

考試科目	經濟學	所別	商學院各系所 (科管與智財所科技管理組 學士後班 一般生除外)	考試時間	2 月 23 日 (六) 第一節
------	-----	----	---------------------------------------	------	------------------

Multiple Choice (1 point each)

Identify the letter of the choice that best completes the statement or answers the question.

- When marginal cost is rising, average variable cost
 - must be rising.
 - must be falling.
 - must be constant.
 - could be rising or falling.
- When goods are not excludable
 - the good will be produced as a private good but not as a public good.
 - the good will not be produced since no one values it.
 - the free-rider problem prevents the private market from supplying them.
 - everyone can have all they want and the good will have a zero price.
- The Coase theorem suggests that private markets may not be able to solve the problem of externalities
 - if the government does not become involved in the process.
 - when the number of interested parties is large and bargaining costs are high.
 - if the firm in the market is a monopoly.
 - if some people benefit from the externality.
- The substitution effect of a wage decrease in the work-leisure model results in the worker choosing to
 - work less than before.
 - work more than before.
 - possibly work more or less than before.
 - work more with a higher level of consumption.
- Suppose a tax of \$1 per unit is imposed on a good. The more elastic the supply of the good, other things equal, the
 - smaller is the response of quantity supplied to the tax.
 - larger is the tax burden on sellers relative to the tax burden on buyers.
 - larger is the deadweight loss of the tax.
 - All of the above are correct.

備

註 試題隨卷繳交

考試科目	經濟學	所別	商學院各學所 (科管與智財所科技管理組 學士班甲一般生除外)	考試時間	2月23日(六) 第一節
------	-----	----	--------------------------------------	------	--------------

6. If a monopolist faces a downward sloping market demand curve, its
- average revenue is always less than marginal revenue.
 - marginal revenue is greater than the price of the units it sells.
 - average revenue is less than the price of its product.
 - marginal revenue is always less than the price of the units it sells.
7. Comparing marginal revenue to marginal cost
- reveals the contribution of the last unit of production to total profit.
 - is helpful in making profit maximizing production decisions.
 - always reveals whether a firm is making an economic profit.
 - tells a firm whether its fixed costs are too high.
- (i) and (ii) only
 - (iii) only
 - (ii) and (iii) only
 - All of the above are correct.
8. In a world with only two countries, the noncooperative outcome to an “arm race” game clearly
- could not be considered a waste of economic resources.
 - is bad for society.
 - is the best possible outcome for society.
 - is optimal for one player at the expense of the other.
9. When a profit-maximizing firm in a monopolistically competitive market is producing the long-run equilibrium quantity,
- it will be earning economic profit.
 - its demand curve will be tangent to its average total cost curve.
 - its average revenue will equal marginal cost.
 - its marginal revenue will exceed marginal cost.
10. Workers displaced by trade will eventually find jobs in
- another country.
 - the government sector.
 - the industries in which the country has a comparative advantage.
 - a different company in the same industry.

備

註

試題隨卷繳交

考試科目	經濟學	所別	商學院各系所 (科管與醫財所科技管理組 學士後甲一般生除外)	考試時間	2月23日(六)第一節
<p>11. A citizen of Japan uses previously obtained U.S. dollars to purchase the Kindle e-book readers from the United States. This transaction</p> <p>A. increases Japan net capital outflow, and increases U.S. net exports. B. increases Japan net capital outflow, and decreases U.S. net exports. C. decreases Japan net capital outflow, and increases U.S. net exports. D. decreases Japan net capital outflow, and decreases U.S. net exports.</p> <p>12. Which of the following shifts aggregate demand to the left?</p> <p>A. an increase in the price level B. a decrease in the money supply C. an increase in net exports D. Congress passes a new investment tax credit</p> <p>13. Policymakers who control monetary and fiscal policy and want to offset the effects on output of an economic contraction caused by a shift in aggregate supply could use policy to shift</p> <p>A. aggregate supply to the right. B. aggregate supply to the left. C. aggregate demand to the right. D. aggregate demand to the left.</p> <p>14. Judith sells cars. In 2012 she added \$500,000 to her inventory. \$200,000 of this addition was from used cars she purchased, while the remaining \$300,000 was from her purchases of newly manufactured cars. How much of Judith's inventory is included in 2012's GDP?</p> <p>A. \$0 B. \$200,000 C. \$300,000 D. \$500,000</p> <p>15. The Consumer Price Index measures the level of prices in a given year relative to some base year and is calculated using a weighted average of prices for a typical bundle of goods. The weights are</p> <p>A. the same for each good. B. equal to the share of income spent on each good in the base year. C. equal to the share of income spent on each good in the current year. D. different across goods but assigned randomly.</p>					
備註	試題隨卷繳交				

