From athena
ssh shadydealings.mit.edu
- screen stata
- (ctrl+a) d

to get back:
- screen -d -r

ls .snapshot
in stata: (ctrl+r) recalls previous command

Coding carefully

For each project, have the following directories:
do dta gph log src
src = source code

use ../src/07439-0004-Data, clear
- this works no matter where you run it

/*
use a template for each do file.
author:
purpose:
date created:
notes:
modifications
*/

Comment carefully so that you know what to do later.

Make a summary.do that goes through the entire project.

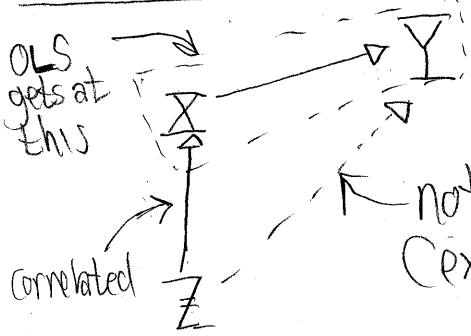
Program to edit do files remotely:

- nano
- vim
- emacs

} find a tutorial online or ask Noto.

To close a screen,
exit when in the program

Instrumental Variables



- deals with
- measurement error
- omitted variables

$$\hat{\beta}_{IV} \to \frac{cov(Z,Y)}{cov(Z,X)}$$

measurement error $\Rightarrow$

$$= \frac{cov(Z, X^*\beta + \varepsilon)}{cov(Z, X^* + \nu)}$$

$$= \beta \frac{cov(Z,X^*)}{cov(Z,X^*) + \underbrace{cov(Z,\nu)}_{=0?}} + \frac{\overbrace{cov(Z,\varepsilon)}^{=0}}{cov(Z,X^*) + cov(Z,\nu)}$$

$$= \beta$$

Suppose $Z \in \{0,1\}$

- $Cov(Z,Y) = E[ZY] - E[Z]E[Y]$

$$= E[Y|Z=1]Pr[Z=1] - Pr[Z=1]E[Y]$$

$$= Pr[Z=1]\left[E[Y|Z=1] - E[Y]\right]$$

$$= Pr[Z=1]\left[E[Y|Z=1] - E[Y|Z=1]Pr[Z=1] - E[Y|Z=0]Pr[Z=0]\right]$$

factoring out

$Pr[Z=0] = 1 - Pr[Z=1]$

$$= Pr[Z=0]Pr[Z=1]\left[E[Y|Z=1] - E[Y|Z=0]\right]$$

Plug this into $\hat{\beta}_{IV}$ expression.

$$\hat{\beta}_{IV} \longrightarrow \frac{E[Y|Z=1] - E[Y|Z=0]}{E[X|Z=1] - E[X|Z=0]}$$ } Wald estimators

"Two-sample IV" can compute these from separate data sets.

- any IV is a weighted average of Wald estimators
- these are quite transparent.

Kling takes into account that prisoners were randomly assigned to judges.

Two instruments:

- dummy for each judge
- scalar summarizing harshness of judge.

let $Z = [Z_1 \cdots Z_K] = \begin{bmatrix} \Phi_R & & 0 \\ & \ddots & \\ 0 & & \Phi_R \end{bmatrix}$ where Φ_R is a vector of ones $(R \times 1)$

K groups
R obs/groups
N obs total

$N \times K$
$RK \times K$

$\Rightarrow P_Z = Z(Z'Z)^{-1}Z'$ (assume $K=2$)

$$= \begin{bmatrix} \Phi_R & 0 \\ 0 & \Phi_R \end{bmatrix} \underbrace{\begin{bmatrix} R & 0 \\ 0 & R \end{bmatrix}^{-1}} \begin{bmatrix} \Phi_R & 0 \\ 0 & \Phi_R \end{bmatrix}'$$

$$= \begin{bmatrix} \Phi_R' & 0' \\ 0' & \Phi_R' \end{bmatrix} \begin{bmatrix} \Phi_R & 0 \\ 0 & \Phi_R \end{bmatrix} = \begin{bmatrix} \Phi_R'\Phi_R & 0 \\ 0 & \Phi_R'\Phi_R \end{bmatrix} = \begin{bmatrix} R & 0 \\ 0 & R \end{bmatrix}$$

$$= \begin{bmatrix} \Phi_R & 0 \\ 0 & \Phi_R \end{bmatrix} \begin{bmatrix} \frac{1}{R} & 0 \\ 0 & \frac{1}{R} \end{bmatrix} \begin{bmatrix} \Phi_R' & 0' \\ 0' & \Phi_R' \end{bmatrix}$$

$$= \frac{1}{R} \begin{bmatrix} \Phi_R\Phi_R' & 0 \\ 0 & \Phi_R\Phi_R' \end{bmatrix}$$

In IV:

$$P_Z X = \begin{bmatrix} \frac{\Phi_R\Phi_R'}{R} & 0 \\ 0 & \frac{\Phi_R\Phi_R'}{R} \end{bmatrix} \begin{bmatrix} X_{11} \\ \vdots \\ X_{1R} \\ X_{21} \\ \vdots \\ X_{2R} \end{bmatrix} = \begin{bmatrix} \Phi_R \cdot \overbrace{\sum_{i=1}^{R} \frac{X_{1i}}{R}}^{\text{avg sentence}} & 0 \\ 0 & \Phi_R \cdot \sum_{i=1}^{R} \frac{X_{2i}}{R} \end{bmatrix}$$