



Notes: The point weights for each question are assigned. The standard normal probability density table is provided for finding the value of probability.

- (5 points) If X is a random variable such that $E(X) = 3$ and $E(X^2) = 13$, use Chebyshev's inequality to **determine a lower bound** for the probability $\Pr(-2 < X < 8)$.
- (10 points) If X_1 and X_2 are random variables of the discrete type having joint probability density function (p.d.f)

$$f(x_1, x_2) = \begin{cases} \frac{(x_1 + 2x_2)}{18}, & (x_1, x_2) = (1,1), (1,2), (2,1), (2,2) \\ 0, & \text{elsewhere} \end{cases}$$

find

- the conditional mean of X_2 , give $X_1 = x_1$, $x_1 = 1$ or 2 .
 - the conditional variance of X_2 , give $X_1 = x_1$, $x_1 = 1$ or 2 .
- (12 points) Let X be a random variable such that $E(X^{2m}) = \frac{(2m)!}{2^m m!}$, $m = 1, 2, 3, \dots$, and $E(X^{2m-1}) = 0$, $m = 1, 2, 3, \dots$,

find

- the moment generating function of X .
 - the probability density function of X .
- (5 points) Let \bar{X} denote the mean of a random sample of size n from a distribution that has mean μ , variance $\sigma^2 = 10$, and a moment generating function. **Find n** so that the probability is approximately 0.954 that the random interval

$$\left(\bar{X} - \frac{1}{2}, \bar{X} + \frac{1}{2}\right) \text{ includes } \mu.$$

- (10 points) Consider the two independent normal distribution $N(\mu_1, 400)$ and $N(\mu_2, 225)$. Let $\theta = \mu_1 - \mu_2$. Let \bar{x} and \bar{y} denote the observed means of two independent random samples, each of size n , from these two distributions. We reject $H_0: \theta = 0$ and accept $H_1: \theta > 0$ if and only if $\bar{x} - \bar{y} \geq c$. If $K(\theta)$ is the power function of this test, **find n and c** so that $K(0) = 0.05$ and $K(10) = 0.90$, approximately.



6. (18 points)
- A.I.G insurance company believes that people can be divided into two classes—those that are accident prone and those are not. Their statistics show that an accident prone person will have an accident at some time within a fixed 1-year period with probability 0.6, whereas this probability decreases to 0.2 for a non accident prone person. If we assume that 50% of the population is accident prone, **what is the probability** that a new policy holder will have an accident within a year of purchasing his policy?
 - Suppose a new policy holder has an accident within a year of purchasing his policy. **What is the probability** that he is from an accident prone person?
 - What is the conditional probability** that a new policy holder will have an accident in his second year of policy ownership, given that he has an accident in his first year?
7. (30 points) The YunTech.com was just established and urgent to have higher growth performance to interest potential capital entrepreneurs. The executives are trying to provide financial forecasting results. One of the crucial references is to examine whether the product sales (Y) is affected by the R&D expenditures (X) by using regression model. 6 years information on financial reports (in thousands of dollars) is available.
- $\sum X = 24$; $\sum X^2 = 124$; $\sum Y = 42$; $\sum Y^2 = 338$; $\sum XY = 196$
 $\alpha = 0.05$; $t_{0.05}(4)=2.132$; $t_{0.025}(4)=2.776$
- Please provide **ANOVA table**.
 - Please find the regression **slope** and **intercept**.
 - Please test whether the effect of R&D expenditures on sales performance is positive.
 - Calculate the **coefficient of determination**.
 - Using your regression results, please help the executives provide performance forecasting when the R&D expenditures next year is \$4000.
 - Please determine the 95% **confidence interval for the slope**.
 - Please determine the 90% confidence interval for the mean value of **production sales** and 90% **prediction interval for an individual year's production sales** when the R&D expenditures is \$5000.



8. (5 points) There is a test on whether teaching assistant is helpful for improving student examination scores. Nine randomly selected students were tested, and the results before (after) teaching assistant's counseling are following. ($\alpha=0.05$; $T_{0.05}(9)=8$)

Before	90	81	73	92	79	65	77	80	78
After	96	82	75	90	87	80	86	75	90

Please set up hypothesis to examine the claim that the assistant teaching counseling is effective in improving student testing scores.

