ECON 613: Applied Econometrics

Methods for Panel Data

March 19, 2019

Linear Models

Introduction (1)

- Data on cross section that is observed over several unit of time.
- In microeconometrics, panel are usually short.

Introduction (2)

- The error is correlated over time..
- Examples
- Open possibilities..

Introduction (3)

Consider the following Model

$$Y_{it} = \alpha_i + \gamma_{j(t)} + \beta X_{it} + \epsilon_{it} \tag{1}$$

- Estimation of fixed effects
- Correlation between the fixed effects
- Estimation issues

Introduction (4)

Consider the following DGP:

- 1,000 individuals over 10 periods.
- $Y_{it} = \alpha_i + \beta X_{it} + \epsilon_{it}$
- Parametrization
  - $\beta = 1$
  - $\alpha_i \sim \mathit{uniform}(0, 1)$
  - $\epsilon_{\sim}\mathbb{N}(0, 1)$

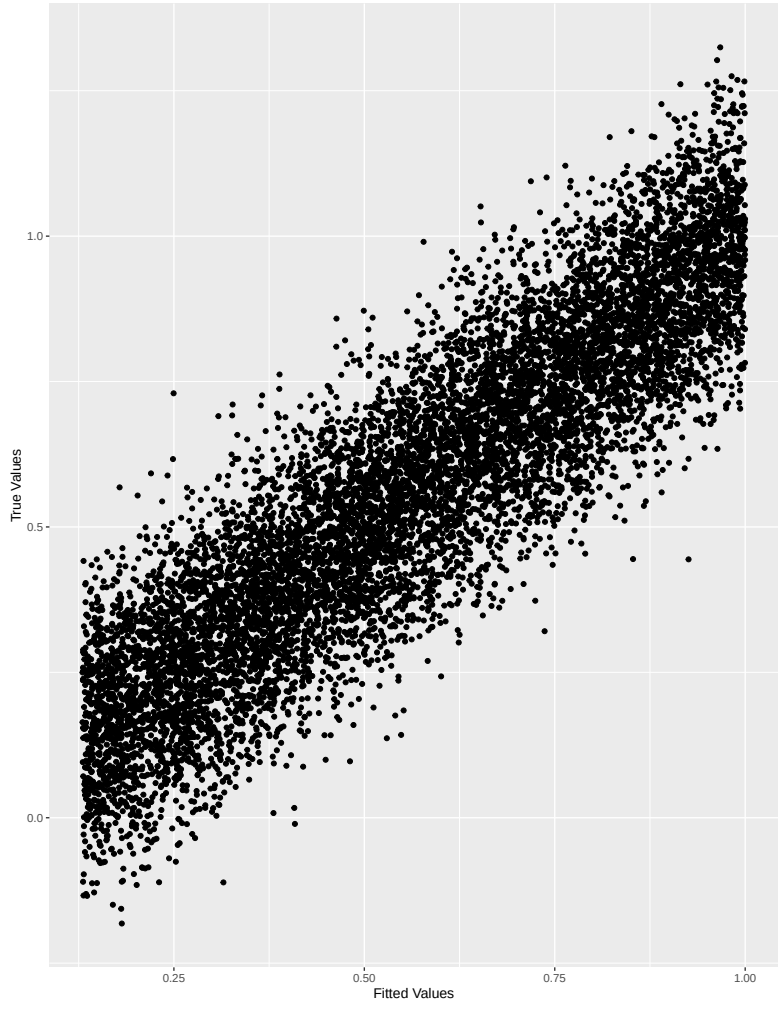
Pooled Estimation

	Model 1
(Intercept)	0.49***
	(0.02)
c(xMat)	0.93***
	(0.00)
R^2	0.87
Adj. R^2	0.87
Num. obs.	10000
RMSE	1.05

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

Table: Statistical models

Fitted Values (1)



Introduction (5)

Consider the following DGP:

- 1,000 individuals over 10 periods.
- $Y_{it} = \alpha_i + \beta X_{it} + \epsilon_{it}$
- Parametrization
  - $\beta = 1$
  - $\alpha_i \sim \mathit{uniform}(-10, 10)$
  - $\epsilon_{\sim}\mathbb{N}(0, 1)$

