

## Efficiency

① 2SLS 是同时, 所有 IV 中最有效的.

② OLS 的方差比 IV 方差小:

"OLS 比 2SLS 方差小."

$$y = \beta_0 + \beta_1 x_1 + \dots + \beta_k x_k + u$$

$$\text{Avar}(\hat{\beta}_k) = \frac{\sigma^2}{\widehat{SSR}_k}, \quad \widehat{SSR}_k \text{ 是 } \hat{x}_k \text{ 对 } 1, \hat{x}_1, \dots, \hat{x}_{k-1} \text{ 回归的残差平方和}$$

$$\widehat{SSR}_k = \widehat{SST}_k (1 - \hat{R}_k^2)$$

$\hat{R}_k^2$  是  $\hat{x}_k$  对  $1, x_1, \dots, x_{k-1}$  回归的  $R^2$

$\hat{x}_k$  是  $x_k$  对  $1, x_1, \dots, x_{k-1}, z$  回归的拟合值.

## Summary

2SLS vs. OLS

OLS: inconsistent, more efficient

2SLS: consistent, less efficient

weak IV can be a serious problem