9. (5 points) A research question of whether different types of people would choose risk-bearing securities as investment assets is explored. A random sample shows the following results. ($\alpha=0.05$; $\chi^2_{0.05}(3)=7.815$)

	Highly-paid Male	Highly-paid Female	Poorly-paid Male	Poorly-paid Female
Choose	15	9	10	9
Not Choose	18	27	26	28

Please determine whether the choice of risky securities is dependent on gender.



國立雲林科技大學 102 學年度

系所：財金系

碩士班暨碩士在職專班招生考試試題

科目：統計學(4)

Table 1 The Standard Normal Distribution

$$N(z) = \int_{-\infty}^z \frac{1}{\sqrt{2\pi}} e^{-\frac{w^2}{2}} dw$$

z	N(z)	z	N(z)	z	N(z)
0.00	0.500	1.10	0.864	2.05	0.980
0.05	0.520	1.15	0.875	2.10	0.982
0.10	0.540	1.20	0.885	2.15	0.984
0.15	0.560	1.25	0.894	2.20	0.986
0.20	0.579	1.282	0.900	2.25	0.988
0.25	0.599	1.30	0.903	2.30	0.989
0.30	0.618	1.35	0.911	2.326	0.990
0.35	0.637	1.40	0.919	2.35	0.991
0.40	0.655	1.45	0.926	2.40	0.992
0.45	0.674	1.50	0.933	2.45	0.993
0.50	0.691	1.55	0.939	2.50	0.994
0.55	0.709	1.60	0.945	2.55	0.995
0.60	0.726	1.645	0.950	2.576	0.995
0.65	0.742	1.65	0.951	2.60	0.995
0.70	0.758	1.70	0.955	2.65	0.996
0.75	0.773	1.75	0.960	2.70	0.997
0.80	0.788	1.80	0.964	2.75	0.997
0.85	0.802	1.85	0.968	2.80	0.997
0.90	0.816	1.90	0.971	2.85	0.998
0.95	0.829	1.95	0.974	2.90	0.998
1.00	0.841	1.96	0.975	2.95	0.998
1.05	0.853	2.00	0.977	3.00	0.999



本份試卷共 25 格填充題，每個答案 4 分，請依照以下範例依題序作答，每一行標明題號後寫出該題答案，下一題答案請換行書寫，請勿附上說明或計算過程。

作答範例:

- (A) 答案.... (寫出答案即可，請勿附上說明或計算過程) _____
- (B) 答案.... (寫出答案即可，請勿附上說明或計算過程) _____
- (C) 答案.... (寫出答案即可，請勿附上說明或計算過程) _____

1. C 公司權益成本 $R_E = 20\%$ ，負債成本 $R_D = 10\%$ ，公司稅率為 25%，公司目標 $D/E = 1$ 。

- (1) 若公司決定發股票融資某專案計畫，該計畫的風險與公司目前總體的風險差不多，當計算該計畫的 NPV 時，應該使用的折現率為 (A)
- (2) 若公司決定發公司債融資該專案計畫，請問上題的答案會不會改變? (B) (請回答「會」或「不會」，不需要說明理由。)

2. 甲公司正考慮發行普通股，並利用所得資金購回部份流通在外的公司債。若 L 公司執行此計畫，公司的 D/E 將從 0.5 下降到 0.4。目前 L 公司所發行的公司債市值為 1,000 萬，負債的資金成本為 10%。公司預估未來的 EBIT 為每年 450 萬，此現金流量將一直持續下去。假設沒有公司稅。

- (1) 甲公司發股票購回公司債之前的公司價值為 (C)
- (2) 甲公司發股票購回公司債之後的公司價值為 (D)
- (3) 甲公司發股票購回公司債之前的權益資金成本為 (E)
- (4) 若乙公司與甲公司一模一樣，但是乙公司沒有舉債，則乙公司的權益資金成本為 (F)
- (5) 甲公司發債購回股票之後的權益資金成本為 (G)

