國立臺北大學八十九學年度碩士班招生考試

系（所）別：經濟學系　　可使用計算機

科目：統計學(含計量經濟學)　　（共二頁 第一頁）

一、The marketing director of a cable television company is interested in determining whether there is a difference in the proportion of households that adopt a cable television service based on the type of residence (single-family dwelling, two- to four-family dwelling, and apartment house). A random sample of 400 households revealed the following:

	TYPE RESIDENCE			
PURCHASE CABLE TELEVISION ?	SINGLE-FAMILY	TWO- TO FOUR-FAMILY	APARTMENT HOUSE	TOTAL
Yes	94	39	77	210
No	56	36	98	190
Total	150	75	175	400

(a) At the .01 level of significance, is there evidence of a significant difference among the types of residence with respect to the proportion of households that adopt the cable TV service? (18%)

(b) If appropriate, use the .01 level of significance and determine which types of residence differ in the proportion of households that purchase cable television service. (10%)

(Hint: Using Marascuilo Procedure)

$\chi^2_{0.01,2} = 9.210$　　$F_{0.01,2,2} = 99.00$

$\chi^2_{0.01,3} = 11.345$　　$F_{0.01,3,2} = 99.17$

$\chi^2_{0.01,4} = 13.277$　　$t_{0.01,2} = 6.9646$

$t_{0.01,3} = 4.5407$

二、A purchaser of electrical components buys them in lots of size 10. It is his policy to inspect 3 components randomly from a lot and to accept the lot only if all 3 are nondefective. If 30 percent of the lots have 4 defective components and 70 percent have only 1, what proportion of lots does the purchaser reject? (10%)

三、Consider the probability distribution function

$$f(x;\theta) = \frac{1}{\theta} e^{-x/\theta} \quad 0 < x < \infty$$
$$= 0 \quad \textit{elsewhere.}$$

It is desired to test the hypothesis $H_0 : \theta = 2$ against alternate hypothesis $H_1 : \theta > 2$. Suppose a random sample X_1, X_2 is used and the critical region is $X_1 + X_2 \geq 9.5$.

<1> Calculate an expression for the power function, $K(\theta_1)$, for all $\theta_1 > 2$, and specifically for $\theta_1 = 4$. (12%)

<2> Calculate the probability of Type I error. (10%)

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四、(10%) Suppose you have a multiple regression model :

$$Y_i = \alpha K_i^{\beta_2} L_i^{\beta_3} E_i^{\beta_4} \exp\{e_i\}, \quad e_i \sim N(0,\sigma^2)$$

and you have a sample of T observations. Please describe in detail how do you test the following hypothesis?

1. $H_0: \quad \beta_2 = \beta_3 = 0$ against $H_1: \ \beta_2 \neq 0$ and/or $\beta_3 \neq 0$,
2. $H_0: \quad \beta_2 = \beta_3 = \beta_4 = 0$ against $H_1: \ \beta_2 \neq 0$ and/or $\beta_3 \neq 0$ and/or $\beta_4 \neq 0$

五、(10%) Assume the first-order autoregressive model: $e_t = \rho e_{t-1} + \varepsilon_t$, where ε_t satisfies the assumptions of the classical linear regression model and $-1 < \rho < 1$.

1. Show that $Var(e_t) = \dfrac{\sigma^2}{1-\rho^2}$.
2. Calculate $Cov(e_t, e_{t-1})$ and $Cov(e_t, e_{t-2})$. Generate your results.

六、(20%) Examine whether the following statements are true, false, or uncertain. State your explanations.

1. Even though the disturbance term in the classical linear regression model is not normally distributed, the OLS estimators can still be obtained and are BLUE.
2. Even if heteroscedasticity is present, the conventional t and F tests are still valid.
3. If the covariance between the explanatory variable and the error term in a simple regression model is not equal to zero, then the OLS estimators are still unbiased and efficient.
4. Consider the following two models:

$$Y_i = \alpha_1 + \alpha_2 X_{2i} + \alpha_3 X_{3i} + e_{1i}$$

$$Y_i - X_{2i} = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + e_{2i}$$

Using the OLS method, you can obtain the following results:

$\hat{\alpha}_3 = \hat{\beta}_3$, $\hat{\alpha}_2 = 1 - \hat{\beta}_2$, and R^2 in the two models are the same.