考試科目	經濟學	所別	商學院各系所 (科管與智財所科技管理組 學士後甲一般生降升)	考試時間	2 月 23 日 (六) 第一節
<p>16. Assume that autonomous consumption equals \$400 and disposable income equals \$2000. If total consumption equals \$1600, then the marginal propensity to consumption is</p> <p>A. 0.2 B. 0.6 C. 0.8 D. 1.0</p> <p>17. Suppose that from a new checkable deposit, Bank A holds four million dollars in vault cash, sixteen million dollars on deposit with the central bank, and two million dollars in required reserves. Given this information, we can say Bank A faces a required reserve ratio of</p> <p>A. 5% B. 10% C. 15% D. 20%</p> <p>18. Everything else held constant, in the market for reserves, when the federal funds rate is 3%, raising the discount rate from 4% to 5%</p> <p>A. has an indeterminate effect on the federal funds rate. B. raises the federal funds rate. C. lowers the federal funds rate. D. has no effect on the federal funds rate.</p> <p>19. The quantity theory of inflation indicates that if the aggregate output is growing at 6% per year and the growth rate of money is 10%, then inflation is</p> <p>A. 4% B. -4% C. 1.6% D. 0.6%</p> <p>20. If the required reserve ratio is 10%, currency in circulation is \$200 billion, checkable deposits are \$400 billion, and excess reserves are \$0.4 billion, then the M1 money multiplier is about</p> <p>A. 0.60 B. 3.50 C. 1.50 D. 2.50</p>					
備註	試題隨卷繳交				

考試科目	經濟學	所別	商學院各系所 (科管與智財所科技管理組 學士班甲一般生除外)	考試時間	2 月 23 日 (六) 第一節
------	-----	----	--------------------------------------	------	------------------

Problems and Short-essay Questions

Please answer the following questions IN SEQUENCE. All questions may be answered in either Chinese or English.

- Consider a competitive market whose demand is given by $Q(P) = 500 - 50P$. There are 200 identical firms in the market, each producing with a technology characterized by the total cost function, $TC(q) = 4 + 0.02nq + q^2$, where n and q denote the number of firms and quantity produced by each firm, respectively. Apparently, each firm's marginal cost is increasing in the number of firms coexisting in the market.
 - (5 points) How much profit does each firm make in the short-run equilibrium?
 - (15 points) In the long run, firms can freely enter or exit the market. How many firms are there in the market when it reaches the long-run equilibrium? How many units of output does each firm produce in the long-run equilibrium? What is the corresponding marginal cost?
- Suppose, for a specific good, the excess demand function of the home country is $P = 2 - Q$ and the excess supply function of the foreign country is $P = 1 + Q$. Answer the following questions.
 - (10 points) What are the equilibrium price and the home country's quantity of import under free trade?
 - (10 points) Suppose the home country imposes an ad valorem tariff. Calculate the optimal tariff the government should levy if it wants to maximize the welfare of its citizen.
- (6 points) Give two major reasons that support a downward-sloping aggregate demand (AD) curve?
 - (7 points) Explain in detail how the several rounds of quantitative easing (QE) implemented by the Federal Reserve system could possibly affect the AD curve in the U.S.?
 - (7 points) Given that the current interest rate is already very low (the real interest rate is reportedly negative), how could another round of QE (say QE4) boost up the U.S. economy?
- (20 points) This is a question about the expectations theory of the term structure of interest rates. Consider 1-year zero-coupon bond and 2-year zero-coupon bond. Both bonds have the same face value of \$1. Today's 1-year interest rate on the 1-year bond is 10%. Investors are risk-neutral.
 - Suppose that investors expect that the 1-year interest rate on the 1-year bond next year will be 10%. There is no uncertainty, meaning that investors assume that the 1-year interest rate next year will be exactly 10%. Given these information, according to the expectations theory of term structure, what would be today's 2-year interest rate on the 2-year bond?

