試科目	經濟學	所別	國貿所	考試時間	5月22日(上)午第 星期六 下

一、

1. (10%) Assume that prices and wages adjust rapidly so that the markets for labor, goods, and assets are always in equilibrium. What are the effects of each of the following on output, the real interest rate, and the current price level?

   (a) a temporary increase in government purchase

   (b) a reduction in expected inflation

   (c) a temporary increase in labor supply

   (d) an increase in the interest rate paid on money

2. (10%) It is sometimes argued that economic growth that is "too rapid" will be associated with inflation. Use AD-AS analysis to show how this statement might be true. When this claim is made, what type of shock is implicitly assumed to be hitting the economy?

3. (10%) Consider a business cycle theory that combines the classical IS-LM model with the assumption that temporary changes in government purchases are the main source of cyclical fluctuations. How well would this theory explain the observed cyclical behavior of each of the following variables? (a). employment, (b). the real wage, (c). average labor productivity, (d). investment. Explain.

4. (10%) To fight an ongoing 15% inflation, the government makes raising wages or prices illegal. However, the government continues to increase the money supply (and hence aggregate demand) by 15% per year. The economy starts at full-employment output, which remains constant.

   (a) Using the AD-AS framework, show the effects of the government's policies on the economy. Assume that firms meet the demand at the fixed price level.

   (b) After several years in which the controls have kept prices from rising, the government declares victory over inflation and removes the controls. What happens?

5. (10%) Consider an artificial economy called Groovy.

   (a) If there is a positive productivity shock in Groovy, how would the domestic capital market equilibrium be affected?

   (b) Suppose Groovy is a significant player in the world economy. Would the productivity shock affect the world market at all? Justify your answers.

二、個體經濟 (以下四大題，共佔 50%)

(8%) 1. Suppose that utility function $u(x_1, x_2)$ is continuous and strictly increasing. Show that indirect utility function is strictly increasing in income and decreasing in prices.

(16%) 2. A firm produces computer chips with a cost function $C(Q)$, which exhibits increasing marginal costs. Of the chips it produces, a fraction $(1-\alpha)$ are defective and cannot be sold. Working chips can be sold at a price p and the chip market is highly competitive.

(1) Calculate the derivatives of profits and output with respective to α and their signs.

(2) Suppose that there are n identical producers. Let $D(p)$ and $p(\alpha)$ be the demand function and competitive price, respectively. Calculate $dp/d\alpha$ and its sign.

(16%) 3. A profit-maximizing bank receives rate r_L on loans L and pays out the regulated rate r_D on its demand deposits D. Since both loans L and deposits D are costly to administer, the bank's profit π is given by

$$\pi(L, D) = r_L L - r_D D - C(L, D)$$

where $C(L, D)$ is the cost function of the bank with $\partial C/\partial D > 0, \partial C/\partial L > 0$, $\partial^2 C/\partial D^2 > 0$, $\partial^2 C/\partial L^2 > 0$ and $\partial^2 C/\partial D\partial L = \partial^2 C/\partial L\partial D = 0$. The constraint the bank faces is its balance sheet, which requires that total assets be equal to total liabilities (assuming zero net worth). The assets of the bank are its loans L and its reserves R, while its only liability is the amount of outstanding demand deposits D. The monetary authority imposes a reserve ratio q on the bank, where $q = R/D$ with $0 < q < 1$.

(1) Write out the first-order conditions for the bank's profit maximization problem. Do the second-order conditions hold?

(2) Suppose that the monetary authority increases the regulated rate r_D. Determine how this will affect the profit-maximizing amount of loans and deposits. Do your results make any economic sense? Explain.

(10%) 4. Consider the following normal form game:

		Player 2	
		Left	Right
Player 1	Up	(3, 2)	(1,1)
	Down	(1,1)	(2, 3)

Find all the pure strategy and mixed strategy Nash equilibria.

試科目	統計學	所別	國貿所	考試時間	5月22日 星期六 下午 第

1. Let $Y_1,\cdots,Y_n$ and $Z_1,\cdots,Z_m$ be random variables. Suppose that $Cov(Y_i,Z_j)$ exists for $i=1,\cdots,n$ and $j=1,\cdots,m$ and that $a_1,\cdots,a_n$ and $b_1,\cdots,b_m$ are constants.

   (a) Show that $Cov\left(\sum_{i=1}^{n}a_iY_i,\sum_{j=1}^{m}b_jZ_j\right)=\sum_{i=1}^{n}\sum_{j=1}^{m}a_ib_jCov(Y_i,Z_j)$. (10%)

   (b) Suppose that $X_1,\cdots,X_n$ are random variables such that the variance of each variable is 1 and the correlation between each pair of $X_1,\cdots,X_n$ is 1/4. Use the formulae proved in (a) to determine $Var(X_1+\cdots+X_n)$. (10%)

2. If A and B are any random variables for which the necessary expectations and variances exist, show that

$$Var(B)=E\left[Var(B|A)\right]+Var\left[E(B|A)\right]. \text{ (10\%)}$$

3. Suppose that an urn contains five coins, and that for each coin there is a different probability that a head will turn up when the coin is tossed. Let p_i denote the probability of a head when the i th coin is tossed $(i=1,\cdots,5)$, and suppose that $p_1=0$, $p_2=1/4$, $p_3=1/2$, $p_4=3/4$, and $p_5=1$. Answer the following questions.

   (a) If the first head turns up on the fourth toss, what is the posterior probability that the i th coin was selected $(i=1,\cdots,5)$? (10%)

   (b) If we continue to toss the same coin until another head turns up, what is the probability that exactly three additional tosses will be required? (10%)

4. Suppose the true data generating process (DGP) is given as the following

$$Y_i = 1 + 2X_i + \mu_i,\ i = 1, \ldots, n,$$

where X_i is non-stochastic, and the mean and the variance for the error term μ_i are $E(\mu_i) = 0$, and $Var(\mu_i) = \sigma_0^2$, respectively. Without knowing this true DGP, a researcher collected data and ran a least-squares regression assuming the following model

$$Y_i = \beta X_i + \varepsilon_i,\ i = 1, \ldots, n.$$

(a) Derive the least-squares estimator of β. (8%)
(b) Is this estimator unbaised? Why or why not? (8%)

5. In order to examine whether a coin is fair, an experiment of 10 coin tosses was conducted. Suppose that the decision criterion is: "Reject the null hypothesis that the coin is fair, if the outcome of the experiment turns out to be 10 heads or 10 tails". What is the probability of Type-I error of this testing procedure? (5%) Now, change the criterion of rejecting the null hypothesis to the following: "Reject the null hypothesis, if the number of heads is less than 2 or greater than 8." What is the probability of Type-I error of the testing procedure this time? (5%)

6. Suppose $\{X_1, \cdots, X_n\}$ is a set of i.i.d. random variables with mean μ and variance σ^2. The following estimator is proposed for estimating the population mean μ

$$\widetilde{\mu} = \frac{X_1 + X_n}{2}.$$

(a) Is $\widetilde{\mu}$ an unbiased estimator of μ? (8%)

(b) Is $\widetilde{\mu}$ a consistent estimator of μ? (8%)

(c) Is $\widetilde{\mu}$ more efficient than the sample mean $\overline{X}$? (8%)