

2018年度

慶應義塾大学大学院入試問題

経済学研究科（修士課程）

2017年9月7日 実施

科目名	Economics (English)	受験番号		氏名	
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注意事項 (Please note:)

1. This set of problems contains 9 pages (including the cover page).

There are seven problems from which you should choose two to answer. Each problem should be answered on a separate answer sheet. Please write the number of the problem you are answering on each answer sheet.

If you answer two or more problems on one answer sheet, only the first answer will be treated as a valid answer. Everything after the first answer will not be marked.

2. Answer in English.
3. Although the problem sheets will not be collected after the examination, please write your name and exam registration number (受験番号, jyuken-bango) on the cover page.

Problem 1. Answer both (1) and (2).

(1) Consider a general equilibrium model where two goods (good M and good F) are produced using two factors of production, labor (L) and land (T). Wage w and rent r denote the factor prices, whereas p_M and p_F denote the prices of the two goods. The technology is described by the matrix

$$\begin{pmatrix} a_{LM} & a_{LF} \\ a_{TM} & a_{TF} \end{pmatrix} = \begin{pmatrix} 2 & 1 \\ 1 & 2 \end{pmatrix}$$

where a_{ij} denotes the quantity of factor i ($i=L, T$) required to produce a unit of good j ($j=M, F$). There is one consumer whose preference is represented by the utility function $U(C_M, C_F) = C_M C_F$ where C_j denotes the consumption of good j ($j=M, F$). The factor endowments, which are owned by the consumer, are $(L, T) = (10, 10)$. We assume that all markets are perfectly competitive. No firm can earn positive profit in an equilibrium owing to the free entry condition.

- (a) Draw the production possibility frontier in this economy. Specify the efficient allocation.
- (b) Write down all equations to characterize the perfectly competitive market equilibrium. Explain them.
- (c) Suppose that the factor endowments changed from $(L, T) = (10, 10)$ to $(L, T) = (11, 10)$. Evaluate its effect on the production levels, the prices of goods and the factor prices at equilibrium.

(2) Suppose a game between a worker and a firm. At the first stage, the worker decides how much to invest in developing his skill. Let I denote the worker's investment. The investment entails the worker's personal cost $I^2/2$. The firm observes I . At the second stage, the firm offers the worker a wage w . At the third stage, the worker accepts or rejects it. If the worker accepts it, he is employed by the firm and earns the payoff $w - I^2/2$. The firm's profit is $6I - w$. If the worker rejects it, he works at his own business and earns payoff the $4I - I^2/2$ and the firm's profit is zero.

- (a) Designate the subgame perfect equilibrium of this game. What level of investment is selected in the equilibrium?
- (b) Consider a variant of the game in which the worker offers the firm a wage w at the second stage, and the firm accepts or rejects it at the third stage. What is the level of investment selected in the subgame perfect equilibrium?
- (c) Explain the difference between (a) and (b). What determines the investment levels in the equilibrium?

Problem 2

Consider an overlapping generations model in which an agent lives for two periods. An agent supplies labor only in the first period and receives a total wage of wL for supplying L hours of work. An agent consumes in both periods and the consumption in the second period is covered by the saving from the first period and the interest payment on it.

An agent in this model solves the following optimization problem.

$$\max_{C_1, C_2, L, X} u(C_1) - v(L) + \beta u(C_2)$$

subject to

$$C_1 + X = wL$$

$$C_2 = X(1 + r)$$

C_1 and C_2 denote consumption in each period, L is work hours in the first period and X is the saving. The interest rate paid on the agent's saving is denoted by r .

- (1) Derive the life-time budget constraint of the agent.
- (2) Derive optimality conditions for the labor supply in the first period and savings. Show the steps to derive the conditions. Provide economic intuitions for each condition.
- (3) State under what conditions the optimal consumption of the first period is the same as that of the second period.
- (4) Suppose the utility from consumption and disutility from labor supply are given as follows. Compute the optimal labor supply and saving and express them as functions of exogenous variables.

$$u(C) = \ln(C)$$

$$v(L) = \frac{1}{2}L$$

Problem3.

