HW2 Labor Economics

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1 Identification

1.1 Heuristic Identification

- 1. "We don't have enough sample size to identify the causal effects of the problem."

 The sample size doesn't effect the identification. Only the standard error of the estimation is effected.
- 2. "We don't have a good identification strategy so I need to use a structural model."
 - Having a structural model does not guarantee the identification of its parameters.
- 3. "Because I have a structural model, I don't need to think about identification." Same as above, consider a structural model with two indistinguishable clusters. If the two clusters are the same, the identification of the parameters is impossible.
- 4. "Because I can use the maximum likelihood estimator, I can identify that."

 Let's take a counterexample. Assume the maximum likelihood estimator that we constructed is flat around its global maximum (for some reason). The estimation is unidentified in this case.

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1.2 Identification of OLS

Recall that

$$\hat{\beta} = (X'X)^{-1}X'Y$$

As long as X'X is nonsingular, the estimator of OLS will be certain. It turns out that this is true if there exists no perfect multicollinearity.

1.3 Identification of Factor Model

Labeling the equations,

$$y_{i,t} = \nu_{i,t} + \epsilon_{i,t} \tag{1a}$$

$$\nu_{i,t} = \rho \nu_{i,t-1} + \xi_{i,t} \tag{1b}$$

1.3.1 ρ

Substituting Eq. (1b) into Eq. (1a), we get

$$y_{i,t} = \rho \nu_{i,t-1} + \xi_{i,t} + \epsilon_{i,t} \tag{2}$$

By Eq. (1a), we know $y_{i,t-1} = \nu_{i,t-1} + \epsilon_{i,t-1}$, hence by Eq. (2) we get

$$y_{i,t} = \rho y_{i,t-1} - \rho \epsilon_{i,t-1} + \epsilon_{i,t} + \xi_{i,t}$$
 (3)

 ρ can then be obtained by

$$\rho = \frac{\mathbb{E}(y_{i,t})}{\mathbb{E}(y_{i,t-1})}$$

1.3.2 σ_{ϵ}^2