in terms of C_0 on the horizontal axis:
      i.) the substitution effect of the change in r_____
      ii.) the income (or wealth) effect of the change in r._____
h. Is the person better off or worse off after the change in r? Explain_____
_____

2. (20) Dinah lives in a two period Fisherian world. Her utility function for consumption streams can be written as $u = C_0^{.45} C_1^{.55}$, hence her marginal rate of substitution is

$$MRS = -\frac{.45C_1}{.55C_0}$$

Her endowment of present and future resources is (100000, 206000). She can borrow or lend at a market real interest rate of 3 percent.

a. What is her wealth?

b. Write the equation for her budget constraint.

c. Derive the marginal rate of substitution.

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

e. What financial transaction is required to attain the optimal consumption stream? Indicate what is exchanged for what, when, and indicate the amounts involved.

3. (16) a. At age 20 you put $2000 into an IRA account held in the form of a Vanguard Index 500 mutual fund. At age 60, as you begin to think seriously about retiring, you find that the account is worth $192,865.48. What has been the average annual rate of return on this account?

_____%.

b. Your house remodel will cost $96,000. You plan to pay for it with your equity line of credit with a stated annual interest rate of 9 percent. If the loan is to be paid off in 60 equal monthly payments starting one month from now, what is your monthly payment?_____.

c. LOTTO FEVER $32MILLION!!!   Participants in the WA State Lottery must choose between a prize of
        a. 1/2 of the jackpot amount paid immediately   or
        b. 1/25th of the jackpot paid in 25 annual installments, with the first payment paid
            immediately.
At an interest rate of 6.5% and ignoring tax considerations, which choice makes you wealthier? Explain and show your analysis.

d. Since I plan to hold Boeing Co.'s stock for at most five years, I am not concerned about the company's dividends after that horizon date. Indicate whether the statement is True, False, or Uncertain. Explain.

4. (20) Yields, prices of zero coupon bonds, coupon bonds, forward interest rates.

a. The yield on a four-year zero coupon bond is 6.05 percent. What is its price?

b. A five-year zero coupon (pure discount) bond sells for 73:24. What is its yield?

c. Find the price of a two-year Treasury note, with a 5% coupon rate, semi-annual coupons, when the relevant discount rate is 6%.

d. A two-year, 6% <u>annual</u> coupon bond has a price of 101. What is its yield to maturity?

e. A 4-year Treasury Strip yields 5.2%. A 5-years Strip yields 5.4%. What is the forward interest rate, $_4f_5$?

5. (12)The Lumina Company is considering a project which requires the building of solar panels. Solar panels of type A costs $180,000 to build and lasts five years. An alternative type of solar panel, type B, costs $270,000 to build and lasts 8 years. Both types of solar panels would provide the same stream of services in the context of the project. Neither has a scrap value at the end of its life. Whichever is built, it will need to be replaced when it wears out, indefinitely.
Assuming that the opportunity cost of capital is 6 percent in real terms and ignoring taxes, which type of solar panel would you choose? Explain and show your work.

6. (12) The probability distribution for next year's price of XYZ stock is given by

Price P_1	$90	$100	$110	$120
Probability	.1	.2	.5	.2

a. Compute the expected value of next year's price.

b. Compute the variance of next year's price.

c. Compute the expected rate of return if the current price is $100 and you expect to receive a $2 dividend at time 1..

