

國立臺灣大學 110 學年度農業經濟學系博士班入學考
考試時間為 12:30~15:30。試題請隨答案本繳回。

經濟理論 第(一)卷

2021/4/23

本試卷分為第(一)卷與第(二)卷，卷(一)共 3 題，總分 50 分。
請將答案分別填寫於相對應試卷之答案本內。

1. Consider the following utility maximization problem with the utility function

$$u(x_1, x_2) = \min\{2x_1+x_2, x_1+2x_2\}.$$

The price of good x_1 is p_1 and the price of good x_2 is p_2 .

- (1) Draw the indifference curve for $u(x_1, x_2)$ and shade the area where $u(x_1, x_2) > 20$. (5 points)
- (2) For what values of (p_1/p_2) will the unique optimum be $x_1 = 0$? (5 points)
- (3) For what values of (p_1/p_2) will the unique optimum be $x_2 = 0$? (5 points)
- (4) If neither x_1 nor x_2 is equal to zero, and the optimum is unique, what must be the values of (p_1/p_2) ? (5 points)

2. Suppose that there are two goods, x_1 and x_2 , and that x_1 is an inferior good. Let the prices of good 1 and good 2 be p_1 and p_2 , and let the consumer's income be I . Show that good 2 must be a normal good. (10 points)

3. Consider the following cost function:

$$c(w_1, w_2, q) = e^{q/2} \sqrt{w_1 w_2},$$

where w_1 and w_2 are input prices, and q is the output level.

- (1) What is the corresponding production function? (10 points)
- (2) Let the price of output be p . Derive the maximized profit function for this firm. (10 points)

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經濟理論 第(二)卷

2021/4/23

本試卷分為第(一)卷與第(二)卷，卷(二)共 3 題，總分 50 分。
請將答案分別填寫於相對應試卷之答案本內。

1. If we are interested in estimating the effect of a binary policy (D_{it}) on an outcome variable Y_{it} across N areas (n) and T time periods (t); that is, we estimate the model:

$$Y_{nt}(D_{nt}) = \beta_n D_{nt} + \eta_n + \theta_t$$

- (1) What is the key problem for us to interpret β_i as the impact of the policy? (2 points)
(2) What are the common interpretations of η_n and θ_t ? (3 points)
(3) Now consider a 2 x 2 difference-in-differences (DID) setting (i.e., $D = 0$ or 1 , $t = 0$ or 1), so we have:

$$E(\beta_n | \Delta D = 1) = E(Y_{n1} - Y_{n0} | \Delta D = a) - E(Y_{n1} - Y_{n0} | \Delta D = b)$$

where $\Delta D = D_{n1} - D_{n0}$

What are a and b ? (2 points)

- (4) If now there are multiple periods before the policy took effect, what is the key assumption for supporting the validity of the DID design? (3 points)
(5) If now the policy hits different areas at different timing, please explain why using a canonical two-way fixed effects model can be problematic. You might find using some graphical illustrations useful. (5 points)
(6) A large strand of papers has used the following design to study the effect of COVID-19 on various societal outcomes:

$$Y_{nt} = \beta COVID_t Year_{2020,t} + \eta_n + \theta_t$$

where $Year_{2020,t} = 1$ if the observations are from year 2020 and $= 0$ otherwise, and $COVID_t = 1$ if the observations are from period after date of the first outbreak of COVID-19 or a COVID-19 related treatment took effect in each year. Please first explain the interpretation of β and discuss, in words, under what circumstances the design may fail to identify the casual effect of COVID-19 (or the treatment of interest)? (5 points)

2. Consider a classical setup with an instrumental variable:

$$Y_n = \beta X_n + \gamma_1 W_n + \varepsilon_n$$

$$X_n = \rho Z_n + \gamma_2 W_n + v_n$$

- (1) With Y_n being the outcome variable, X_n the endogenous variable of interest, and Z_n the excluded instrument, state formally the two of the identifying assumptions: relevance and exclusion restrictions. (5 points)
- (2) Provide an example (conceptual framework) that instrumental variable approach can be applied in a research question in the field of agricultural economics. Please state clearly what the X_n , Y_n , and Z_n are, and how your instrument can be valid (or not). (10 points)
3. Please state the common assumptions for the regression discontinuity design (5 points), and discuss, conceptually, how such design can be applied to identify the effect of studying in a “first choice” (第一志願) high school on the score of college entrance exams in Taiwan. (10 points)