ECONOMETRICS RETAKE EXAM: PART A (30%)

June 17, 2024

Universidad Carlos III de Madrid

Write your name and group in each answer sheet. Answer the questions in 50'.

Use the **mroz** dataset from Wooldridge to estimate the labour supply of married women already working and the wage offer they receive. The labour supply is specified as

$$\log(hours) = \beta_0 + \beta_1 \log(wage) + \beta_2 educ + \beta_3 age + \beta_4 kidslt6 + \beta_5 nwifeinc + u, \quad (1)$$

where $hours$ are annual worked hours, $wage$ is hourly wage in dollars, $educ$ are the years of education, age is the age of the woman in years, $kidslt6$ is the number of children less than 6 years old and $nwifeinc$ is the non wage income of the woman, including husband income.

We consider that the wage offer for the women satisfies the following equation

$$\log(wage) = \alpha_0 + \alpha_1 \log(hours) + \alpha_2 educ + \alpha_3 exper + \alpha_4 exper^2 + v, \quad (2)$$

where $exper$ are the years of experience. The variables $educ$, age, $kidslt6$, $nwifeinc$, $exper$ and $exper^2$ are taken as exogenous.

1. (40%) Discuss which of the two equations are identified. (1/2) Check, if possible, the relevance and exogeneity of the proposed instruments for each equation explaining in detail the methods used. (1/2)
2. (20%) How much does the wage increase when the hours of work increase 10% and the rest of variables in the model remain constant? (1/2) Provide a 95% confidence interval for this effect and interpret the result. Is it significant at a 10% significance level? (1/2)
3. (25%) We now consider that $educ$ in equation (1) is also endogenous because $ability$ is omitted in the equation, while the rest of assumptions continue to be valid. We consider two instruments for $educ$: $motheduc$ and $fatheduc$, which are the number of years of education of the mother and of the father, respectively. Discuss the identification of this equation with the new assumptions (1/2) and check, if possible, the relevance and exogeneity of the instruments proposed. (1/2)
4. (15%) Test under the assumptions of part 3 whether labour supply decreases more with an additional year of education than with one more year of age, all other variables remaining constant.

SOME CRITICAL VALUES: $Z_{0.10} = 1.282$, $Z_{0.05} = 1.645$, $Z_{0.025} = 1.96$, $\chi^2_{1,0.05} = 3.841$, $\chi^2_{1,0.01} = 6.635$, $\chi^2_{2,0.05} = 5.991$, $\chi^2_{2,0.01} = 9.210$, $\chi^2_{3,0.05} = 7.815$, $\chi^2_{3,0.01}11.345$, $\chi^2_{4,0.05} = 9.488$, $\chi^2_{4,0.01} = 13.277$, $\chi^2_{5,0.05} = 11.071$, $\chi^2_{5,0.01} = 15.086$, $\chi^2_{6,0.05} = 12.592$, $\chi^2_{6,0.01} = 16.812$, where $\mathbb{P}(Z > Z_\alpha) = \alpha$ and $\mathbb{P}\left(\chi^2_m > \chi^2_{m,\alpha}\right) = \alpha$, Z is distributed as a standard normal random variable of zero mean and unit variance, and χ^2_m as a $chi - squared$ with m degrees of freedom.