Parametric Bootstrap Pseudocode

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Model (1)

$$y_{ij} = \mathbf{x}_{ij}^T \boldsymbol{\beta} + u_i + e_{ij}, \quad j = 1, \ldots, n_i; i = 1, \ldots, D.$$

Information

The parametric bootstrap method for the estimates $\hat{\theta} = (\hat{\boldsymbol{\beta}}, \hat{\sigma}_u^2, \hat{\sigma}_e^2)$.

Parametric Bootstrap

1. Generate independent level 2 errors for the D groups as $u_i^* \sim N(0, \hat{\sigma}_u^2)$, $i = 1, \ldots, D$.

   ```
   u.star <- rnorm(D, 0, sigma.u^2)
   ```

2. Generate independent level 1 errors for all n samples units as $e_{ij}^* \sim N(0, \hat{\sigma}_e^2)$, $j = 1, \ldots, n_i$.

   ```
   e.star <- rnorm(n_i, 0, sigma.e^2)
   ```

3. Simulate bootstrap sample data $(y_{ij}^*, \mathbf{x}_{ij})$ using the model $y_{ij}^* = \mathbf{x}_{ij}^T \hat{\boldsymbol{\beta}} + u_i^* + e_{ij}^*$.
4. Fit the two-level random effects model (1) to the bootstrap sample data generated in Step (2) to obtain bootstrap parameter estimates $\hat{\theta}^* = (\hat{\boldsymbol{\beta}}^*, \hat{\sigma}_u^{2*}, \hat{\sigma}_e^{2*})$.
5. Repeat Steps 1-3 B times to obtain B sets of bootstrap parameter estimates.