Quiz 8

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8.26

First I display the ANOVA table with the full model

$$y_{ijk} = \mu + P_i + O_j + (PO)_{ij} + \varepsilon_{ijk} \begin{cases} i = 1, 2, ..., 10 \\ j = 1, 2 \\ k = 1, 2, 3 \end{cases}$$

Where P_i is the ith part and O_j is the jth operator.

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
part	9	99.0166667	11.0018519	7.3345679	0.0000032
operator	1	0.4166667	0.4166667	0.2777778	0.6010725
part:operator	9	5.4166667	0.6018519	0.4012346	0.9270089
Residuals	40	60.0000000	1.5000000	NA	NA

It can be seen that the interaction term (as well as the operator term) is not significant. I suggest we fit a reduced model that drops this term.

$$y_{ijk} = \mu + P_i + O_j + \varepsilon_{ijk} \begin{cases} i = 1, 2, ..., 10 \\ j = 1, 2 \\ k = 1, 2, 3 \end{cases}$$

and the ANOVA table from the reduced model is shown here.

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
part	9	99.0166667	11.0018519	8.2408776	0.0000002
operator	1	0.4166667	0.4166667	0.3121019	0.5789374
Residuals	49	65.4166667	1.3350340	NA	NA

With the reduced model, we can estimate gauge repeatibility with $\hat{\sigma}^2$ wich is simplly the mean square error of our model, **1.335034**.

We can estimate gauge reproducibility with

$$\sigma^2_{Reproducibility} = \sigma^2_O = 0$$

where

$$\sigma^2_O = \frac{MS_{operator} - MS_{Error}}{an}$$

and a = 10 and n = 3, and if it is less than zero we assume it to be zero.