ISyE 4031 Regression and Forecasting
Homework 3 Solutions
Spring 2016

1. Exercise 3.11.

a. $b_1 = 2.66522$ has the following interpretation: For each increase in the price difference (PriceDiff) of one dollar, the mean demand for Fresh increases by 266,522 bottles.

$b_0 = 7.81409$ has the following interpretation: When there is no price difference between fresh price and average industry price, mean demand for the large bottle of Fresh is 781,409 bottles.

b. $\hat{y} = 7.814088 + 2.665214(0.10) = 8.081$.

c. $\hat{y} = b_0 + b_1 x$

8.5 = 7.81409 + 2.6652x => $x = \dfrac{.68591}{2.6652} = .257,$ or about 26 cents.

d. $s^2 = \dfrac{SSE}{n-2} = \dfrac{2.8059}{30-2} = 0.10021$

$s = \sqrt{s^2} = \sqrt{.10021} = 0.3166$.

2. Exercise 3.18.

a. $b_0 = 7.81409, b_1 = 2.6652$.

b. $SSE = 2.806,\ s^2 = 0.100,\ s = 0.316561$

c. $s_{b_1} = 0.2585, t = 10.31$.

$t = \dfrac{b_1}{s_{b_1}} = 2.6652/.2585 = 10.31$.

d. $t^{(28)}_{[.025]} = 2.048$; Since 10.31 > 2.048, reject $H_0 : \beta_1 = 0$, strong evidence of a linear relationship between *x* and *y*.

e. $t^{(28)}_{[.005]} = 2.763$; Since 10.31 > 2.763, reject $H_0 : \beta_1 = 0$, strong evidence of a linear relationship between *x* and *y*.

f. *p*-value = 0.000 < 0.001 (and less than all other significance levels). Reject $H_0 : \beta_1 = 0$, extremely strong evidence of linear relationship.

g. $[2.6652 \pm 2.048(.2585)]$ = [2.136, 3.194]. We are 95% confident that the mean fresh detergent demand increases by between 2.136 bottles and 3.194 bottles for each 1 unit increase in price difference.

h. $[2.6652 \pm 2.763(.2585)]$ = [1.951, 3.379] .

i. $s_{b_0} = 0.07988$, $t = 97.82$.

$t = \dfrac{b_0}{s_{b_0}} = 7.81/0.07988 = 97.82$.

j. $p-$value = 0.000 < 0.001 and all other α's; reject $H_0 : \beta_0 = 0$.

k. $s_{b_1} = \dfrac{s}{\sqrt{SS_{xx}}} = \dfrac{.316561}{\sqrt{1.49967}} = 2585$.

3. Exercise 3.22.

a. 8.0806, [7.9479, 8.2133].

b. 8.0806, [7.4187, 8.7425].

c. See graph with Exercise 3.22. A vertical line at Pricedif = 0.1 will cross the curves at the points that correspond to the values for 95% CI (Part a) and 95% PI (Part b).

d. $s\sqrt{\text{DistanceValue}} = 0.0648 \quad s = 0.316561$

$D.V. = \left(\dfrac{.0648}{.316561}\right)^2 = 0.0419$

99% $C.I.$ is $[8.0806 \pm 2.763(.316561)\sqrt{.0419}] = [8.0806 \pm .1790] = [7.9016, 8.2596]$

99% $P.I.$ is $[8.0806 \pm 2.763(.316561)\sqrt{1.0419}] = [8.0806 \pm .8928] = [7.1878, 8.9734]$.