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MAT 222
Spring 2019
Quiz 8

"Looking in the mirror, staring back at me, isn't so much a face as the expression of a predicament."
– George Falconer, A Single Man

Problem 1: As cheese ages, various chemical reactions take place that affect the taste of the final product. A researcher is trying to predict the final quality of cheese (given some qualitative metric) based on the log amount of acetic acid, the log concentration of hydrogen sulfide (H_2S), and the concentration of lactic acid. The results of the regression are given (partially) below.

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	*3*	4994.5	*1664.8*	*16.22*	*0.000*
Error	*26*	2668.4	102.6		
Total	29	7662.9			

Model Summary

S	R-sq	R-sq (adj)
10.13	*65.2%*	61.2%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value
Constant	*-28.88*	19.74	-1.46	0.155
acetic	0.328	*4.460*	0.07	0.942
H2S	3.912	1.248	*3.13*	*0.0025*
lactic	19.671	8.629	2.28	0.031

The regression equation is

$\texttt{taste} = -28.88 + 0.328\ \texttt{acetic} + 3.912\ \texttt{H2S} + 19.671\ \texttt{lactic}$

(a) Complete the missing entries in the table above.

(b) Perform an F-test for this regression. Be sure to state the null and alternative hypotheses, the test statistic, the degrees of freedom (of the numerator and denominator), and the conclusions using a 5% significance level.

We have hypotheses

$$\begin{cases} H_0 : \beta_1 = \beta_2 = \beta_3 = 0 \\ H_a : \textit{not all } \beta_i = 0 \end{cases}$$

From completing the table above, we have F-statistic 16.22, with degrees of freedom in the numerator 3 and degrees of freedom in the denominator 26, i.e. overall degrees of freedom $(3, 26)$. This gives, as shown above, p-value $p = 0.000$. Therefore, we reject the null hypothesis—at least one of the coefficients is nonzero.