3. 請問以下何者代表好的公司治理的指標? (H) (請選出最可能的 2 個答案)

- (I) 外資法人及董監事持股比例高
- (II) 董監事股票質押比例高
- (III) 公司主要控制股東利用金字塔或是母子公司交叉持股的方式控制公司
- (IV) 有數位獨立董監事
- (V) 董監人數超過 13 人

4. 請問根據資本結構的抵換理論 (trade-off theory)，以下何種狀況下公司應該少舉債? (I) (請選出可能的 2 個答案)

- (I) 未來在新興市場有好的投資機會的公司
- (II) 工會力量強大，經常威脅罷工的的公司
- (III) 公司現金流量受景氣影響大的公司
- (IV) 高階經理人好大喜功且過度自信的公司

5. 請問以下關於融資順位理論(pecking order theory)的敘述何者錯誤? (J) (請選出最可能的 2 個答



案)

- (I) 公司對於資金來源的偏好為保留盈餘>舉債>發行普通股 (>表示優於)
- (II) 產生融資順位的可能理由為資本市場存在資訊不對稱，投資人無法完全了解公司投資計畫的品質。
- (III) 融資順位理論在產業成熟的公司及歷史較悠久的公司較可能成立。
- (IV) 融資順位理論可以解釋為什麼公司宣告要現金增資時一般而言股價會上漲 (出現正的異常報酬)
- (V) 融資順位理論可以解釋為什麼公司首次公開發行後，長期績效表現不佳。
6. 研究資料顯示公司首次公開發行(IPO)後第一天平均而言股價上漲 17%，代表承銷價格普遍低於公司的價值，以下哪些理由可能可以解釋為什麼公司及承銷商及公司要刻意低估股價? (K) (答案不只 1 個)
- (I) 解決資訊不對稱所帶來的贏家的詛咒。
- (II) 若發行價格高於公司價值，承銷商可能面臨法律訴訟。
- (III) 較低的價格才能吸引投資人投資風險較大的公司。
- (IV) 給與參與認購的機構投資人提供認購需求資訊的好處。
7. 以下關於公司股利政策理論的敘述何者錯誤? (L) (請選出 2 個答案)
- (I) 生命週期理論指出公司股利政策權衡對外融資成本及代理成本。
- (II) 生命週期理論預測年輕、未來獲利機會高的公司將多發股利，當公司進入成熟期後，股利將逐漸減少。
- (III) 訊號放射理論 (signaling hypothesis) 指出股利的高低反應公司高層對於未來公司盈餘(及股利)的看法。
- (IV) 基於訊號放射理論，股利減少或取消時投資人將猜測公司高層對未來悲觀，將導致股價下跌。因此公司高層不會隨便調降股利。
- (V) 基於訊號放射理論，現金流量不穩定的公司將維持較高的股利水準。
8. 當公司宣告併購活動時，以下哪些情形主併公司較可能有高的股價(異常)報酬? (M) (請選出 2 個答案)
- (I) 主併公司本身沒有反併購條款時
- (II) 主併公司的 CEO 持有主併公司大量可執行的價內選擇權時
- (III) 主併公司的某位高階主管或董事同時也在被併公司擔任董事時
- (IV) 主併公司的成長機會低但是自由現金流量多時
9. 實務上通常以資產過去數年的年平均報酬率作為未來投資該資產之預期報酬率，此作法背後隱含的假設為? (N)
10. 無風險利率，為雖名為“無風險”，但仍隱含 (O) 風險溢酬以及對貨幣時間價值的補償。
11. 若你的月薪為\$30,000，公司和你講定每兩週支薪一次，有兩種支薪方式可以選擇，A.第二週末領\$12,000，第四週末領\$18,000; B. 第二週末領\$15,000，第四週末領\$15,000，請問那一種方式對你比較有利? (P)；原因是? (Q)
12. 根據下表的利率期間結構(Term Structure of Interest Rate)，殖利率曲線斜率為 (R)，代表市場預



