

ANOVA and Nested F-Tests

Sequential Sum of Squares Decomposition

Oh no! The Palmer penguinologists accidentally spilled water on the ANOVA table for the fitted interaction model of bill depth as a function of bill length and penguin species:

$$\widehat{\text{depth}}_i = 7.57 + 0.22 (\text{length}_i) + 3.84 (\text{Adelaide}_i) - 2.32 (\text{Gentoo}_i) \\ - 0.04 (\text{length}_i) (\text{Adelaide}_i) - 0.02 (\text{length}_i) (\text{Gentoo}_i)$$

Can you help them out by filling in all remaining cells in the table?

Source	SS	df	MS
<i>Model</i> length			73.47
species	949.16	2	
length:species			
<i>Error</i>	306.32		
<i>Total</i>	1329.82	341	

Sum of Squares Under the Null and Alternative Hypotheses

Let's focus on two components of the ANOVA table above: (i) the additional, sequential contribution to the SSM made by the bill length by species interaction and (ii) the mean square error, i.e., the residual variance $\hat{\sigma}^2$.

- In each of the scenarios below, would you expect the additional sum of squares contribution from the bill length by species interaction to be *large* or *small*?
 - The species by bill length interaction *does not* contribute meaningfully to the bill depth model
 - The species by bill length interaction *does* contribute meaningfully to the model
- Suppose that the full model (which includes the bill length by species interaction) does a good job of explaining variability in penguin bill depths. In that case, would you expect the mean square error to be *large* or *small*?