一、

動態體系裡的計量統計問題中，對於隨機干擾項(stochastic disturbance terms) $\{\varepsilon_t\}$ 的處理，通常都會從文獻上或教科書上看到作者作如此的假設：

(1) stationary stochastic process，或者，(2)serially uncorrelated，或者，(3)identically and independently distributed (iid) with some distributions (e.g. normal)，或者，(4) white noise 等，不一而足。

（一） 請問：以上(1)~(4)四種 alternative assumptions 彼此之間究竟有無差別？如有差別，其差異何在？如無差別，其理安在？

（二） 關於上述第(4)種假設，常見的中文翻譯都寫成「白色躁音」或「白音」，這不免產生了語意上的矛盾：既然是一種「躁音」，為何還會有「顏色」（白色）之別呢？（聲音應是無色才對！）請就此點質疑，提出您個人的分析性看法。

（本大題共計 50 分）

二、

右列資料分別代表台灣加權股價指數(簡稱指數)和中國石油化學公司(中石化)收盤價及其變動量。資料收集自民國 86 年 1 月 18 日至 86 年 2 月 17 日，共 20 日。

請回答下列各問題：

(1) 現就該資料以最小平方法(Ordinary Least Squares)建立二種可能中石化股價之模型。(25%)

(2) 並試圖利用統計理由比較(1)之二種模型之結果，選擇其中之一較能解釋和預測中石化股價之模型。(25%)

	中石化		中石化	
日 期	收盤價	加權指數	收盤價變動量	加權指數變動量
860118	38.6	7154.2	0.7	-19.22
860120	40.2	7254.32	1.6	100.12
860121	40.5	7251.04	0.3	-3.28
860122	43.3	7290.77	2.8	39.73
860123	42.5	7219.55	-0.8	-71.22
860124	42.2	7248.01	-0.3	28.46
860125	41.2	7212.28	-1	-35.73
860127	40.5	7156.96	-0.7	-55.32
860128	40.8	7146.21	0.3	-10.75
860129	41.3	7149.54	0.5	3.33
860130	41.5	7221.98	0.2	72.44
860131	42.3	7283.4	0.8	61.42
860201	42.1	7315.39	-0.2	31.99
860203	42.1	7346.88	0	31.49
860211	42.8	7410.47	0.7	63.59
860212	42.2	7424.1	-0.6	13.63
860213	42.2	7536.28	0	112.18
860214	43	7499.51	0.8	-36.77
860215	43.9	7598.93	0.9	99.42
860217	46	7687.18	2.1	88.25
860218	44	7642.03	-2	-45.15
860219	43.4	7656.85	-0.6	14.82
860220	43.1	7678.04	-0.3	21.19
860221	45.4	7791.19	2.3	113.15
860222	45.1	7739.94	-0.3	-51.25

89 總體經濟部份(共五十分)

1. (i) Build a classical model and conduct comparative statics. Draw as many conclusions about monetary and fiscal policies from your model as you can. (7 points)

   (ii) By the assumption of classical school, saving is a function of interest rate. If this assumption does not hold and, rather, saving is a function of income, will the conclusions of the classical school be affected? (7 points)

2. Build a typical IS-LM model and answer the following questions:

   (i) How do equal increases in G(government spending) and T(lump sum taxes) affect the position of the IS curve? Specifically, what is the effect on Y for a given level of interest rate? (7 points)

   (ii) How do equal increases in G and T affect the position of the AD curve? Specifically, What is the effect on Y for a given level of P? (7 points)

3. Suppose that money demand is given by $m_t - p_t = c - b(E_t p_{t+1} - p_t)$, where m and p are the logs of the money stock and the price level, and where we are implicitly assuming that output and the interest rate are constant.

   (i) Express p_t in terms of m_t, $E_t m_{t+1}$, $E_t m_{t+2}$ ……, Assume that $\lim_{i \to \infty} E_t\{[b/(1+b)]^i p_{t+i}\} = 0$] (7 points)

   (ii) Explain intuitively why an increase in $E_t m_{t+i}$ for any i > 0 raises p_t? (7 points)

   (iii) Suppose expected money growth is constant, so $E_t m_{t+i} = m_t + gi$. Solve for p_t in terms of m_t and g. How does an increase in g affect p_t? (8 points)

89 個體經濟學部份（共五十分）

4. 設 $f(x_1, x_2)$ 為一生產函數，請導出下列生產函數之成本函數

   (i) $f(x_1, x_2) = x_1 + 2x_2$（5 分）

   (ii) $f(x_1, x_2) = \min\{2x_1, x_2\}$（5 分）

5. 我國憲法規定：大規模公用事業或獨占性事業應由國家經營。您能否依經濟學原理，給「獨占性」賦予一個定義？（10 分）

6. 若消費者的效用函數為 $U = \alpha \ln x_1 + (1-\alpha)\ln x_2$，預算限制為 $p_1x_1 + p_2x_2 \le y$。消費者共有 100 人。市場上有一獨占廠商，生產成本為 $c_i(x_i)$, $\partial c_i / \partial x_i > 0$，請問廠商之最適決策為何？（15 分）

7. 假設社會上有兩類人，兩種商品。A 類人的原賦向量是 $(\omega_1^A, 0)$，B 類人的原賦向量是 $(0, \omega_2^B)$。A 類人共有 N_A 人，其效用函數為 $u = \alpha \ln x_1 + (1-\alpha)\ln x_2$，B 類人共有 N_B 人，其效用函數為 $u = \beta \ln x_1 + (1-\beta)\ln x_2$，請解出競爭均衡之交換價格。（15 分）

（20 分） 1. Please **Compare** the differences between E. Fama's viewpoints of "Market Efficiency" in 1970 and 1991. And **Comment** why he made such changes in 20 years.

