

一、(20%)

茲考慮一存在之積分式： $\int_{-\infty}^{\infty} \exp\left(-\frac{1}{2}y^2\right)dy$ ，請由此分別導出常態分配的機率密度函數(probability density function)及動差母函數(moment generating function)。

二、(30%)

「設由常態母體 $N(X; \mu, \sigma^2)$ 中獨立抽出 n 個變量 (X_1, X_2, \dots, X_n) 為一組隨機樣本，求得其樣本平均數為 $\bar{X} = \frac{1}{n} \sum_{i=1}^n X_i$ ，樣本變異數為 $S^2 = \frac{1}{n} \sum_{i=1}^n (X_i - \bar{X})^2$ ，則 \bar{X} 與 S^2 互相獨立」，證明此一定理成立，並舉例說明此一定理在統計推論上之重要性。

三、以下資料分別代表台灣加權股價指數(簡稱指數)和台灣積體電路製造有限公司(簡稱台積電)，資料收集自民國84年1月5日至民國84年2月16日，共30日。

日期	台灣加權指數	台積電收盤價
840105	7051.49	155
840106	6919.31	154
840107	6915.4	154
840109	6869.08	151
840110	6756.88	150
840111	6777.24	149.5
840112	6609.5	148
840113	6582.4	146
840114	6511.3	140
840116	6536.65	137.5
840117	6515.79	137
840118	6623.52	138.5
840119	6598.02	145
840120	6372.01	141.5
840121	6431.99	146.5
840123	6295.04	140
840124	6167.79	139
840125	6299.62	143
840126	6307.85	141
840204	6328.38	143
840206	6417.28	148
840207	6531.82	147.5
840208	6526.74	146.5
840209	6543.42	147
840210	6554.78	148.5
840211	6565.24	150
840213	6498.21	149
840214	6504.59	148.5
840215	6576.25	152
840216	6646.55	156

請回答以下各問題：

- (1)請利用現有資料，試建立二種可能的股價預測模型。(15分)
- (2)根據(1)，試選其中之一較具代表性的模型，並陳述選擇的理由。(10分)
- (3)在此樣本期間，台積電股價變動率是否具有統計上的常態性和變動的波動性？(10分)
- (4)請寫出若以機率形式表示每日指數變動率和台積電股價變動率來解釋市場效率性。(15分)

個體經濟部份

1. 假設某甲之效用函數可用 $U(X) = -\frac{1}{X}$ 代表之。其中， $U(X)$ 是一個 V-M 效用函數。

- (i) 請計算某甲之 ARA (Absolute Risk Aversion)。
- (ii) 請計算某甲之 RRA (Relative Risk Aversion)。
- (iii) RRA 和 ARA 最大的差異為何？其經濟上的意涵為何？請說明。

2. 某乙之效用函數可用 $U(X) = \ln X$ 代表之。其中， $U(X)$ 為 N-M 效用函數。假設某乙之期初財富為 5000 元。

- (i) 假設某乙面對一個情況，某乙可能會贏得或損失 1000 元 (各以 1/2 之機率)。面對此項風險，某乙可以花 125 元來規避此項風險，某乙也可以面對此項風險，接受機率的挑戰。請問某乙會如何選擇？請說明。
- (ii) 若某乙選擇了接受機率的挑戰，而卻輸了 1000 元，而只剩下 4000 元。若某乙再次面對完全相同的選擇時 (輸或贏 1000 元各有 1/2 的機率；或者買一個 125 元的保險)，請問他的決策將會是什麼？為什麼完全相同的人，會作出上述的決定？請說明。

3. 在賽局論 (Game Theory) 中，對成員 (Players) 不同的行為假設將會產生不同的均衡解。請說明下列均衡解之觀念 (您可以畫圖以補充說明不同賽局之情境)。

- (i) Nash Equilibrium
- (ii) Subgame Perfect Equilibrium
- (iii) Bayesian Nash Equilibrium

4. 在福利經濟學 (Welfare Economics) 中著名的第一及第二福利定理 (First and Second Fundamental Welfare Theorem) 之主要內容為何? 其主要的意義是什麼? 請說明。

87 總體經濟部份

1. Construct a classical model in mathematical form including labor market, aggregate supply, aggregate demand and money market. Use the model to prove the neutrality of money. (12 points)

2. Construct an IS-LM-BP model in mathematical form and show what happens to output, exchange rate and interest rate when the current account improves due to some unknown exogenous factors. (12 points)

3. Let the value of x at time $t+j$ rationally expected at time t with information available then be denoted by $x_{t+j}^e = E(x_{t+j} / \Omega_t)$ where E stands for mathematical expectation and Ω_t the information available at time t . (13 points)

(1) Show $E(x_{t+1} - x_{t+1}^e) = 0$

(2) Let z_t denote any variable whose value is known to agents at t , show

$$E[x_{t+1} - x_{t+1}^e | z_t] = 0$$

4. Assume the following model

Aggregate supply $\pi_t = \bar{\pi} + \eta(Y_t - \bar{Y})$

Money growth $(M/P)_t = (M/P)_{t-1}(1 + \mu - \pi_t)$

IS curve $Y_t - \bar{Y} = \gamma(\lambda_t - \bar{\lambda}) - \phi(r_t - \bar{r})$

Real exchange rate $\lambda_t = E_t P_t^* / P_t = \lambda_{t-1}(1 + \varepsilon_t)(1 + \pi_t^*) / (1 + \pi_t)$

Interest rates $r_t = i_t - \pi_t$

LM curve $(M/P)_t - (M/P)_{t-1} = a(Y_t - Y_{t-1}) - b(i_t - i_{t-1})$

where a bar above a variable denotes its long-run value and a * indicate foreign country.