備

註 試題隨卷繳交

考試科目	經濟學	所別	商學院各系所 (科管與智財所科技管理組 學士級甲一般生除外)	考試時間	2 月 23 日(六) 第一節
------	-----	----	--------------------------------------	------	-----------------

b. Now the expected rate is still 10%, but suppose there is uncertainty: with probability 1/2 the 1-year interest rate on the 1-year bond next year will be 12%, and with probability 1/2 the 1-year interest rate on the 1-year bond next year will be 8%. What would be today's 2-year interest rate on the 2-year bond in this case?

c. Continue from (b) above, but now suppose the investors are risk-averse. In this case, today's 2-year interest rate will be higher or lower than your answer in (b)? Why?



備註	試題隨卷繳交
----	--------

考試科目	財務管理	系別	金融學系/金融管理組	考試時間	2 月 23 日(六) 第 3 節
------	------	----	------------	------	-------------------

I. Explain the following terms briefly (24 points, each 4 points)

1. Goodwill.
2. The inventory turnover ratio.
3. TIPS.
4. Fundamental analyst.
5. The Modified Accelerated Cost Recovery System (MACRS).
6. Cyclical industries.

II. Computational Questions (36 points, each 6 points)

1. Net Corp. has an ROE of 30% and would like to see earnings grow at a 18% annual rate. What percent of earnings can they afford to pay out as dividends?
2. What is the amount of the annual coupon payment for a bond that has six years until maturity, sells for \$1,050, and has a yield to maturity of 9.37%?

3. Which projects should be undertaken if the risk-free rate is 6% and the market risk premium is 9%?

Project	Beta	IRR
A	2.0	25%
B	1.6	22%
C	1.1	15%
D	0.8	11%

4. Assume the corporate tax rate is 30%. The firm has no debt in its capital structure. It is valued at \$100 million. What would be the value of the firm if it issued \$50 in perpetual debt and repurchased the equity?
5. The Granite Paving Company has a debt equity ratio of 1.5. The before-tax cost of debt is 11% and the unlevered equity is 14%. Calculate the weighted average cost of capital for the firm if the tax rate is 33%.
6. Given the following data:

	Firm A	Firm B	Firm AB (after merger of A and B)
Market Price per share	\$20	\$10	
Number of shares	1,000,000	500,000	
Market value of the firm	\$20 million	\$5 million	\$30 million

If Firm A offers 250,000 shares for B's shareholders, calculate the true cost of merger.

考 試 科 目	財務管理	系 別	金融學系/金融管理組	考 試 時 間	2 月 23 日(六) 第 3 節
---------	------	-----	------------	---------	-------------------

III. Short Answer Questions (12 points, each 6 points)

1. Define DOL, discuss what affects it and how to interpret it.
2. Explain why an insurance company is willing to sell life insurance to individuals, but will be more reluctant to issue policies insuring against earthquake damage to residents living along fault lines. Why don't insurance companies simply charge the residents a premium that reflects the actuarial probability of damage from earthquakes?

