２０２０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）

２０１９年９月５日 実施

科目名	Economics (English)	受験番号	Application number	氏名	Name

注意事項（Please note:）

1. This set of problems contains 8 pages (including the cover page).

2. 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.

3. 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.

4. Answer in English.

5. 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.

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Problem 1. Answer all questions.

(1) Consider a strategic-form game $(I, \{S_i\}_{i\in I}, \{u_i\}_{i\in I})$ where I is the set of all players, S_i is the set of all strategies of player $i \in I$, and $u_i: \prod_{i\in I} S_i \to \mathbb{R}$ is the payoff function of player $i \in I$.

(a) Define a Nash equilibrium.

(b) Define a dominant strategy and a dominant strategy equilibrium.

(c) Prove that any dominant strategy equilibrium is a Nash equilibrium.

(2) A market demand curve for some good is given by

$$d = 3 - p$$

where d stands for the quantity demanded, and p for the price of the good. The good is supplied by two firms $i \in \{1,2\}$ which have the same cost function $c_i(x_i)$

$$c_1(x_1) = \frac{1}{3}(x_1)^3, \quad c_2(x_2) = \frac{1}{3}(x_2)^3$$

where x_i is the output of firm i.

Suppose that the two firms are price takers.

(a) Find the market supply curve.

(b) Calculate the market equilibrium price and the equilibrium quantity.

(c) Calculate the consumers' surplus, the producers' surplus, and the total surplus.

(3) Suppose that the market demand curve and the two firms' cost functions are given as in question (2). Consider the case where the two firms are not price takers but face the Cournot competition.

(a) Explain the Cournot competition.

(b) Find a Cournot equilibrium in the previous case.

(c) Prove that the Cournot equilibrium you found in (b) is not a dominant strategy equilibrium.

(d) Calculate the consumers' surplus, the producers' surplus, the total surplus, and the loss of surplus in the Cournot equilibrium you found in (b).

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Problem 2.

Consider an economy that lasts over $t = 0,1,2 \ldots\ldots$ A large number of profit-maximizing firms face competitive product and factor markets, and produce the final good Y_t according to the production function $Y_t = {K_t}^{\alpha}(A_t N)^{1-\alpha}$, where K_t is the stock of capital, A_t is the level of technology, N is the working population, and α is a constant that satisfies $0 < \alpha < 1$. The technology level grows according to $A_t = (1+g)^t$, where g is the rate of technological progress. The population is constant over time.

Investment is financed by savings to ensure $sY_t = I_t$, where $s(0 < s < 1)$ is the saving rate and I_t is the investment in capital. The stock of capital evolves according to $K_{t+1} = I_t + (1-\delta)K_t$, where $\delta(0 < \delta < 1)$ is the depreciation rate of capital.

(1) When variables are changed as $Y/AN \equiv y$ and $K/AN \equiv k$, you can rewrite the production function as $y_t = {k_t}^{\alpha}$. Show that you can derive $s{k_t}^{\alpha} = (1+g)k_{t+1} - (1-\delta)k_t$ from the equality $sY_t = I_t$.

(2) Solve the steady state value of k (a value that satisfies $k_t = k_{t+1}$).

(3) Assume that the initial value at time $t = 0$, k_0, is smaller than the steady state value. Explain the "convergence" process toward the steady state using a figure. In particular, explain the dynamic behaviors of capital accumulation, the interest rate (that equals the marginal product of capital), and the growth rate of output.

(4) Assume that the economy was initially at the steady state, then hit suddenly by an economic crisis, and lost parts of the technology level and the capital stock. A proportion $\varepsilon^A(0 < \varepsilon^A < 1)$ of the technology level A_t and a proportion $\varepsilon^K(0 < \varepsilon^K < 1)$ of the stock of capital K_t were lost. Assuming $\varepsilon^A = \varepsilon^K$, explain the dynamic path of $\log Y_t$ before and after the crisis using a figure.

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Problem 3.

In the field of Marxian economics, there are several different theories and interpretations on the “falling rate of profit”. Explain at least two of them.

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Problem 4.

Read the sentences below and answer all of the questions (1) – (3) that follows.
Suppose that Y_i follows a regression, which is given as: $Y_i = \beta X_i + u_i$, $i = 1, \ldots, n$, where u_i, $i = 1, \ldots, n$ are mutually uncorrelated random variables with $E(u_i) = 0$, $\text{var}(u_i) = \sigma_i^2$, $\sigma_i > 0$, and X_i, $i = 1, \ldots, n$ are not random variables (note that, for different i, the variance of u_i could be of different values).

