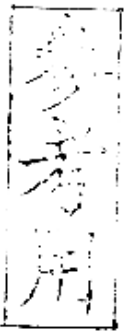


國立中央大學八十四學年度碩士班研究生入學試題卷

所別：企業管理研究所 甲乙組

科目：統計學

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1. 10% The dean of a business school is considering canvassing the members of the school's alumni association for the purpose of generating donations to the school's development fund. Currently, there are 3,500 members of the alumni association, 2,100 of whom live in-state while the remainder live out-of-state. The dean has decided to select a stratified sample of alumni (stratified according to current residence) to estimate total donations; using the sample evidence, he will decide whether to contact all remaining alumni. Find the number n of alumni that should be contacted if the dean wishes to estimate the total alumni contributions with a bound on the error of estimation of \$10,000. How should this sample size be allocated between in-state and out-of-state alumni? From prior fund-raising drives the standard deviations for donations by in-state and out-of-state alumni were found to be \$20 and \$30, respectively.

2. 20% Does much variance exist in the cost of living in the major metropolitan areas of the United States? The *CPI Detailed Report* offers some insight into this issue by including within each monthly report a listing of cost indexes for several items in five major metropolitan areas. Listed in Table 1 are the 1987 CPI values (1967 = 100) for each cost group in each of five metropolitan areas and the measures of relative importance (weights) of each cost group.

- Compute the overall CPI for each metropolitan area for 1987.
- With 1967 as a base, by what percentage has the increase in the cost of living in New York exceeded that of Detroit? By what percentage has it exceeded that of Philadelphia?
- With 1967 as a base, by what percentage has the increase in fuel and utilities and transportation costs in New York exceeded that of Los Angeles?
- Do these data provide sufficient evidence to determine which metropolitan area among the five offers the lowest cost of living and which offers the greatest cost of living? Explain.

Table 1 Cost Index Data

Group	Importance	Metropolitan Area				
		Chicago	Detroit	L.A.	N.Y.	Philadelphia
Food, beverage	17.6	313.1	301.6	320.2	349.8	329.2
Housing	27.8	466.0	428.9	455.8	407.5	411.1
Fuel, utilities	7.7	318.1	395.7	344.9	363.8	369.3
Household operations	7.0	247.8	216.2	242.1	263.6	256.5
Apparel, upkeep	6.3	185.0	184.5	196.0	196.2	199.5
Transportation	17.5	321.0	318.2	342.7	356.9	351.0
Medical care	5.8	475.3	502.7	502.8	487.7	511.1
Entertainment	4.4	307.6	250.2	241.8	308.0	265.5
Other goods and services	5.9	368.9	350.1	364.4	394.6	409.2

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參考用

3.
20%

某食品公司為瞭解顧客對A,B兩種填加料的反應, 經調查訪問結果如左:

顧客	記錄	
	A	B
1	4	6
2	7	4
3	6	5
4	9	6
5	8	7
6	8	4

試利用下述三種方法檢定顧客對這兩種填加料的喜好是否有別。

1. 利用 t 法檢定 $\left(\begin{matrix} F(v_1=5, v_2=5) = 7.15 \\ t(df=10) = 2.228 \\ t(\alpha=0.025) = 2.571 \end{matrix} \right)$ 。
2. 利用駢對 t 法檢定 $\left(t(\alpha=0.025) = 2.571 \right)$ 。
3. 利用魏考森符號等級法檢定 ($T \leq 2$ 為棄卻區)。
4. 試以各法使用的前提, 說明三種結論的取捨。

4.
20%

設某應變數 y 與預測變數 x_1, x_2 間的觀察結果資料經 MINITAB 分析結果報表如下, 試依報表結果回答下列問題。

1. 此迴歸方程式可做為對 y 的預測之用嗎? 為什麼(設 $\alpha = 0.05$)?
2. $x_1 x_2$ 項的偏迴歸係數為 0 的假設成立嗎? 為什麼(設 $\alpha = 0.05$)?
3. R-sq(adj) 的意義是什麼?
4. P.I. 為什麼比 C.I. 來的大(95%)?
5. 若 x_1 與 x_2 具有共線性時, 所估得的迴歸方程式是否可用?

The regression equation is
 $Y = 51.7 - 20.9 X1 - 15.6 X2 + 7.30 X1SQ + 2.40 X2SQ + 0.30 X1X2$

Predictor	Coef	Stdev	t-ratio	P
Constant	51.676	3.761	13.74	0.000
X1	-20.900	5.809	-3.60	0.006
X2	-15.552	3.232	-4.81	0.000
X1SQ	7.300	2.596	2.81	0.020
X2SQ	2.4040	0.7319	3.29	0.009
X1X2	0.300	1.061	0.28	0.784

s = 4.743 R-sq = 89.4% R-sq(adj) = 83.4%

Analysis of Variance

SOURCE	DF	SS	MS	F	P
Regression	5	1699.25	339.85	15.11	0.000
Error	9	202.49	22.50		
Total	14	1901.72			

SOURCE	DF	SEQ SS
X1	1	324.90
X2	1	952.03
X1SQ	1	177.63
X2SQ	1	242.88
X1X2	1	1.80

Unusual Observations

Obs.	X1	Y	Fit	Stdev. Fit	Residual	St. Resid
13	2.00	10.00	18.79	2.58	-8.79	-2.21R

R denotes an obs. with a large st. resid.

Fit	Stdev. Fit	95% C.I.	95% P.I.
26.66	2.63	(20.71, 32.61)	(14.39, 38.93)



5.

30%

Sometimes experiments involving success/failure responses are run in a paired or before/after manner. Suppose that before a major policy speech by a political candidate, n individuals are selected and asked whether (S) or not (F) they favor the candidate. Then after the speech the same n people are asked the same question. The responses can be entered in a square table as follows:

		After	
		S	F
Before	S	X_1	X_2
	F	X_3	X_4

where $X_1 + X_2 + X_3 + X_4 = n$

Let $p_1, p_2, p_3,$ and p_4 denote the four cell probabilities, so that $p_1 = P(S \text{ before and } S \text{ after})$, and so on. We wish to test the hypothesis that the true proportion of supporters (S) after the speech

has not increased against the alternative that it has increased.

- State the two hypotheses of interest in terms of $p_1, p_2, p_3,$ and p_4 . (10%)
- Construct an estimator for the after/before difference in success probabilities. (5%)
- When n is large, it can be shown that the random variable $(X_1 - X_2)/n$ has approximately a normal distribution with variance $[p_1 + p_2 - (p_1 - p_2)^2]/n$. Use this to construct a test statistic with approximately a standard normal distribution when H_0 is true (the result is called McNemar's test). (10%)
- If $x_1 = 350, x_2 = 150, x_3 = 200,$ and $x_4 = 300$, what do you conclude? (5%)