Answer the following two questions on capitalism. Base your answer on the methodology of Marxian economics.

(1) Explain the following concepts in a concise manner.

- ① Surplus value
- ② Price of production

(2) Explain the mechanism of the industrial cycle in the competitive stage.

Problem 4. Consider a multiple regression model with one dependent variable (Y) and two explanatory variables (X_1, X_2).

Suppose that we have n sets of observations $(Y_1, X_{11}, X_{12}), \dots, (Y_i, X_{i1}, X_{i2}), \dots, (Y_n, X_{n1}, X_{n2})$

and the relationship among them is determined by the following model:

$$Y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \varepsilon_i.$$

where $\varepsilon_1, \dots, \varepsilon_i, \dots, \varepsilon_n$ are independently and identically distributed random variables with zero expectations.

(a) Explain the meaning of the least square estimator of the regression coefficient β_1 for the explanatory variable X_1 . You should use the following two words:

residual(s),

simple linear regression analysis

(b) Show the least square estimator of the regression coefficient β_1 for the explanatory variable X_1 when you use only the explanatory variable X_1 .

(c) Explain what is the unbiasedness of an estimator.

(d) Prove the unbiasedness of the least square estimator obtained in problem (b) under $\beta_2 = 0$.

(e) Explain the problems that arise when using the least square estimator of the regression coefficient under the multiple regression analysis model above when $\beta_2 = 0$ holds.

You should use the following well known property that "the variance matrix of the least square estimators for a multiple regression model is proportional to the inverse matrix of the covariance matrix of the explanatory variables", and use as an example the specific case where the correlation of the two explanatory variables is 0.7.

(f) Discuss the properties of the estimator obtained in problem (b) when $\beta_2 = 0$ does not hold. Discuss separately the cases where the correlation between the explanatory variables X_1 and X_2 are positive, and negative.

You should base your argument on mathematical expressions.

Problem 5.

Answer one of A and B.

A

Suppose that the stock or population of fish is denoted by X and that the net-growth of the stock is expressed by the logistic growth function where the carrying capacity is 10 and the intrinsic growth rate is 2. On the other hand, Let E stand for fishing effort and suppose that the catch Y is expressed by $Y=EX$. Moreover, the unit cost of fishing effort is represented by w , and the unit price of the fish is expressed by p . Then answer the following questions.

1. Derive the static equilibrium stock as a function of E .
2. Explain what open access means and define it in the model above. Derive the level of the stock in the open access equilibrium.
3. Suppose that we introduce a taxation t per catch. Derive the taxation t^* that makes the open access equilibrium coincide with the profit maximizing equilibrium.

B

- (1) A consumer gains utility from consumption $c \geq 0$ and leisure $h \geq 0$. His/her utility function is given by $u(c, h) = c + h^{\frac{1}{2}}$. By working $l = T - h$ hours, where $T > 0$ is the total hours he/she can allocate to leisure and working, he/she earns income of wl , where $w > 0$ is wage per hour, and spends it all on consumption of a good whose price is normalized to 1. Derive this

consumer's working hours when the government applies a tax rate of t ($0 < t < 1$) to his/her income.

(2) Using the answer to question (1), answer whether the following assertion is correct or not, and give an intuitive reason:

"If the government sets a higher tax rate, the working hours of this consumer increases."

(3) Using the answer to question (1), answer whether the following assertion is correct or not, and give an intuitive reason:

"If the government sets a higher tax rate, the tax revenue of the government increases."

Problem 6.

Choose any region or country and discuss the role of coal in its economic development, using historical facts.

Problem 7.

Choose one theory from (1) the theory of value, (2) the theory of economic growth, (3) the theory of money, and (4) the theory of social contract, and write an outline of its history.