

# 東海大學九十二學年度碩士班招生入學考試試題

系所組別：國貿系

科目：統計學C

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## 一、解釋名詞 (10%)

1. Non-Parametric Statistics
2. Factors (Decomposition) of Time Series Data vs. PROC X11

## 二、有4位女性及6位男性應徵者，參加東海大學國貿系助教甄選口試。

1. 假設從全部應徵者中隨機抽取3名且不放回 (without replacement)，請問這三名中有兩位是女性的機率是多少？ (4%)
2. 假設從全部應徵者中隨機抽取3名且放回 (with replacement)，請問這三名中有兩位是女性的機率是多少？ (4%)

## 三、根據國內一項對全民健保的隨機抽樣調查顯示，有60%的受訪者不認為全民健保制度能夠持續十五年；在此隨機樣本裡，有60%的受訪者其年紀低於45歲。又年紀等於或超過45歲的受訪者中，有70%的受訪者認為全民健保制度將能夠持續十五年。現隨機抽取一位相信全民健保制度將會持續十五年以上的受訪者，請問此位受訪者的年紀大於或等於45歲的機率是多少？ (5%)

## 四、國內興農牛職業棒球隊擁有四名主力投手：飛勇，勇壯，蔡仲南，及何紀賢，每位投手每四場比賽主投一次。根據過去的比赛結果，如果比賽是由飛勇主投，其勝率達60%；由勇壯主投，則勝率為40%；由蔡仲南主投，勝率為35%；由何紀賢主投，則勝率為35%。如果你是一位熱情的職棒球迷，而卻忘了觀賞昨天興農牛的比赛，且倘若昨天興農牛為勝場，請問該場比賽由勇壯主投的機率是多少？ (7%)

## 五、You want to know whether the population variance of returns on the Vanguard S&P 500 index fund **changed** subsequent to the market crash of October 1987. You have specified a 0.05 level of significance, and gather the following data for 120 months of returns before October 1987 and for 120 months of returns after October 1987. Show whether the null hypothesis is rejected or not. (5%)

Time period	n	Mean monthly return	Standard deviation	Variance
After Oct. 1987	120	1.44%	3.97%	0.1576%
Before Oct. 1987	120	1.42%	4.73%	0.2237%

六、Suppose that, in 1988, 10% of all businesses classified as small businesses hired a CPA as a consultant to provide accounting guidance. Because of increased government regulation and other requirements, small businesses are feeling more pressure to hire outside professional accounting assistance. As a result, a greater proportion of small businesses seem to hire CPAs as consultants in 2002. To test this theory, suppose 400 small businesses are sampled randomly from a list provided by the Small Business Administration. If 60 of these sampled small businesses use a CPA as a consultant, is there enough evidence to support this theory? Assume a 1% level of significance.(5%)

七、Suppose that  $X_1, X_2, \dots, X_n$  is random sample drawn from a normal population with mean  $\mu$  and variance  $\sigma^2$ . Define  $S^2 = \sum_{i=1}^n (X_i - \bar{X})^2 / (n-1)$ . Find

1. The mean of  $S^2$  (Note:  $\sum (X_i - \mu)^2 = \sum (X_i - \bar{X})^2 + n(\bar{X} - \mu)^2$ ) (5%)
2. The variance of  $S^2$  (5%)

八、Consider the function  $f(x) = \begin{cases} 2(\frac{1}{3})^x, & \text{for } x = 1, 2, 3, \dots \\ 0, & \text{otherwise} \end{cases}$

1. Derive the moment generating function for X. (Note: assume  $|\frac{1}{3}e^t| < 1$ ) (5%)
2. Derive the mean for X. (5%)

九、給予《表1》訊息，並回答下列兩個問題：(10%)

1. 請以統計方法，分別評估台灣地區在降價前、降價後之售價，是否高於其他地區？
2. 若要更嚴謹進行微軟產品是否存在跨國差別定價之研究，您認為應如何進行？

《表1》 微軟產品在主要國家零售價格

產品 (完整版)	台灣地區		大陸地區	日本地區	北美地區
	降價前	降價後			
Windows XP (家用版)	8,190	6,814	5,922	6,210	6,832
Windows XP (專業版)	12,090	9,225	7,992	8,636	10,266
Office XP (標準版)	18,690	16,073	15,760	13,897	16,446
Office XP (專業版)	22,490	19,341	18,880	16,623	19,879

資料來源：中國時報。

十、給予《表2》、《表3》訊息，並回答下列問題：(30%)

1. 本案例旨在估計美國在1951~1997年雞肉需求函數，茲依《表2》所提供訊息，說明各個變數之統計特性。【NOTE:  $Y_t$  = per capita chicken consumption (in pounds) in year t

$PC_t$  = the price of chicken (in cents per pound) in year t

$PB_t$  = the price of beef (in cents per pound) in year t

$YD_t$  = U.S. per capita disposable income (in hundreds of dollars) in year t】

2. 依《表3》之迴歸估計結果，請回答下列課題：

(1)請計算空白欄數據(依(a)~(e)順序)，並解析其意義。【NOTE:  $t_{0.05}(43)=2.014$ ;  $F_{0.05}(3,43)=2.82$ 】

(2)請計算雞肉需求之平均自身價格彈性、交叉價格彈性及所得彈性，並解析其意義。

3. 由《表3》之DW值顯示何種意義，您認為實證模型應如何設定？【NOTE:  $k=2$ 時， $d_L=1.34$ ， $d_U=1.53$ ； $k=3$ 時， $d_L=1.30$ ， $d_U=1.58$ 】

《表2》敘述統計彙總表

Date: 03/28/03

Time: 09:01

Sample: 1951~1997

	Y	PC	PB	YD
Mean	45.8383	11.78723	40.63617	78.3317
Median	40.1	10.3	33.7	49.42
Maximum	83.7	25	74.6	216.31
Minimum	21.3	6.5	14.9	14.86
Std. Dev.	18.87062	4.118179	20.34377	65.25813
Skewness	0.60805	1.354953	0.271589	0.755132
Kurtosis	2.221986	4.676765	1.474246	2.12562
Jarque-Bera	4.081573	19.88714	5.136643	5.963981
Probability	0.129926	0.000048	0.076664	0.050692
Sum	2154.4	554	1909.9	3681.59
Sum Sq. Dev.	16380.61	780.1323	19037.97	195896.7
Observations	47	47	47	47

《表3》 普通最小平方法之估計結果

Dependent Variable: Y

Method: Least Squares

Date: 03/17/03 Time: 11:19

Sample: 1951 1997

Included observations: 47

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	31.45523	1.218604	25.8125	0
PC	(a)	0.077104	-9.45383	0
PB	0.116623	(b)	3.343578	0.0017
YD	0.232805	0.011347	(c)	0

R-squared	0.990187	Mean dependent var	45.8383
Adjusted R-squared	(d)	S.D. dependent var	18.87062
S.E. of regression	1.933461	Akaike info criterion	4.237766
Sum squared resid	160.7458	Schwarz criterion	4.395226
Log likelihood	-95.5875	F-statistic	(e)
<b>Durbin-Watson stat</b>	<b>1.007858</b>	Prob(F-statistic)	0