Stat 346 Homework 4

Nathan Jarus

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1 Problem 1

$$R^2 = \frac{SSR}{SSTO} = 1 - \frac{SSE}{SSTO} \tag{1}$$

$$\frac{R^2}{1-R^2} = \frac{\frac{SSR}{SSTO}}{1-(1-\frac{SSE}{SSTO})} \tag{2}$$

$$= \frac{\frac{SSR}{SSTO}}{\frac{SSE}{SSTO}} \tag{3}$$

$$= \frac{SSR}{SSE} \tag{4}$$

$$\tag{5}$$

2 Problem 2

2.1 Part a

For this example, our F-statistic is

$$F = \frac{MSR}{MSE} \tag{6}$$

$$= \frac{\frac{SSR}{1}}{\frac{SSE}{20}} \tag{7}$$

$$= \frac{SSR}{SSE} \times 20 \tag{8}$$

$$= \frac{R^2}{1-R^2} \times 20 \tag{9}$$

Putting in numbers, we get

$$F \approx 13.875 \tag{10}$$

2.2 Part b

Our critical F-value is 4.35, which is significantly less than our F-statistic. Based on this, we reject H_0 and conclude that there is a significant linear relationship, assuming that SLR holds.

3 Problem 3; KNN # 5.2

3.1 Part 1

$$A + C = \begin{bmatrix} 5 & 9 \\ 11 & 11 \\ 10 & 8 \\ 6 & 12 \end{bmatrix}$$

This is a 4x2 matrix.

3.2 Part 2

$$A - C = \begin{bmatrix} -1 & -7 \\ -5 & -1 \\ 0 & 6 \\ 2 & 4 \end{bmatrix}$$

This is a 4x2 matrix.

3.3 Part 3

$$B'A = \begin{bmatrix} 58 & 80 \end{bmatrix}$$

This is a 1x2 matrix.

3.4 Part 4

$$AC' = \begin{bmatrix} 14 & 22 & 11 & 8 \\ 49 & 54 & 20 & 26 \\ 71 & 82 & 32 & 38 \\ 76 & 80 & 28 & 40 \end{bmatrix}$$

This is a 4x4 matrix.

3.5 Part 5

$$C'A = \begin{bmatrix} 63 & 94 \\ 55 & 77 \end{bmatrix}$$

This is a 2x2 matrix.

4 Problem 4; KNN # 5.14

4.1 Part a

$$\left[\begin{array}{cc|c} 4 & 7 & 25 \\ 2 & 3 & 12 \end{array}\right]$$

4.2 Part b

We can use Gaussian Elimination to obtain the reduced row echelon form:

$$\left[\begin{array}{cc|c} 1 & 0 & 4.5 \\ 0 & 1 & 1 \end{array}\right]$$

From this we can trivially solve the system:

$$y_1 = 4.5 \tag{11}$$

$$y_2 = 1 \tag{12}$$