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Econometrics - Advanced Methods

Many and/or weak instruments

A. Consider the following model

$$y = X\beta + u$$
$$X = Z\pi + v\,,$$

where $E(Z_i\,u_i) = 0$, $\pi = \sqrt{\frac{c}{n}}\iota_m$, $E(u_i^2|Z_i) = \sigma_u^2$ and $E(Z_iZ_i') = I_m$, i.e. the instruments are orthogonal.

1. Derive μ^2 in the above setup and link it to the F-statistic. What do you observe?
2. The "EAM2019 - class 3A.do"-file replicates any point of the figure on lecture slide 3-16 in a Monte Carlo Simulation. Of course, only if you fill the gaps.
3. Try different values for `xx` and check if the Chao and Swanson approximation is accurate. What is `xx` referring to? Now, reduce the number of instruments to say, 3. What do observe?
4. Use now "EAM2019 - class 3B.do". It compares OLS, 2SLS and bias-adjusted 2SLS. Compare mean and median bias of all estimators.

B. Kolesar *et al.* (2015) consider the following model

$$y = Z\gamma + X\beta + u$$
$$X = Z\pi + v\,,$$

where $E(Z_i\,u_i) = 0$ but $\gamma \neq 0$.

1. Suppose first that each instrument is strong and we don't have too many IVs. Derive the probability limit of $\widehat{\beta}_{2SLS}$ under m being fixed. Where is the troublemaker in this setup?
2. Under what condition can you get rid of the additional "systematic" invalitiy? What is the price?
3. Can you think about a consistent estimator here?
4. We will replicate the point estimates of Table 1 in Kolesar *et al.* (2015).