Figure 1

C_1
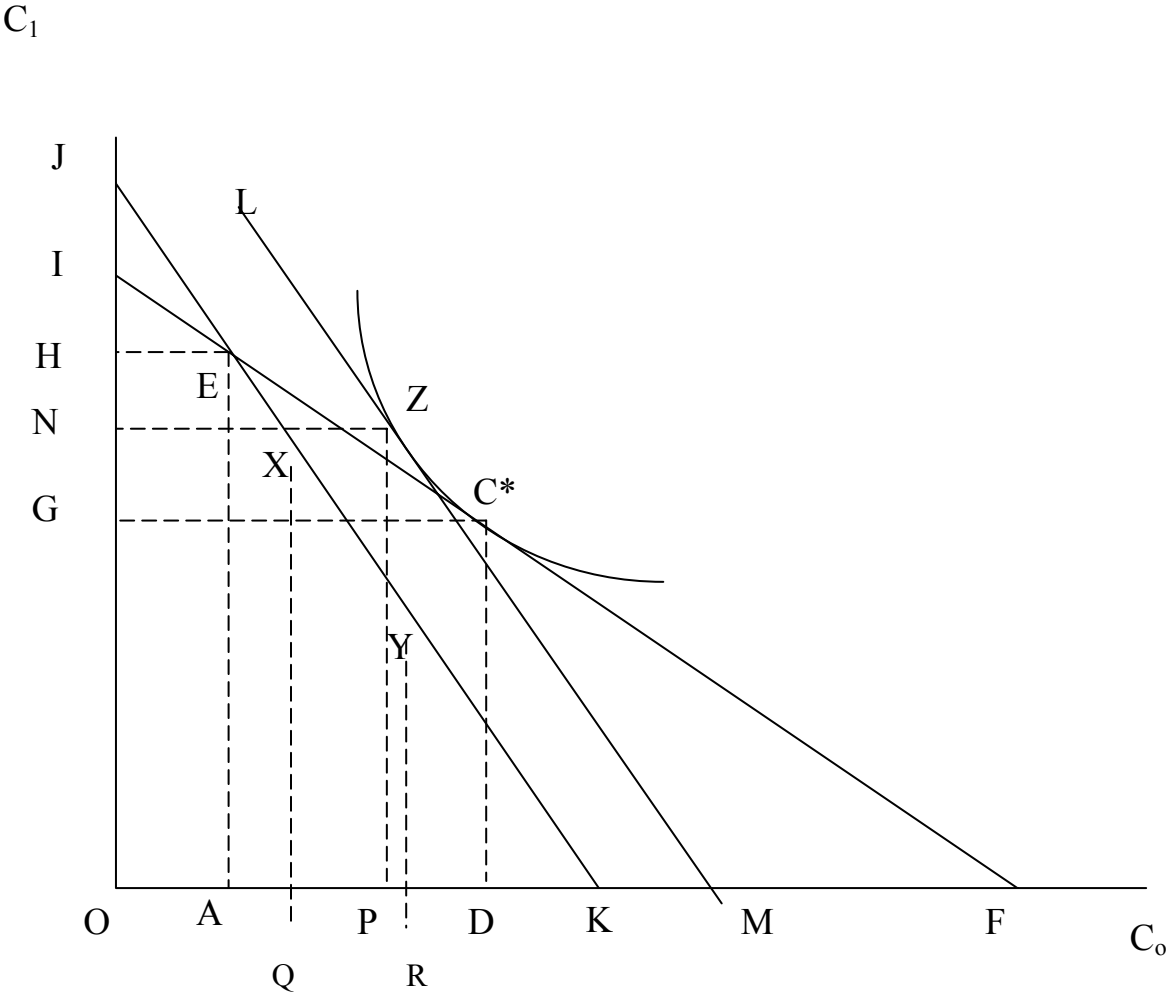
ECONOMICS 422
FINAL EXAMINATION

R. W. Parks   Autumn 2000

Two hours. Answer all questions on these exam sheets. Question weights (total=100) are given in parentheses.

1. (20) Interest rates, rates of return:

   a.   Instead of liquidating your investment portfolio, you continue to manage it, and with your astute guidance, in 5.5 years it grows from $100,000 to $400,000. What is your average annual rate of return? _____

   b.   Find the yield to maturity for a 1-year, 6 percent coupon U.S. Treasury bond, paying semiannual coupons if its price is 100:24. [Note the punctuation here and in part c.]

   c.   If today's *Wall Street Journal* shows that a 10 year Treasury strip sells for 52:16 and a 30 year strip sells for 16:24, what is the forward interest rate now for the 20 year period from June 2010 to June 2030?

d. According to the Fisher Model, which of the following is a determinant or are determinants of
    the *real* riskfree interest rate?   [Circle the numeral for your choice or choices.]
                    i. The expected rate of inflation
                    ii. Investment productivity
                    iii. The average beta
                    iv. Societal preferences regarding the timing of consumption
                    v. Attitudes toward risk
                    iv. The time profile of people's endowments

2. (10) The Zephir Company is considering a project that requires the building of a windmill.
Windmills of type A costs $360,000 to build and lasts five years. An alternative type of windmill,
type B, costs $540,000 to build and lasts 8 years. Both windmills would provide the same stream of
services in the context of the project. Neither has a scrap value at the end of its life. Whichever is
built, it will need to be replaced when it wears out, indefinitely.

