

$$T=2, \quad y_{it} - \bar{y}_i = y_{it} - \frac{y_{it} + y_{it-1}}{2} \\ = \frac{y_{it} - y_{it-1}}{2}$$

Random effects, σ_u^2 , σ_ε^2 to it.

Ex. 17 Pooled OLS

$$\textcircled{1} \hat{\sigma}_v^2 = \hat{\sigma}_u^2 + \hat{\sigma}_\varepsilon^2, \quad \hat{\sigma}_v^2 \rightarrow \frac{1}{T} \sum_{t=1}^T E[v_{it}^2]$$

$$\hat{\sigma}_v^2 = \frac{1}{NT-K} \sum_{i=1}^N \sum_{t=1}^T \hat{v}_{it}^2$$

$$\textcircled{2} \sigma_u^2 = E[v_{it} v_{is}] = \sum_{t=1}^{T-1} \sum_{s=t+1}^T E[v_{it} v_{is}]$$

$$= \sigma_u^2 (1 + \dots + (T-1)) = \sigma_u^2 \frac{T(T-1)}{2}$$

$$\hat{\sigma}_u^2 = \frac{1}{N \frac{T(T-1)}{2} - K} \sum_{i=1}^N \sum_{t=1}^{T-1} \sum_{s=t+1}^T \hat{v}_{it} \hat{v}_{is}$$