（20 分） 2. Traditional Finance theories (e.g. M&M 1958) assume that Firm's investment (Capital Budgeting) and financing decisions are separate. However, both issues actually interact and influence each other closely. Please **List** (at least 3 different) possible interactions between them and **Explain** in details how they influence each other.

（10 分） 3. Portfolio theory (H. Markowitz 1952) is an important presumption of Capital Asset Pricing Model (Sharp 1964, Lintner 1965, Mossin 1966). Please **address in steps** how Portfolio theory is related to CAPM.

(20 分) 4. Brealey and Myers point out that six lessons can be learned from market efficiency. There are markets have no memory, trust market prices, there are no financial illusions, the do-it-yourself alternative, seen on stock then seen them all, and reading the entrails. Please explain the meanings of above six lessons.

(15 分) 5. Discuss briefly the relative risk of the following positions:

(1) Buy stock and a put option on the stock
(2) Buy stock
(3) Buy call
(4) Buy stock and sell call option on the stock
(5) Buy bond
(6) Buy stock, buy put and sell call

(15 分) 6. The Chocolate Ice Cream Company and the Vanilla Ice Cream Company have agreed to merge and form Fudge Swirl Consolidated. Both companies are exactly alike except that they are located in different towns. The end-of-period value of each firm is determined by the weather, as shown.

State	*Probability*	*Value*
Rainy	0.1	$100,000
Warm	0.4	200,000
Hot	0.5	400,000

The weather conditions in each town are independent of those in the other. Furthermore, each company has an outstanding debt claim of $200,000. Assume that no premiums are paid in the merger.

a. What is the distribution of joint values?

b. What is the distribution of end-of-period debt values and stock values after the merger?

c. Show that the value of the combined firm is the sum of the individual values.

d. Show that the bondholders are better off and the stockholders are worse off in the combined firm than they would have been if the firms remained separate.

1. (25%) An individual's choice problem of portfolio selection is:

$$\underset{\{a_j\}}{Max}\ E\{u[W_0(1+r_f)+\sum_j a_j(\tilde{r}_j - r_f)]\}$$

where a_j is the wealth amount invested in risky asset j and $\{a_j\}$ are the decision variables. W_0 = initial wealth. r_f = risk-free rate. $\tilde{r}_j$ = random return of risky asset j. Assume there exists a solution to the above problem. (1) Solve the optimal solution. (2) At the optimum, find the implicit differentiation of the variable a_2 with respect to W_0.

2. (25%) $\tilde{r}_1$ and $\tilde{r}_2$ are the random returns of risky asset 1 and 2, respectively. Assume $\tilde{r}_1 = \tilde{r}_2 + \tilde{e}$ where $E[\tilde{e}\,|\,\tilde{r}_2] = 0$. $U(\cdot)$ is a concave function. Show that $E[U(\tilde{r}_1)] \leq E[U(\tilde{r}_2)]$

3. (20%) Let $\{X(t), t \geq 0\}$ be a Brownian motion process with drift μ and diffusion coefficient σ^2, i.e.,

$$X(t) - X(0) \sim N(\mu t, \sigma^2 t), \quad t \geq 0,$$

where $N(m, s^2)$ denotes the normal random variable having mean m and variance s^2. The process defined by

$$Y(t) = e^{X(t)}, \quad t \geq 0,$$

is called geometric Brownian motion. Compute the mean and variance of $Y(t)$ given $Y(0) = y$. That is, compute $E[Y(t)|Y(0) = y]$ and $\mathrm{Var}[Y(t)|Y(0) = y]$.

4. (30%) Let X be an $m \times n$ matrix with full column rank. It can be shown that X^TX is nonsingular (X^T denotes the transpose of X.) Thus $(X^TX)^{-1}$ exists.

   (a) Let $P = X(X^TX)^{-1}X^T$. Show that P and $I - P$ are projection matrices (a matrix A is called a projection matrix if $A^T = A$ and $A^2 = A$), where I is an $m \times m$ identity matrix.

   (b) Let y be any m-vector, $\hat{y} = Py$, and $\hat{e} = y - \hat{y}$. Show that $X^T\hat{e} = 0$ and $\hat{y}^T\hat{e} = 0$.

   (c) (continued from (b)) Assume the first column of X is $\mathbf{1} = (1, \ldots, 1)^T$. Let

$$\bar{y} = (\frac{1}{m}\sum_{i=1}^{m} y_i)\mathbf{1} = (\frac{1}{m}\mathbf{1}^T y)\mathbf{1}$$

   (Note that $\bar{y}$ is an m-vector.) Show that

$$\|y - \bar{y}\|_2^2 = \|y - \hat{y}\|_2^2 + \|\hat{y} - \bar{y}\|_2^2,$$

   where $\|\cdot\|_2$ denotes the 2-norm of vectors and is defined to be $\|x\|_2 = \sqrt{x^Tx}$ for any vector x.