IV. Questions (28 points)

1. In each of the following cases, which of the two companies is likely to be characterized by the higher ratio? Explain the reason briefly.
 - a. Debt-equity ratio: a shipping company or a computer software company. (3 points)
 - b. Payout ratio: United Foods Inc. or Computer Graphics Inc. (3 points)
 - c. Average collection period: Regional Electric Power Company or Z-Mart Discount Outlets. (3 points)
 - d. Price-earnings multiple: Basic Sludge Company or Fledgling Electronics. (3 points)
2. Executive Red Wine has issue debt with a market value of \$100 million and has outstanding 15 million shares with a market price of \$10 a share. It now announces that it intends to issue a further \$60 million of debt and to use the proceeds to buy back common stock. Debtholders, seeing the extra risk, mark the value of the existing debt down to \$70 million.
 - a. How is the market price of the stock affected by the announcement? (5 points)
 - b. How many shares can the company buy back with the \$60 million of new debt that it issues? (2 points)
 - c. What is the market value of the firm (equity plus debt) after the change in capital structure? (3 points)
 - d. What is the debt ratio after the change in structure? (2 points)
 - e. Who (if anyone) gains or loses? (4 points)

考試科目	統計學 A	所別	金南農系 / 金南農管理組	考試時間	2月23日(六) 第二節
------	-------	----	------------------	------	--------------

Instructions. (i), Two question sheets in total. (ii), Answer ALL questions.

1. For a random sample of size n from a population of size N , consider the following as an estimate of the sample mean μ :

$$\bar{X}_c = \sum_{i=1}^n c_i X_i$$

where the c_i are fixed numbers and X_1, \dots, X_n is an i.i.d. sample.

- (a) (5 points) Find a condition of the c_i such that the estimate is unbiased.
 (b) (10 points) Show that the choice of c_i that minimizes the variance of the estimate subject to this condition is: $c_i = \frac{1}{n}$, where $i = 1, \dots, n$.
2. (a) (10 points) Let X be a normally distributed random variable, i.e. $X \sim N(\mu, \sigma^2)$. Show that:

$$E[e^{\alpha X} 1_{l \leq X \leq h}] = e^{\alpha\mu + \frac{1}{2}\alpha^2\sigma^2} \left\{ N\left(\frac{h - (\mu + \alpha\sigma^2)}{\sigma}\right) - N\left(\frac{l - (\mu + \alpha\sigma^2)}{\sigma}\right) \right\}$$

where $1_{l \leq X \leq h} = 1$ for $l \leq X \leq h$, and $1_{l \leq X \leq h} = 0$ otherwise; and α, l, h are some arbitrary constants.

- (b) (5 points) If $Y = e^X$, then the random variable Y is said to be lognormally distributed. Find the mean, μ_Y , and variance, σ_Y , of Y .
 (c) (5 points) Based on the results obtained above, find:

$$E[(Y - K) 1_{Y > K}]$$

for some arbitrary constant K .

3. OLS (ordinary least-squares method) as a technique in fitting the best straight line $Y_i = b_0 + b_1 X_i$ to a sample of X and Y observations involves minimizing the sum of squared (vertical) deviations of points from the line:

$$\min \sum (Y_i - \hat{Y}_i)^2$$

where Y_i refers to the actual observations, and \hat{Y}_i refers to the corresponding fitted values, so that $Y_i - \hat{Y}_i = e_i$ are the residuals.

- (a) (5 points) Derive the following normal equations:

$$\sum Y_i = nb_0 + \hat{b}_1 \sum X_i$$

$$\sum X_i Y_i = \hat{b}_0 \sum X_i + \hat{b}_1 \sum X_i^2$$

where n is the number of observations and \hat{b}_0 and \hat{b}_1 are estimators of the true parameters b_0 and b_1 .

- (b) (5 points) Hence, solve for \hat{b}_1 and \hat{b}_0 .
 (c) (5 points) What is meant by an unbiased estimator? How is bias defined?
 (d) (5 points) What is meant by the best linear unbiased estimator (BLUE)? Why is this important?

考試科目	統計學A	所別	金南農系/ 金南農管理組	考試時間	2月23日(六)第二節
------	------	----	-----------------	------	-------------

4. The Pareto distribution has been widely used as a model in economics for a decaying function with a slowly decaying tail:

$$f(x|x_0, \theta) = \theta x_0^\theta x^{-\theta-1}, \quad x \geq x_0, \theta > 1$$

Assume that $x_0 > 0$ is given and that X_1, \dots, X_n is an i.d.d. sample.

