

# STA302 Lec5101, Methods of Data Analysis 1

## Module 6: Problem set

October 24, 2024

### **Problem. (Covered in Module 7)**

For each of the three terms in the decomposition, match them to the appropriate written description of their use/purpose.

1. Variation initially present prior to fitting a linear model to the data.
2. Measure of variation around the fitted regression relationship.
3. Amount of variation in the response that has been explained by the predictors.

### **Problem.**

Suppose we have a large model containing 9 predictors, labelled  $x_1, \dots, x_9$ . We wish to test whether a smaller model containing the predictors  $x_2, x_4, x_8$ , and explains a similar amount of variation to the larger model. Write the null and alternative hypothesis for this partial F test.

### **Problem.**

Based on the data below, compute the components of the decomposition of the sum of squares for the fitted model that uses Sales as the response, and Temperature as the predictor:  $\hat{y}_i = 8.081 + 1.933x_i$

Sales: 50, 58, 38, 70

Temperature: 22, 27, 15, 31

### **Problem.**

A model fit to a sample of 20 observations includes 3 predictors. The RSS of this model is 1050, while the SSreg of this model is 450. If the critical value for this situation is 3.24, what would be the conclusion of an ANOVA test of overall significance for this model?

### **Problem.**

A model fit to a sample of 20 observations includes 3 predictors. The RSS of this model is 1050, while the SSreg of this model is 450. If the critical value for this situation is 3.24, what would be the conclusion of an ANOVA test of overall significance for this model?

### **Problem.**

In addition to the model fit in question 4, a new model is fit using only one of the three predictors previously used. The RSS of this new model is 1100 while the SSreg of the model is 300. Based on the information provided in question 4 and question 5, what would be the conclusion of the partial F test that compares these two models? The critical value needed for this question is 3.63.

## **1 Basic learning objective practice**

### **Problem.**

Sheather: Chapter 2: Exercises 5, 6

Sheather: Chapter 5, Exercise 3 (using output provided)

### **Problem.**

Weisberg: Chapter 2, Problem 2.1.4, 2.7.2

Use:

```
library(alr4)

data(Hwt)
```

## 2 Advanced learning objective practice

### Problem.

Weisberg: Chapter 3, Problem 3.1 (all parts), 3.5 (all parts)

Use:

```
library(alr4)

data(BSGirls)

data(water)
```