

## 淡江大學 98 學年度碩士班招生考試試題

系列：產業經濟學系

科目：計量經濟學

准帶項目請打「V」

✓

簡單型計算機

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本試題雙面印製

1. (18%) Prove that the least-squares slope estimator in the two-variable regression model is unbiased.
2. (30%) Let  $X_1, X_2, \dots, X_n$  represent a random sample from each of the distributions having the following probability density functions:
  - (a)  $f(x; \theta) = \theta x^{\theta-1}, 0 < x < 1, 0 < \theta < \infty$ , zero elsewhere.
  - (b)  $f(x; \theta) = \left(\frac{1}{\theta}\right)e^{-x/\theta}, 0 < x < \infty, 0 < \theta < \infty$ , zero elsewhere.

In each case find the maximum likelihood estimator  $\hat{\theta}$  of  $\theta$ .

3. (10%) If  $X$  is normally distributed with mean  $\mu$  and variance  $\sigma^2$ , find a transformation of  $X$  that has the chi-square distribution with 1 degree of freedom.
4. (24%) To study the demand for housing, the following regression model was specified:

$$\ln Q = \beta_1 + \beta_2(\ln P) + \beta_3(\ln Y) + \varepsilon \quad (1)$$

where  $Q$  = measure of quantity of housing in square feet consumed by each of 3,120 families per year,

$P$  = price of unit of housing in family's locality,

$Y$  = measure of family income.

The estimation results were (standard errors are in parentheses):

$$\ln \hat{Q} = 4.17 + \frac{-0.247}{(0.11)}(\ln P) + \frac{0.96}{(0.017)}(\ln Y) \quad R^2 = 0.371$$

- (a) How large is the price elasticity of demand?
  - (b) Is the price elasticity significantly different from zero or not? Explain.
  - (c) How large is the income elasticity?
  - (d) Is the income elasticity significantly different from one? Explain.
5. (18%) Now suppose that we wish to know whether the demand for housing of blacks differs from that of whites. We thus expand the model given in equation (1) to allow for different slopes and intercepts. The expanded model is:
 
$$\ln Q = \beta_1 + \alpha_1 D + \beta_2(\ln P) + \alpha_2(D)(\ln P) + \beta_3(\ln Y) + \alpha_3(D)(\ln Y) + \varepsilon \quad (2)$$
 Let  $D$  denote a dummy variable which is equal to 1 for black households and 0 otherwise. By using the same data as in Question 4, the estimation results were (standard errors are in parentheses):

◀ 注意背面尚有試題 ▶

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$$\ln \hat{Q} = 4.17 + \underset{(0.11)}{-0.221}(\ln P) + \underset{(0.02)}{0.920}(\ln Y) + \underset{(0.031)}{0.006}(D) - \underset{(0.042)}{0.114}(D)(\ln P) + \underset{(0.061)}{0.341}(D)(\ln Y)$$

$$R^2 = 0.380$$

- (a) Do the t tests on each of the individual coefficients of the terms involving the dummy variables show to be significantly different from zero at the five percent level?
- (b) How would you test the null hypothesis that the dummy coefficients are all jointly equal to zero ( $H_0 : \alpha_1 = \alpha_2 = \alpha_3 = 0$ ) by using  $R^2$  from estimation results of equations (1) and (2)? Given  $F_{(3,3114)(0.05)} = 2.60$ , can we reject the null hypothesis at the 5 percent level of significance?
- (c) Now we wish to test the null hypothesis that the income elasticity of demand for housing of blacks is equal to 1. Under the null hypothesis  $\beta_3 + \alpha_3 = 1$ . Substituting  $\alpha_3 = 1 - \beta_3$  into the expanded model and rewriting, we obtain the restricted model:
- $$\ln Q - (D)(\ln Y) = \beta_1 + \alpha_1 D + \beta_2(\ln P) + \alpha_2(D)(\ln P) + \beta_3[\ln Y - (D)(\ln Y)] + \varepsilon$$
- The  $R^2$  associated with the restricted model (which has one restriction) is 0.3785. Calculate the relevant F statistic. How big is the critical value at the 5 percent level of significance? Can we reject the null hypothesis?