Final Problem Set
Econometrics 410
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Not to be turned in

Problem 1. Consider the following simultaneous equation model:

$$Y_{1i} = \beta_0 + \beta_1 Y_{0i} + \beta_2 Z_i + v_{1i}$$
$$Y_{0i} = \gamma_0 + \gamma_1 Y_{1i} + \gamma_2 X_i + v_{2i}$$

and the reduced form equations:

$$Y_{1i} = \beta_0^* + \beta_1^* Z_i + \beta_2^* X_i + v_{1i}^*$$
$$Y_{0i} = \gamma_0^* + \gamma_1^* Z_i + \gamma_2^* X_i + v_{2i}^*$$

a) Derive the reduced form parameters $(\beta_0^*, \beta_1^*, \beta_2^*, \gamma_0^*, \gamma_1^*, \gamma_2^*)$ in terms of the original parameters from the simultaneous equation model.

b) Suppose I told you what the reduced form parameters $(\beta_0^*, \beta_1^*, \beta_2^*, \gamma_0^*, \gamma_1^*, \gamma_2^*)$ were. Explain how you could use these to get β_1 and γ_1.

Problem 2. Suppose I want you to estimate the elasticity of demand for Orange Juice

You have annual data on

- The price of orange juice
- The quantity of orange juice consumed in the U.S.
- The amount of damage done by hurricanes

Assume that hurricanes do not affect the demand for orange juice, but do occasionally destroy a bunch of orange production when they come.

Explain how to estimate the elasticity of demand

Problem 3. Wooldridge 16.4

Problem 4. Wooldridge 16.7

Problem 5. Wooldridge C16.3

Problem 6. Suppose you have quarterly data on GDP and the Dow jones. You want to estimate the model

$$Dow_t = \beta_0 + \beta_1 GDP_t + u_t.$$

Imagine estimating the model in the following ways:

1. regress Dow GDP
2. regress Dow GDP, robust
3. arima Dow GDP, ar(1)
4. arima Dow GDP, ma(1)
5. arima Dow GDP, ar(1) ma(1)
6. newey Dow GDP, lag(0)
7. newey Dow GDP, lag(7)

Compare and contrast these different approaches. What assumptions justify the approach? How will the estimates and standard errors vary across the approaches.

Problem 7. Think about obtaining time series data on Housing Prices and unemployment. You run the regression:

$$H_t = \beta_0 + \beta_1 U_t + \varepsilon_t.$$

Which assumptions of the classical linear regression models are most likely to be violated. What are the consequences of these violations?

What would you do to fix them?

Problem 8. Wooldridge 8.1

Problem 9. Wooldridge 8.4

Problem 10. Wooldridge 10.1

Problem 11. Consider an MA(3)) model

$$u_t = \varepsilon_t + \alpha_1 \varepsilon_{t-1} + \alpha_2 \varepsilon_{t-2} + \alpha_3 \varepsilon_{t-3}$$

So that the ε_t are serially uncorrelated with variance σ_ε^2. Calculate

a) $\text{Cov}(u_t, u_{t+1})$

b) $\text{Cov}(u_t, u_{t+2})$

c) $\text{Cov}(u_t, u_{t+3})$

d) $\text{Cov}(u_t, u_{t+4})$