期未來之利率水準將 (S) (請寫提高或降低)。

Term	1 years	2 years	3 years	5 years
Rate(%)	1.12	1.36	1.97	2.31

13. 以下敘述何者為非? (T) (請選出2個答案)
- (I) 內部報酬率(IRR)法假設資金成本為再投資報酬率;
- (II) 內部報酬率(IRR)法不符合價值相加法;
- (III) 方案在投資期間內,除期初以外,必需進行多筆資本投資,該方案將具有多重內部報酬率(IRR);
- (IV) 由於內部報酬率(IRR)法代表方案的投資報酬率,因此,為了正確比較兩個規模不同的投資案,仍以內部報酬率法為最佳的評估方法。
14. 那一種資本預算法與公司極大化股東財富的目標相符? (U)。
15. 投資組合報酬率為投資組合中個別資產報酬率的加權平均值,投資組合標準差卻低於個別資產標準差的加權平均,投資組合風險降低的部份為 (V) 風險,風險降低的程度取決於個別資產間的 (W)。
16. 若你發現今天台股指數變動率為1.5%,低於銀行一年定存利2.5%,你手上持有的TSMC股票貝他值(beta)為1.8,則今天台積電股票的預期超額報酬為? (X)
17. 你以\$110/股買入TSMC股票,你預期年底該股票將漲到\$118/股,該公司於投資期間發放股利\$3/股,若銀行一年定存利2.5%,且你預期每單位市場風險溢酬為5%,根據資本資產定價模式(CAPM),TSMC的貝他值(beta)應該為? (Y)



本試題共有八大計算題，每題的配分如各題的開頭所顯示。

1. Carl is stranded in the forest and must survive on coconuts and quail. His utility function for those items is $U = f(C, Q) = 10C - C^2 + 4Q - Q^2$.
 - a. (5 points) If Carl maximizes his utility and has no constraints on how many he can get, what will he do?
 - b. (5 points) If Carl is able to get only some combination of 5 coconuts and quail, how many will he get of each if he is doing the best he can?

2.
 - a. (5 points) Your bike is worth \$100 and if you park it outside at school there is a 25% chance that it will be stolen. Your utility function for money is $U = (\text{money})^2$. Are you a risk taker?
 - b. (5 points) What is the expected value of your bike?
 - c. (5 points) Campus security has a bike check in that will guard your bike for \$15 so there will be no risk of loss. Do you take the campus security deal? Why and Why not?
 - d. (5 points) What is the maximum you would pay security to check in your bike?

3. (5 points) Suppose the consumer's utility function is given by $U(x, y) = x^{1/4}y^{3/4}$, the equation for this consumer's demand curve for x is _____?

4. (5 points) Suppose that a consumer's demand curve for a good can be expressed as $P = 50 - 4Q^d$. Suppose that the market is initially in equilibrium at a price of \$10. What is the consumer surplus at the original equilibrium price?

5. (5 points) Suppose that the market for corn is initially in equilibrium and is perfectly competitive. The demand curve can be expressed as $P = 10 - Q^d$; the supply curve can be expressed as $P = 0.25Q^s$. Quantity is expressed in millions of bushels. Now suppose that the federal government imposes a price floor of \$3 per bushel of corn. What is the dead-weight loss (per million bushels) associated with the price floor when the most efficient producers are active?



