1 A4 2 sides

Fin Econometrics < Final >

3 steps:

1) Model constructions * understand property of model

Multicollinearity or near multicollinearity

↳ $corr(x_1, x_2) > 0.8$

2) Estimation Estimator

Endogeneity = $cov(x, u) \neq 0$

↑

z

***

3) <u>Inference</u>

$(1-\alpha)$ CI → formula ไม่ได้คะแนน

→ $\hat{\beta}$

→ se

→ Critical ✓ degree of freedom

↓

Panel data

Times - series

& lag ⇒ lose # obs

1 1

↱ autoregressive conditional heteroskedasticity

ARCH : mean equation $y_t = \beta x_t + u_t$

if we don't have endogeneity → can use OLS

if x & u don't correlate

can use OLS to estimate mean equation, not volatility equation

volatility equation

$\sigma_t^2 = \alpha_0 + \alpha_1 u_{t-1}^2$

Dfuller ⇒ test-stat : $\dfrac{\hat{\theta}}{se(\hat{\theta})}$

distribution : Dickey Fuller dist

rule to reject $H_0$ : test-stat < critical value how many times have to do difference to get stationary process

Integration

don't have to do anything

I(0)

integration of order zero

I(2)

x is not stationary process

but $\partial(\partial x)$ is stationary process

Final exam:

- Consistency / unbiased
- Hypothesis test, confidence interval
- Interpret $\beta$, ln □

$\ulcorner H_0: \beta_1+\beta_2=0$ vs. $H_1: \beta_1+\beta_2>0$

E.g. check whether debt has positive impact for small firm's ROA but negative impact for large firm's ROA ← $H_0: \beta_1=0$ vs. $\beta_1<0$

How to model it?

1) Cross-section data

dummy: 1 small, 0 large

$$ROA = \beta_0 + \beta_1 debt + \beta_2 size \cdot debt + U$$

2) Panel data
- ~~pooled cross section~~
- fixed effect → has $\alpha$, $\alpha$ correlate
- random effect

$$ROA_{it} = \beta_0 + \beta_1 debt_{it} + \beta_2 size_{it} \cdot debt_{it} + U_{it}$$

$U_{it} \downarrow \alpha_i$

$i$ individual

$t$ time

What is the effect of $x_1$ on $y$?

$$y = \beta_0 + \beta_1 x_1 + \beta_2(x_1 - x_2) + \beta_3(x_1 - x_3)$$

$\beta_1 + \beta_2 + \beta_3$

diff by $x_1$ then interpret

or back to original

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_1 - \beta_2 x_2 + \beta_3 x_1 - \beta_3 x_3$$

$$= \beta_0 + (\beta_1 + \beta_2 + \beta_3) x_1 - \beta_2 x_2 - \beta_3 x_3$$

## Hausman test

$$y_{it} = \beta_0 + \beta_1 x_{1_{it}} + \beta_2 x_{2_i} + \alpha_i + U_{it}$$

not sure is fixed or random

RE estimator → $\hat{\beta}_1$ $\hat{\beta}_2$

FE estimator → $\hat{\beta}_1$ ~~$\hat{\beta}_2$~~

df = 1 instead of 2

$\beta$ used to compare

2nd

**Hausman test** ; compare $\hat{\beta}^{FE}$ & $\hat{\beta}^{RE}$ < close : RE model ; far : FE model

$$y_{it} = \beta X_{it} + \alpha_i + U_{it}$$

Random Effect Model $cov(\alpha_i, x_{it}) = 0$ or Fixed Effect Model ? $cov(\alpha_i, x_{it}) \neq 0$

FE estimator : → reg $y - \bar{y}$ on $x - \bar{x}$ → $\alpha_i$ will be eliminated! → whether $cov(\alpha_i, x_{it}) = 0$ or not → doesn't matter

consistent $\hat{\beta}^{FE} \approx \beta$ consistent $\hat{\beta}^{FE} \approx \beta$

correlate to

$\hat{\beta}^{FE} \approx \hat{\beta}^{RE}$

far

RE estimator → reg $y - \theta\bar{y}$ on $x - \theta\bar{x}$ → still has $\alpha - \theta\bar{\alpha}$

consistent $\hat{\beta}^{RE} \approx \beta$ not consistent $\hat{\beta}^{RE} \neq \beta$

will be closed to

1st → keep result

FINITE Distributed Lags: * delay effect ?

$$y_t = \beta_0 + \delta_0 x_t + \delta_1 x_{t-1} + \dots + \delta_m x_{t-m}$$

depend on relationship btw x & prob {y=1|x}

BINARY Response Model — y can be either 0 or 1

prob increase linearly

can use OLS. LPM → Prob {y = 1 | x} = $x\beta$

cannot use OLS, not linear — PROBIT, LOGIT — Prob {y = 1 | x} = CDF ($x\beta$)

$$y = \begin{cases} 1 & \text{pass} \\ 0 & \text{fail} \end{cases}$$

if #hr = 100 ; −0.3 + 0.005 (100) = 0.2
200 = 0.7
1 = ☹ $\notin$ (0,1)

e.g. −0.3, 0.005

prob linear in x

LPM: $y = \beta_0 + \beta_1 \#hrs + \dots + U$

Sample : FT 27 #hr → (100, 200) ⇒ $\hat{\beta}$

FT 42 #hr → (1,2)

not suitable to use this model — it's not fit!! — need new model

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fin mlt B, fin stat B,