EXTRAORDINARY FINAL EXAM ECONOMETRICS A

Answer all questions in 1 hour.

(30%) Use data for married women in MROZ dataset of Wooldridge to estimate the hours of work offered by women during a year ($hours$) in terms of $\log(wage)$ controlling for the following variables, which we take as exogenous: years of education ($educ$), age (age), an indicator of having children less than 6 years old ($kidslt6$) and other income in the household ($nwifeinc$).

1. (7.5%) Explain why we consider that $\log(wage)$ is endogenous in the previous regression model (2%). Estimate the labor supply curve by 2SLS using as instruments the years of experience ($exper$) and its squares. Interpret the coefficient of $\log(wage)$ (2%). Provide a 95% confidence interval for the labour supply elasticity at the mean value of worked hours in the sample and interpret it (3.5%).

2. (7.5%) Explain how you can test that the two instruments are weak (provide the null and alternative hypothesis, the test statistic and the rejection region) (5%). Implement the test (2.5%).

3. (7.5%) Explain how you can test that the instrumental variables are exogenous (provide the null and the alternative hypothesis, the statistic and the rejection region) (5%). Implement the test (2.5%).

4. (7.5%) Consider now that education ($educ$) is also endogenous because the "ability" of the worker in the job market is omitted from the equation. Why mother education ($motheduc$) and father education ($fatheduc$) can be valid instruments for education? (2%) Estimate the new model with all instruments available and explain how the labor supply of women shifts for different levels of education (2%). Explain how you would perform an exogeneity test of all instruments and perform the test (3.5%).

SOME CRITICAL VALUES: $Z_{0.10} = 1.282$, $Z_{0.05} = 1.645$, $Z_{0.025} = 1.96$, $\chi^2_{2,0.05} = 5.99$, $\chi^2_{2,0.025} = 7.378$, $\chi^2_{3,0.05} = 7.81$, $\chi^2_{3,0.025} = 9.3484$, $\chi^2_{4,0.05} = 9.49$, $\chi^2_{4,0.025} = 11.1433$, $\chi^2_{4,0.05} = 9.49$, $\chi^2_{4,0.025} = 11.1433$, $\chi^2_{5,0.05} = 11.07$, $\chi^2_{5,0.025} = 12.8325$, 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 normal with mean 0 and variance 1, and χ^2_m as a chi-squared with m degrees of freedom.