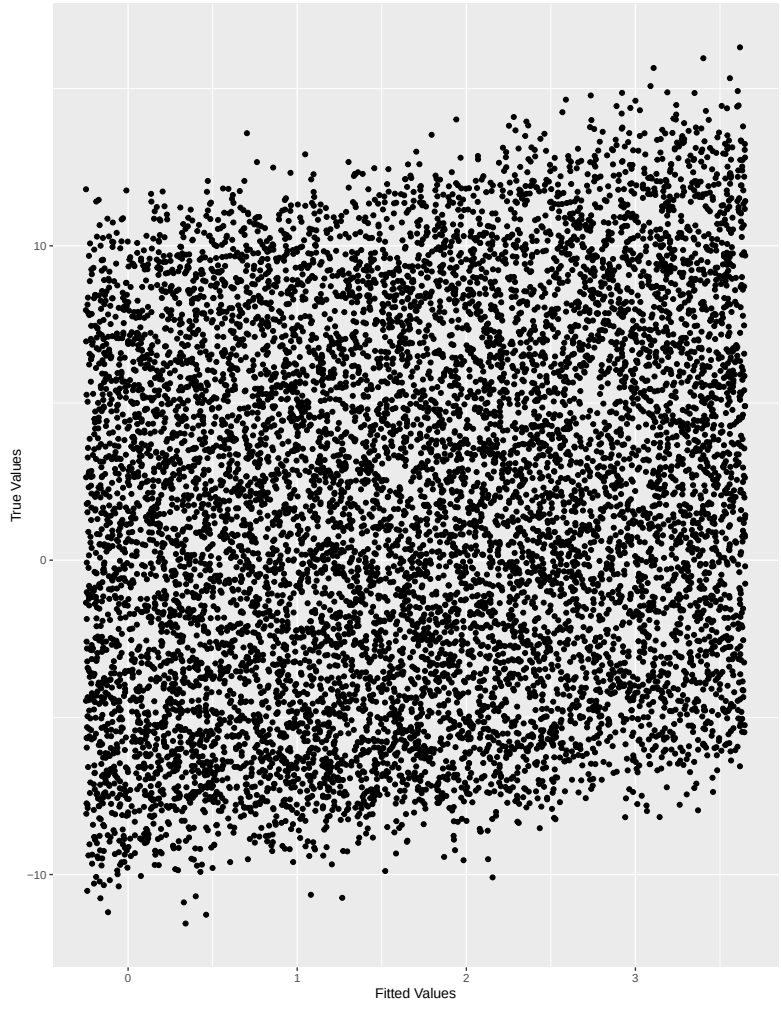
Pooled Estimation

	Model 1
(Intercept)	-0.26^{*}
	(0.11)
c(xMat)	0.40^{***}
	(0.02)
R^2	0.04
Adj. R^2	0.04
Num. obs.	10000
RMSE	5.73

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

Table: Statistical models

Fitted Values (2)



Effects

- Pooled Estimation is a good starting point.
- Individual VS Time Effect.

Individual Effects

- Fixed Effects
- Random Effects
- Examples: Return to Education

Time Effects

- Long Panel Case
- Example: Seasonality?

Some Models (1)

- Pooled Estimator

$$Y_{it} = \alpha + \beta X_{it} + \epsilon_{it} \tag{2}$$

- Problems

Some Models (2)

- Between Estimator

$$\hat{y}_i = \alpha_i + \beta \hat{x}_i + \hat{\epsilon}_i \tag{3}$$

- Problems

Some Models (3)

- Within Estimator

$$y_{it} - \hat{y}_i = \beta(x_{it} - \hat{x}_i) + (\epsilon_{it} - \hat{\epsilon}_i) \tag{4}$$

- Problems

Some Models (4)

- First Difference Estimator

$$y_{it} - y_{i,t-1} = \beta(x_{it} - x_{i,t-1}) + (\epsilon_{it} - \epsilon_{i,t-1}) \tag{5}$$

- Problems