(1) Let $\hat{\beta}_n$ be the OLS estimator of β. Derive the expectation and variance of $\hat{\beta}_n$.
(2) Now, suppose that we know the values of σ_i, $i = 1, \ldots, n$. Using the values, define $Y_i^* = Y_i / \sigma_i$, and $X_i^* = X_i / \sigma_i$. Let $\hat{\beta}_n^*$ be the OLS estimator of the regression model: $Y_i^* = \beta X_i^* + u_i^*$. Derive the expectation and variance of $\hat{\beta}_n^*$.
(3) Show that the variance derived in (2) is always less than or equal to the variance derived in (1). Derive the condition for these two variances to be equal. You can use the result in the following hint:

Hint: for real numbers a_i, b_i, $i = 1, 2, .., n$, it holds that

$$(a_1 b_1 + \ldots + a_n b_n)^2 \le (a_1^2 + \ldots + a_n^2)(b_1^2 + \ldots + b_n^2),$$

where the equality holds when $a_i = c b_i$ for all i and constant c.

Read the sentences below and answer all of the questions (4) – (6) that follows.
Suppose that X_i, $i = 1, \ldots, n$ are i.i.d. continuous random variables with $\mu = E(X_i)$, $\sigma^2 = \text{var}(X_i) < \infty$, and X_i's pdf is given by $f(x)$. Also, suppose that X_i follows a symmetric distribution around the mean, namely, $f(\mu - \varepsilon) = f(\mu + \varepsilon)$ for any $\varepsilon > 0$. Consider the sample mean $\hat{\mu}_n = n^{-1} \sum_{i=1}^{n} X_i$ and the sample median $\tilde{\mu}_n$ as estimators of μ. Here, the sample median is defined as $\tilde{\mu}_n = X_{\{n/2\}}$ when n is even, and $\tilde{\mu}_n = X_{\{(n+1)/2\}}$ when n is odd, where $X_{\{i\}}$, $i = 1, \ldots, n$ are the order statistics of X_i, $i = 1, .., n$, namely, X_i, $i = 1, \ldots, n$ are sorted so that $X_{\{1\}} < X_{\{2\}} < \ldots < X_{\{n\}}$.

(4) Define $T_n = \sqrt{n}(\hat{\mu}_n - \mu)$ and $S_n = \sqrt{n}(\tilde{\mu}_n - \mu)$. Derive the asymptotic distributions of T_n and S_n as $n \to \infty$.
(5) Explain when S_n is a better estimator than T_n, using the result obtained in (4).
(6) For $0 < \alpha < 1$, let $\hat{q}_\alpha$ be the sample α-th quantile, namely, $\hat{q}_\alpha$ is defined as $\hat{q}_\alpha = X_{\{\lceil \alpha n \rceil\}}$, where $\lceil x \rceil$ denotes the smallest integer that is greater than or equal to x. Consider $\mu_n^{(\alpha)} = (\hat{q}_\alpha + \hat{q}_{1-\alpha})/2$ as an estimator for μ (note that $\mu_n^{(0.5)} = \tilde{\mu}_n$). Derive the asymptotic distribution of $R_n = \sqrt{n}(\mu_n^{(\alpha)} - \mu)$ as $n \to \infty$. Also answer whether, when and in what sense, $\mu_n^{(\alpha)}$ can be a better estimator than $\tilde{\mu}_n$.

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Problem 5.

Answer one of A, B, and C. If you answer more than two, all answers become invalid.

A

Consider the problem of estimating the elasticity of hours of work to the real wage for women, using individual level cross-section data that include information about the labor force participation, hours of work, hourly wage rate, and marital status during the survey period. Answer the following questions.

1. What is your theoretical prediction of the elasticity of hours of work to the real wage? Discuss.
2. What other information is necessary in order to estimate the elasticity of hours of work to the real wage in a theoretically correct way? Discuss while referring to measurement issues.

B

The Grossman Model describes individual's decision making on the demand for health. Answer all the questions below.

1. Explain the two roles that health plays in the model.
2. In the model, how is health capital accumulated? Please explain using equations.
3. What are the main conclusions of the model, regarding the relationship between the price of and the demand for healthcare services? What is the mechanism behind the relationship? Explain.

C

Since childcare fees for licensed childcare centers are regulated by the government, each licensed childcare center cannot raise its childcare fees based on its own judgment.

1. Show the supply and demand curves of licensed childcare centers in a graph. In the graph, indicate the presence of children on waiting lists (excess demand) for licensed childcare centers, and explain.
2. Based on your answers to the question above, discuss three policies to eliminate the problem of children being on childcare waiting lists.

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Problem ６.

Choose any region or country and discuss the role played by its public-finance policy in its economic development. Make sure to use concrete historical facts and discuss from the perspective of economic history.

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Problem 7. Choose and answer one of the following questions (if you answer both, all answers become invalid):

1) Briefly explain the claims made by the Historical School of Economics against the Classical and the Neo-Classical Schools, respectively. Be sure to mention the following two keywords in your answer; national economy, the method dispute.

2) What is the "Adam Smith Problem"? Using the most common answer(s) to this problem as a basis, discuss what significance this problem has for us today.