- (5 points) Find the MME (method of moments estimate) of θ .
 - (10 points) Find the MLE (maximum likelihood estimator) of θ .
 - (5 points) Find the asymptotic variance of the MLE.
 - (5 points) Find a sufficient statistic for θ .
5. Let X be a binomial random variable with n trials and probability p of success.
- (5 points) What is the generalized likelihood ratio for testing

$$H_0 : p = 0.5 \text{ against } H_A : p \neq 0.5$$
 - (5 points) Show that the test rejects for large values of $|X - n/2|$.
 - (5 points) Using the null distribution of X , show how the significance level corresponding to a rejection region $|X - n/2| > k$ can be determined.
 - (5 points) If $n = 10$ and $k = 2$, what is the significance level of the test?

備

註 試題隨卷繳交

考 試 科 目	統計學 B	所 別	金融學系 財務工程組	考 試 時 間	2 月 23 日 (六) 第二節
---------	-------	-----	------------	---------	------------------

1. If the return of the stock U is normally distributed with mean μ and variance σ^2 , and if we write $U = \ln(S_t/S_0)$, where S_t is the stock price at time t and let $S_0 = 1$. Then the stock price S_t is said to have a lognormal normal distribution. The lognormal distribution is often used in the financial area. (20%)
- (a). Please find the density function for the stock price S_t . (10%)
- (b). Please derive the mean and the variance of the stock price S_t . (10%)

2. Let Y_1, Y_2, \dots, Y_n denote independent continuous random variables with distribution $F(y)$ and density function $f(y)$. We can denote the ordered random variables Y_i , by $Y_{(1)}, Y_{(2)}, \dots, Y_{(n)}$ where $Y_{(1)} \leq Y_{(2)} \leq \dots \leq Y_{(n)}$. That is $Y_{(1)} = \min(Y_1, \dots, Y_n)$, the minimum of the Y_i 's, and $Y_{(n)} = \max(Y_1, \dots, Y_n)$ the maximum of the Y_i 's. (30%)
- (a) Please find the density function of $Y_{(n)}$. (5%)
- (b) Please find the density function of $Y_{(1)}$. (5%)
- (c) The opening prices per share of two similar stocks, Y_1 and Y_2 , are independent random variables, each with density function

$$f(y) = \begin{cases} \frac{1}{2} e^{-0.5(y-4)}, & y \geq 4 \\ 0, & \text{elsewhere} \end{cases}$$

On a given morning Mr. A is going to buy shares of whichever stock is less expensive. Find the probability density function and the mean for the price per share that Mr. A will have to pay. (20%)

考 試 科 目	統計學 B	所 別	金融學系財務工程組	考 試 時 間	2 月 23 日(六)第二節
---------	-------	-----	-----------	---------	----------------

3. Consider a Brownian motion process $\{B(t), t \geq 0\}$. $B(0) = 0$ and $B(t)$ is normal with mean 0 and variance t , where its density function is given by

$$f_t(b) = \frac{1}{\sqrt{2\pi t}} e^{-b^2/2t},$$

and the process $B(t)$ has stationary and independent increments, where $B(t_1)$, $B(t_2) - B(t_1)$, ..., $B(t_n) - B(t_{n-1})$ for $t_1 < \dots < t_n$ are independent and $B(t_k) - B(t_{k-1})$ is normal with mean 0 and variance $t_k - t_{k-1}$. Assume $B(t_1) = b_1$, $B(t_2) = b_2$, ..., $B(t_n) = b_n$. (20%)

- (a). Please give the joint density of $B(t_1)$, $B(t_2)$, ..., $B(t_n)$. (5%)
- (b). Please find the conditional distribution of $B(s)$ given $B(t) = C$ where $s < t$. (5%)
- (c). Please find the mean and variance of $B(s)$ given $B(t) = C$ where $s < t$. (10%)

