

ADDENDUM TO NOTES ON SPLIT PLOT DESIGNS

p. 2:

1. Add to the parentheses in the first bulleted item:

In other words, the number of experimental units in the first randomization is al .

2. Add to the fourth bulleted item:

(Thus the total number of split plots is bm . In other words, the number of experimental units in the second randomization is bm . In our examples, each level of B is assigned exactly once to each whole plot, so $m = al$.)

Further explanation:

Thus,

- The whole plots are indexed (identified, labeled) by pairs of indices iu , where $i = 1, \dots, a$; $u = 1, \dots, l$.
- The total collection of split plots is indexed by pairs of indices jt , $j = 1, \dots, b$, $t = 1, \dots, m$
- Since the total number of split plots can also be calculated as the number of whole plots time the number of split plots per whole plot, we see that the number of split plots per whole plot is $(bm)/(al)$

3. Add after the Exercise:

In our examples (the special case where each level of B is assigned exactly once to each whole plot), the model can be simplified to

$$Y_{ijtu} = \mu + \alpha_i + \epsilon_{iu}^W + \beta_j + (\alpha\beta)_{ij} + \epsilon_{jtu}^S$$

where

$$i = 1, \dots, a; u = 1, \dots, l; j = 1, \dots, b;$$

$$\epsilon_{iu}^W \sim N(0, \sigma_W^2), \epsilon_{jt(iu)}^S \sim N(0, \sigma_S^2),$$

ϵ_{iu}^W 's and $\epsilon_{jt(iu)}^S$'s all mutually independent.

p. 3: Add:

Model checking: Since there are two error terms in the model, two kinds of residuals need to be checked, the WP (whole plot) and SP (split plot) residuals. To calculate them, first calculate the residuals in the usual way (response values minus fitted values). Then

- WP residuals are obtained by averaging residuals corresponding to each WP.
- SP residuals are obtained by subtracting WP residuals from residuals.

Now make the following model-checking plots:

- Normal plot of SP residuals (to check normality of split-plot errors)

- Normal plot of WP residuals (to check normality of whole-plot errors)
- Plot SP residuals against fitted values (to check constant variance for SP errors)
- Plot WP residuals against the average fitted value for the corresponding whole plot (to check constant variance for WP errors)
- Plot WP residuals against SP residuals (to check independence of WP and SP errors)