



DEPARTMENT OF ECONOMICS AND ECONOMETRICS
FINAL ASSESSMENT NOVEMBER 2014
AUCKLAND PARK KINGSWAY CAMPUS

Course: ECONOMETRICS 4B

Marks: 100

Time: 3 Hours

Assessor: Dr IK Kanyama

Date: September 13

Moderator: Ms Renee Van Eyden

Venue: D1 Lab 108

Instructions:

1. The paper consists of 6 questions, subdivided in two sections: Section A (Theory) and Section B (Practical). You will use the STATA software for Section B and the data will be provided.
2. Answer all the questions in the answer books provided, respecting the order in which they are asked. Answer all questions as concisely as possible.
3. Number of pages: 3 pages

SECTION A

QUESTION 1

[10]

Consider the unobserved component model after the time-demeaned transformation has been performed:

$$\check{y}_i = \check{X}_i\beta + \check{u}_i, \quad i = 1, 2, \dots, N.$$

- A. Define the vectors/matrices \check{y}_i , \check{X}_i and \check{u}_i and provide their expressions. [2]
- B. What is the variance of \check{u}_{it} ? [3]
- C. What is the correlation between \check{u}_{it} and \check{u}_{is} , $t \neq s$? [5]

QUESTION 2

[15]

Explain two ways of choosing between the random effect model and the fixed effect model. Concisely provide as much details as you can.

QUESTION 3

[25]

Consider the following simple regression model

$$y = \beta_0 + \beta_1 x + u, \quad \text{Cov}(x, u) \neq 0,$$

and let z be an instrumental variable for x . You are asked to answer the questions below.

- A. Derive the OLS estimator for β_1 as well as its asymptotic bias. [6]
- B. Derive the IV estimator for β_1 as well as its asymptotic bias. [6]
- C. What is the condition for the asymptotic bias for the IV estimator to be less than that of the OLS estimator, assuming that the variables on the right hand side of the equation are positively correlated, and that each of them is positively correlated with the instrumental variable? [5]

Now assume that the population variance is the same for x and u . Further assume that the correlation between x and z is $\frac{1}{2}$ and that between x and u is $1/10$.

- D. What is the asymptotic bias in the IV estimator? [5]
- E. How much correlation would have to exist between x and u before the OLS estimator has more asymptotic bias than the 2SLS estimator? [5]

QUESTION 4

[10]

Let $chld$ be the number of children ever born from a woman. Assume that the conditional expectation of $chld$ can be modelled as a function of the woman's age (age), education ($educ$) and income (inc) as follows:

$$E(chld|age, educ, inc) = \exp[\beta_0 + \beta_1 age + \beta_2 age^2 + \beta_3 educ + \beta_4 \log(inc)]$$

Answer the following questions:

- A. How would you estimate the coefficients in this model? Justify your answer by discussing the nature of the variable $chld$. [3]
- B. What is the interpretation of β_4 ? [4]
- C. Find the partial effect of age on the conditional expectation of $chld$. [3]

SECTION B.

QUESTION 5

[20]

The file **data1.dta** contains information on a telephone survey attempting to elicit the demand for a fictional ecologically friendly apple. Each family was randomly presented with a set of price for regular apples and the eco-labelled apples and asked how many pounds of each kind of apples they would buy. Carefully explore the data and answer the questions below.

- A. Discuss the nature of the variable $ecolbs$ and decide on the suitable model for modelling the conditional mean of the quantity of eco-labelled apples demanded [2]
- B. Use the model you decided upon in part A to estimate the conditional mean of eco-labelled apples as a function of the following variables: price of eco-labelled apples, price of regular apples, family income, and household size. Discuss the significance of the estimated coefficients [4]

- C. Test the hypothesis that family income and household size jointly affect the quantity of eco-labelled apples that will be demanded. [4]
- D. Estimate the effect of each independent variable on the probability that a household will order a positive amount of ecologically friendly apples. Which of the variables have greater effect on the demand of eco apples? [4]
- E. Compare the predicted conditional mean of ecologically friendly apples for households with size between 2 and 6 to that of households of size between 7 and 8 inclusive. [2]
- F. Compare the predicted conditional mean of ecologically friendly apples for different household size ranges in the sample. [4]

QUESTION 6

[20]

The dataset **data2.dta** allows estimating the following wage equation:

$$\log(wage) = \beta_0 + \beta_1 educ + \beta_2 exper + \beta_3 tenure + \beta_4 age + \beta_5 age^2 + u$$

with the variable *sibs* being generally considered as an IV for education.

- A. Test whether the variable *educ* is exogenous. [5]
- B. Can you run the 2SLS regression given your results in part A? (Explain). If yes, carry out the estimation in STATA and present the results in usual form. [5]
- C. Manually carry out the 2SLS (in STATA) and compare the standard deviations of the second stage to those you obtained in part B. [5]
- D. Estimate the asymptotic variance of β_1 using your estimation in part B. [5]

- Finish -