6. (5 points) Suppose a monopolist faces a demand curve $Q = aP^{-b}$ and that the monopolist has a constant marginal cost of C . The monopolist's profit-maximizing price is _____?
7. Assume that a closed economy is described by the IS curve $Y = 3600 + 3G - 2T - 150r$ and the LM curve $Y = 2(M/P) + 100r$. The investment function for this economy is $I = 1000 - 50r$. The consumption function is $C = 200 + (2/3)(Y - T)$. Long-run equilibrium output for this economy is 4000. The price level is 1.0 and $M = 1200$. Y is output, G is government spending, T is tax, r is interest rate, M is money supply, P is price level and C is consumption.
- a. (6 points) Assume that government spending is fixed at 1200. The government wants to achieve a level of investment equal to 900 and also achieve $Y = 4000$. Denote I as investment. What level of r is needed for $I = 900$? What levels of T and M must be set to achieve the two goals?
- b. (12 points) Now assume that the government wants to cut taxes to 1000. With G set at 1200, what will the interest rate be at $Y = 4000$? What must be the value of M ? Denote I as investment. What will I be? What will be the levels of private, public, and national saving?
- c. (2 points) Which "policy mix" (between question 7.a. and question 7.b.) most encourages investment?
8. Consider the basic Solow model. Assume total labor is fixed at $L = 1$. Time is discrete, and indexed by $t = 0, 1, 2, \dots$. The production function is Cobb-Douglas:
- $$y_t = f(k_t) = Ak_t^\alpha$$
- where y_t is per capita income at time t and k_t is capital per capita at time t . The law of motion for the capital stock is
- $$k_{t+1} = (1 - \delta)k_t + i_t$$
- where i_t is per capital investment. The economy consumes a constant fraction of output:
- $$c_t = (1 - s)y_t$$
- where $s \in (0, 1)$. Assume that the economy starts with initial capital $k_0 > 0$.
- a. (15 points) Compute the steady state capital per capita in this economy. Call it k . Also, compute the level of investment per capita (i) and income per capita (y) in the steady state.
- b. We will now derive an analytical expression for the evolution of the per capita capital stock in this economy. Assume from now on that $\delta = 1$, that is, that the capital stock fully depreciates in one period.
- (1) (5 points) Write k_t as a function of k_0 for any $t \geq 0$.



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系所: 財金系
科目: 經濟學(2)

- (2) (5 points) Show that the limit (as $t \rightarrow \infty$) of the expression you just got for k_t is exactly k . That is, show $\lim_{t \rightarrow \infty} k_t = k$.
- c. (5 points) Using the analytical expression derived in question 8. b.(1), plot the evolution of the per capita stock in this economy. Take $s = 0.2$, $A = 1$, $\alpha = 0.5$ (and of course, $\delta = 1$). That is, plot k_t as a function of t . Do this graph for the case in which $k_0 = 1$.



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系所：財金系

碩士班暨碩士在職專班招生考試試題

科目：微積分(3)

1. Prove that there is no rational number whose square is 2. (5 分)
2. Evaluate $(\log_a b)(\log_b a)$ assuming $a, b > 0$ and $a, b \neq 1$. (5 分)
3. Express in polar form for $-1 + \sqrt{3}i$. (5 分)
4. Prove Bernoulli's inequality $(1+x)^n > 1+nx$, for $n = 2, 3, \dots$ if $x > -1, x \neq 0$. (5 分)
5. If $f(x) = \frac{3x+1}{x-2}, x \neq 2$, find $f(f(x))$. (5 分)
6. The Fibonacci sequence is the sequence $\{u_n\}$, where $u_{n+2} = u_{n+1} + u_n$ and $u_1 = u_2 = 1$.
Find the first 6 terms of the sequence. (5 分)
7. Evaluate $\lim_{x \rightarrow 0^+} \frac{\ln \tan 2x}{\ln \tan 3x}$. (5 分)
8. Evaluate $\frac{d}{dx} \left\{ \sin^2 \left(3x + \frac{\pi}{6} \right) \right\}$ at $x = 0$. (5 分)
9. Find $\int x^n \ln x dx$ if $n \neq -1$. (5 分)
10. Test for convergence: $\sum_{n=1}^{\infty} \frac{1}{n^p}, p = \text{constant}$. (5 分)
11. Evaluate $\lim_{n \rightarrow \infty} \sum_{k=1}^n \frac{1}{n^3} k^2$. (10 分)
12. Find the first derivative of the function $f(x) = 2^x + e^{x^2}$. (10 分)
13. Evaluate the integral $\int_0^1 x^2 e^x dx$. (10 分)
14. Evaluate $\lim_{x \rightarrow 1} \frac{x-1}{\sqrt{x^2+1} - \sqrt{x^2+x}}$. (10 分)
15. A company produces white and black cars and its annual profit is given by

$$f(x, y) = -x^2 + 2xy - 3y^2 + 2400x + 4800y - 210000$$

where x and y represent the units of white and black cars, respectively.

Suppose that the company produces 1,500 units of cars. What is the maximum profit? (10 分)