π = rate of inflation

μ = growth rate of nominal money stock determined by monetary authority

E = nominal exchange rate

i = nominal interest rate

r = real interest rate

ε = rate of change of the exchange rate

Assume in the long run purchasing power parity holds and real interest rate is zero.

(1) Calculate the steady-state value of nominal interest rate and rate of inflation

(2) What is the steady-state ε when π^* is constant. (13 points)

1. 在資本預算問題裏，我們常須計算計畫之 NPV。但是未來現金流量往往有不確定性，產生估算的困難。假設有某金礦公司，未來兩年內每年可生產 1000 盎司黃金，每年總營運成本為固定之 \$200,000。令目前市場現貨黃金價每盎司為 S ，一年期之黃金期貨價每盎司為 F_1 ，二年期之期貨價為 F_2 ，市場無風險利率為 10%，公司之資金成本為 12%，股市報酬率為 15%，黃金儲存成本每盎司為 \$5。

(1) 請估計公司未來兩年生產黃金之 NPV。(5%)

(2) 若市場為效率，則現貨與期貨市場間沒有套利的空間。現貨黃金價每盎司至少要達到多少公司才應進行上述之生產？(5%)

2. 請解釋：(10%)

(1) 債權人與股東之間有那些代理問題？會如何影響公司價值？如何解決這些問題？

(2) 股東與管理者有那些代理問題？會如何影響投資決策？如何解決？

3. Hedging(避險)是否能視為權益資本的替代？為什麼？(5%)

4. 試分析兩稅合一實施後對公司股利政策以及負債結構理論上的影響，並設計一實證研究方法以驗證你的假說。(20%)

5. A recent addition to the American scene (and one we have seen nowhere else in the world) is The Weather Channel—a 24-hour cable channel devoted entirely to weather reports. Basic economics tell us that the market price of wheat must be determined by the demand for and supply of wheat. And since the supply of wheat is in large part determined by weather conditions, shouldn't we be able to use those weather forecasts from The Weather Channel to make money?

More specifically, let's devise a trading strategy: If The Weather Channel forecasts bad weather (e.g., hail in Kansas), we will contract to buy wheat in the future at the price prevailing today. Then, when the bad weather conditions reduce the supply of wheat, the price of wheat will consequently rise. And (here comes the good part), when our contract matures, we will accept delivery of the wheat at the low price we contracted for today and immediately sell it as a higher price.

Q: Do you expect to make money on this strategy? Why or why not? (5%)

6. (10 points) How much cash do you have to deposit to purchase 1000 shares of XYZ Corp. common stock, listed on the Taiwan Stock Exchange, on margin at a market price of \$125 per share? If the stock price falls to \$80 after 10 days, and you receive a margin call, compute the amount of additional cash you have to post to maintain the position. What is the rate of return during this period if you decide to liquidate your position? (Include in all calculations the security transactions tax of 0.3%, the sales commission of 0.1425%, and interest rate on the amount of loan at 10%.)

7. (10 points) Assume that the following model describes equilibrium returns

$$R_i = a_i + b_{i1}I_1 + b_{i2}I_2 + e_i$$

Also assume that returns of the following three well-diversified portfolios A, B, and C are observed.

Portfolio	$E(R_i)$	b_{i1}	b_{i2}
A	7.8%	0.4	0.8
B	8.2%	0.6	0.8
C	10.4%	1.2	1.0
D	11.0%	1.0	1.0

a. From A, B, and C, compute the equation that determines equilibrium returns.
 b. Is portfolio D correctly priced? Does there exist any arbitrage opportunity? Show work.

8. (10 points) Why does the theory of financial markets suggest that trading many different securities in many different markets might be desirable? We have seen in many instances that the use of derivative assets caused serious financial problems to banks and industrial firms as well. Are we really doing wrong in introducing the "evil" derivatives? What seems to be the problem?

9. (20 points) You are a manager in the department of personal banking of a well known foreign bank. Make a recommendation for the following two investors who are concerned about their lifetime financial planning. Miss Wang is 28 years old and has accumulated wealth of NT\$1,000,000 to invest. Mr. Chen is 52 years old and has NT\$15,000,000 in cash plus an apartment that is worth NT\$12,000,000.

Specifically, allocate for the two individuals the available funds among three accounts: cash, long term bonds, and equity portfolio. Be sure to include your knowledge of the markets, the suitable financial instruments, and your personal view of how the markets are going to perform in making your investment recommendations. The investment horizons play an important role in determining the investment strategy and should be explicitly assumed.