ECONOMETRICS II, FALL 2022

Homework 9. Due Wednesday November 9th.

1. Prove that, for a standard normal, the integral

$$E\{\frac{z}{a+z}\} = \int_{-\infty}^{\infty} \frac{z}{a+z}\phi(z)dz\,,$$

does not exist. (Hint: integrate over an area around $-a$. Put an upper limit on the denominator define $x = z - a$ and show that the integral of $1/x$ does not converge at 0.)

Motivation: This shows up as the expectation of the IV-estimator in a very simple case. (See my handout.) This implies that the simplest IV-estimator can produce total garbage once in a while.

2. Monte Carlo study. Simulate a linear model for a variable y with one exogenous regressor x and one endogenous regressor w (a linear function of one or more instruments z and an error term in the x-equation correlated with the error term in the $y-$equation. Make the instruments weak (the coefficient to the instrument is small relative to the error variance). Try to use one instrument in generating the endogenous regressor or more instruments that are more weak.

Estimate the coefficients using OLS, standard IV, and LIML. Plot (or show percentiles for) the distributions of the coefficients to the endogenous regressor. Calculate the F-test for significance of the first stage and report them percentiles.

Using one instrument only, use the method of Moreira Porter Lee McCrary (AER 2022), to test for second stage significance. Do this for weak or strong instruments and compare to significance of standard t-statistics.

3. Use the posted program to replicate the study by Hansen and Singleton. Try and estimate the model using 3–5 different sets of instruments. Try a set of instruments which you may think is good (argue why) and one which you may think is not so good. Try different lag-lengths. Try using a lot of instruments and try to use just a few. Comment on your results. Are the results stable to the choice of instruments?