

ECONOMETRICS I, SPRING 2025.

Homework 10. Due Wednesday April 16.

1. Computer question (continuation of previous homeworks). In Matlab, regress real per capita U.S. data consumption growth on income growth and the interest rate using the posted dataset. (This is the what you did in homework 1.)

- a) You are told that income growth is not exogenous to consumption growth, but lagged income growth is. Suggest a suitable IV estimator. (Just words here.)
 - b) In Matlab, estimate the coefficients using your suggested IV estimator.
 - c) Try a different instrument and see if the IV estimate is different.
 - c) Calculate the standard errors of the coefficients and compare to the estimated standard errors from an OLS regression.
 - d) Based on the IV estimation, test if the coefficient to income growth is zero.
- (NOTE: I mention that you can use the lagged variable here, because you already have it available. It is, or was, rather common to lagged variables used as instruments without much discussion and that is very often not a good idea. So do not take the setup of this problem as a suggestion for doing good empirical economics, but rather as a study of the IV estimator.)

2. Computer Monte Carlo IV question. Set $N=20$ and $N=2000$. Do the following S times (set S to a large number, I think 10,000 is good, but if your computer is slow, pick a lower number): and draw $N(0, 1)$ vectors U and V . Draw an $N(0, \sigma_z^2)$ vector Z , for $\sigma_z^2 = 10$.

Generate

$$X = Z + \sigma_u U,$$

for $\sigma_u = 1, 5$, or 50 .

Then generate

$$Y = \alpha X + \sigma_u U + V,$$

for $\alpha = 1$.

For which values of σ_u do you think the instrument is weak (try and guess before you see the MC results)?

In each Monte Carlo draw, estimate the reduced form, and save the estimated coefficient.

In each Monte Carlo draw, estimate α^{OLS} and α^{IV} by OLS and IV, respectively, and save the coefficient and the t-statistic.

Print the mean and standard error (across your S simulations) of the estimated coefficients and the t-statistic for each of the three values of σ_u and the two values of N . For which values of these parameters do the estimated values look more biased and imprecise?

Note. I haven't done this new exercise myself. So, you should show your results in class next Wednesday. (Or let me know, if you have them on Monday.)