Econometrics (15/Mar/2016)

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Review

Test of Hypothesis

- Single co-efficient
- Single linear relation
- Multiple linear restrictions
- General linear restrictions

OVB – Omitted Variable Bias

$$y = \tilde{\beta}_0 + \tilde{\beta}_1 x_1 + \tilde{u} \qquad y = \hat{\beta}_0 + \hat{\beta}_1 x_1 + \hat{\beta}_2 x_2 + \hat{u}$$

$$E[\tilde{\beta}_1] = \frac{\sum (x_i - \bar{x}_1)}{SST_{x_1}} [\hat{\beta}_0 + \hat{\beta}_1 x_1 + \hat{\beta}_2 x_2 + \hat{u}]$$

$$E[\tilde{\beta}_1] = \beta_1 + \beta_2 \delta_{12}$$

β_2 \ δ_{12}	+	0	−
+	+	0	−
0	0	0	0
−	−	0	+

Hence $\delta_{12} > 0$ and $\beta_2 > 0$ then $\beta_2 \delta_{12} > 0$

For example, if x_1 – Educ, x_2 – Ability. Then $\beta_2 \delta_{12} > 0$

$\tilde{\beta}_1$ will be overestimated.

$\underline{R^2}$

R^2 is positively correlated with k.

$$\bar{R}^2 = 1 - (1-R^2)\frac{n-1}{n-k-1}$$

In a multiple regression

$$\hat{\beta}_j = \frac{\sum \hat{r}_{ji} y_i}{\sum \hat{r}_{ji}^2} = \frac{\sum \hat{r}_{ji} y_i}{SST_j(1-R_j^2)}$$

$\therefore$ $\hat{r}_{ji}$ is the residual of x_j on all other x's.

Assumption 1–6

A7. $u \sim N(0, \sigma^2)$

$E(u|x_j) = 0$ — (1)

$Var(u|x_j) = \sigma^2$ — (2)

$\therefore$ A7 is a strong assumption according to (1) and (2).

~~u ~ (N~~ $u \sim N(0, \sigma^2)$

$y \sim (\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k, \sigma^2)$

~~y ~ (~~ $\hat{\beta}_1 \sim (\beta_1, \frac{\sigma^2}{SSR})$

or SST_1 (?)

SSR

t-statistic

$H_0: \beta_1 = 0$
$H_A: \beta_1 \neq 0$

$$T = \frac{\hat{\beta}_1 - 0}{SE(\hat{\beta}_1)} \sim t_{n-k-1}$$

$$F = \frac{SSR_R - SSR_U}{SSR_U} \cdot \frac{n-k-1}{q}$$

q is # added restrictions in the restricted model.

If $F > 10$, we have evidence to reject null hypothesis.