4. A stochastic process $\{X(t), t \geq 0\}$ is said to be a compound Poisson process if it can be represented as

$$X(t) = \sum_{i=1}^{N(t)} Y_i, \quad t \geq 0$$

where $\{N(t), t \geq 0\}$ is a Poisson process, and $\{Y_i, i \geq 1\}$ is a family of independent and identically distributed random variables which are also independent of $\{N(t), t \geq 0\}$. Let customers leave a supermarket in accordance with a Poisson process with a arrival rate λ . If Y_i , the amount spent by i th customer, $i = 1, 2, \dots$ are independent and identically distributed from normal density with mean μ and variance σ^2 . Then $X(t)$ is a compound Poisson process when $X(t)$ denotes the total amount of money spent by time t . (30%)

- (a). Please find the mean and variance of $X(t)$. (10%)
- (b). Please describe and find how to estimate the parameters λ , μ , σ^2 . (20%)

備 註	試 題 隨 卷 繳 交
-----	-------------

考試科目	財務管理	所別	金融學系財務工程組	考試時間	2月23日(六)第1節
------	------	----	-----------	------	-------------

c. 試依據 pure expectation theory 找出各期的 short rates。

期別	YTM	Short rates
1	6.00%	
2	5.50%	
3	5.07%	
4	6.00%	

3. (20%) Put-call Parity

a. Please define "Put-Call Parity". Please also describe the implications of Put-Call Parity.

b. Please prove Put-Call Parity by No-Arbitrage Principle.

4. (10%) Binominal option pricing model for an European call option

There are two (and only two) possible prices for the underlying asset, S , on the next period. The underlying price will either: Increase by a factor of u to uS ; or decrease by a factor of d to dS . The uncertainty is that we do not know which of the two prices will be realized. There is no dividend. The one-period risk free payoff, R , is constant over the life of the option. Markets are perfect (no commissions, bid-ask spreads, taxes, price pressure, etc.)

Please derive the following formula by No-Arbitrage Principle. $C = \frac{1}{R}(pC_u + (1-p)C_d)$,

where $p = (R-d)/(u-d)$, C_u and C_d are payoffs of the call at period 1.

備

註 試題隨卷繳交

考試科目	財務管理	所別	金融學系財務工程組	考試時間	2月23日(六)第 1 節
------	------	----	-----------	------	---------------

1. (40%) Franco Modigliani 與 Merton Miller 兩位教授指出，在完美市場(perfect market)假設下，即在沒有公司所得稅與個人所得稅的情況下，下列命題將能成立：

命題一(無稅)：公司的價值取決於其營運能力，等於預期息前稅前盈餘(EBIT)除以適用其風險等級的報酬率，使用負債公司的價值，並不受公司資本結構的影響。

$$V_L = V_U = \frac{EBIT}{K_U} = \frac{EBIT}{K_a}$$

其中， V_L 為負債公司的價值；

V_U 為無負債公司的價值；

EBIT 為預期息前稅前盈餘，每年都固定不變，且會持續到永遠；

K_U 為無負債公司的普通股必要報酬率；

K_a 為有負債公司的加權平均資金成本。

若有兩家公司事業風險與預期 EBIT 相同，只有資本結構不同，則其價值的差異終因套利而消失。

- 何謂完美市場？
- 請用無套利評價概念證明 MM 命題一(無稅)。
- 要是存在著有公司稅，MM 命題一有何改變？請用 Miller 的 pie theory 來說明在有公司稅的情況下，MM 命題一對公司資本結構的涵義。
- 要是存在著有公司稅及個人所得稅，Miller 如何改寫 MM 命題一？同時請說明在何種情況下，Miller 模型會回歸至 MM 命題一(無稅)的結論一樣？

2. (30%) Term Structure of Interest Rates is defined as: a yield curve displaying the relationship between spot rates of zero-coupon securities and their term to maturity.

a. 試說明解釋收益曲線形狀的三種利率期限結構理論。

b. Pure expectation theory implies that $(1+y_2)^2=(1+y_1)(1+r_1)$

其中 y_2 是從現在開始的兩年期收益率， y_1 是從現在開始的一年期收益率， r_1 是在一年後開始的一年期 short rate。請用無套利評價概念證明上述等式。

備

註 試題隨卷繳交