

ECON6300/7320/8300

# Assignment Project Exam Help

Advanced Microeconomics  
Bootstrap

<https://powcoder.com>

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Practical 7  
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▶ This class will review:

- ▶ Bootstrap without asymptotic refinement
- ▶ Bootstrap with asymptotic refinement
- ▶ Clustered bootstrap
- ▶ Residual bootstrap

▶ We begin with a demonstration using the data from Microeconometrics using STATA chapter 3 (Health and insurance data)

▶ We move on to a Monte-Carlo based practical.

## Practical

- ▶ In this practical you will conduct a Monte-Carlo experiment to assess the distribution of the OLS estimator under endogeneity.

- ▶ The data generating process is:

$$y_i = \beta x_i + u_i \quad i = 1, \dots, N$$

$$x_i = \frac{\alpha_1 z_i + \alpha_2 u_i + v_i}{\sqrt{\alpha_1^2 + \alpha_2^2 + 1}}$$

$$u_i \sim \mathcal{N}(0, 1), z_i \sim \mathcal{N}(0, 1), v_i \sim \mathcal{N}(0, 1)$$

- ▶ **Note:** We scale  $x_i$  by  $\sqrt{\alpha_1^2 + \alpha_2^2 + 1}$  so that  $x_i \sim \mathcal{N}(0, 1)$ . Consequently, we can vary  $\alpha_1, \alpha_2$  without changing the marginal distribution of  $x_i$ , though clearly we change it's joint distribution with  $z_i, u_i, v_i$ .

## Practical

1. For which value(s) of  $\alpha_1, \alpha_2$  does  $E[u_i|x_i] = 0$ ? For which value(s) does  $E[u_i|z_i] = 0$ ?
2. Write a program to generate the data, compute the OLS and 2SLS estimators of  $\beta$ , and store them as scalars
  - ▶ To generate the data, use  $N = 500$ ,  $\beta = 1$  and  $\alpha_1 = \alpha_2 = 0.5$ .
  - ▶ For the 2SLS estimator, use  $z_i$  as the instrument.
3. Conduct a Monte-Carlo experiment with 1000 replications in order to obtain the distributions of  $\hat{\beta}_{OLS}$  and  $\hat{\beta}_{2SLS}$ .
4. Summarize  $\hat{\beta}_{OLS}$  and  $\hat{\beta}_{2SLS}$  and produce a histogram of their distributions. What do you conclude about the estimators?
5. Repeat 2-4 setting  $\alpha_1 = 0.5, \alpha_2 = 0$ . Explain why your results change.
6. Repeat 2-4 setting  $\alpha_1 = 0, \alpha_2 = 0.5$ . Explain why your results change.
7. Repeat 2-4 using  $N = 10,000$ . Explain why your results change.