The project has risk that is comparable to that of the company's current assets. The current risk-free
interest rate is 5 percent, and the expected market risk premium is 8 percent. The company has a
debt/equity ratio of 0.2, and the beta for the company's stock is 1.5 while the beta for its debt is 0.4.
Based on the monthly returns for five recent years, the standard deviation of the rate of return on
Zephir's stock is 0.334 while that for the market portfolio is 0.2.

Which windmill should the company choose? Explain and show your work.

3. (15) Efficient Market Hypothesis

a. Describe the logic of and the results of a test for the weak form of the efficient market
      hypothesis.

b. You have been asked to evaluate the performance of 1000 mutual fund managers over the last 5
      years. Explain what comparisons you would make in order to judge them.

c. Could the data in part b be used to test the efficient market hypothesis? What form? Explain.

4. (16) You are interested in buying Starbuck's stock forward, e.g. in six months, but there is no
      organized trading in Starbuck's futures (or forwards).

a. Sketch the hypothetical position of a long position in a Starbuck's forward contract.

b. What would be the relationship between the current price of Starbuck's stock and the futures
price? [Remember that Starbuck's pays no dividends.]

c. Show using a position diagram how you could duplicate the forward position using listed options
(assuming that there is option trading in Starbuck's). Be specific about the options that you
would buy or sell.

d. Ignoring transaction costs, would there be any net cash flow associated with setting up the
position using options. Explain.

5. (5) One-year European call and European put options on HIJ Corp's stock, both with an exercise price of $100, currently sell for $10 and $8 respectively. The risk free, annually compounded interest rate is 6 percent. What is the value of the company's stock? Explain.

6. (10) The following table gives the distribution of returns for two stocks:

State of the world	Probability of State	Return for Stock 1	Return for Stock 2
Recession	.3	.1	.1
Normal	.6	.2	.3
Boom	.1	.3	.4

Compute the following:

a. $E(R_1)$

b. $E(R_2)$

c. $V(R_1)$

d. $V(R_2)$

e. $Cov(R_1, R_2)$

7. (14) AuCanada Corp. has approached you wanting to secure a lease with extraction rights for the 200,000 acres that you own in the wilds of Nevada. They have proposed paying you $200 per acre in present value for a 9-year lease. Is this a reasonable price? Explain.

You know that the current market price of gold is $294 per ounce. A recent engineering survey indicates that the land contains approximately 5 ounces of gold per acre, but that it would cost $400 an ounce to strip the land, extract the gold, and return the land to its original state. A 9 year Treasury strip has a yield of about 5 percent (you can ignore the semi-annual compounding feature), and the standard deviation of the rate of return on gold is about 0.20. Assume that the time required to extract the gold is negligible i.e. if AuCanada decides it is worth extracting, they can do it quickly.

8. (10) (a.) The variance of the rate of return for both assets 1 and 2 is 0.16. The returns for these two assets are uncorrelated. What portfolio shares would provide a portfolio variance of 0.10?

(b.) If the riskfree return is 0.04 and if the expected market return is 0.12 with a standard deviation of 0.2, what combination of investments in the riskfree asset and a market portfolio would you need to create a portfolio with standard deviation of 0.25? What expected return would it have? What if you wanted a portfolio with a standard deviation of .15?

Two extra credit questions:

1. Diversifying, hedging, and insuring are three methods by which investors can limit or eliminate risks associated with owning assets. Briefly explain how each of these methods works. Discuss the key similarities or differences. Keep your answers focused on the risk reduction issues. I am not looking for institutional details.

At what interest rate are these two forms of the prize equivalent?

2. Portfolios 1 and 2 have
$$E(r_1) = E(r_2) \text{ and } \sigma_1 = \sigma_2.$$
$$\text{If } \rho_{12} \neq 1.0$$
show that the two portfolios cannot be efficient portfolios.