

Estimation of  $\mu$  in when one-way model misspecified

1. Recall the assembly times for the injections systems data. Recall our agonized discussions about whether to model subjects as fixed or random. In this activity, we'll simulate data according to the mixed model with fixed injection system effects but random subject effects using the following parameters:

$$\begin{aligned}\mu &\approx c(36, 17, 24, 26) \text{ seconds} \\ \sigma^2 &\approx 6 \text{ seconds}^2 \\ \sigma_B^2 &\approx 4 \text{ seconds}^2\end{aligned}$$

- (a) Random generation from such a model may be accomplished using the macro entitled `datagen` found in the file "rbd-mixed.sas". Use the code to generate 20 datasets and then obtain 95% confidence intervals for the true means,  $\mu_1, \mu_2, \mu_3, \mu_4$ . To see whether or not these confidence intervals capture their targets, compute  $p$ -values from  $t$ -statistics like

$$T_i = \frac{\bar{Y}_{i+} - \mu_i}{\sqrt{\frac{1}{b}(\hat{\sigma}_B^2 + \hat{\sigma}^2)}}$$

on Satterthwaite-approximated  $df = \hat{d}f$ .

If repeated measures on subjects are regarded as independent, as in the fixed-block-effect model, we'd use

$$t = \frac{\bar{Y}_{i+} - \mu_i}{\sqrt{MS[E]}}$$

on  $df = t - 1 = 35 - 3 - 8 = 24$ .

- i. Obtain a histogram of the  $p$ -values for tests comparing sample means  $\bar{y}_{i+}$  to true means  $\mu_i$  under
  - The correct, random effects model used to generate the data
  - The incorrect, fixed effects model
 (They should be uniformly distributed between 0 and 1 if our theory is right and the model holds, but might be otherwise distributed if our theory is wrong or the model doesn't hold.)