

# Regression Analysis TA

## Chapter 2 – Inferences in Regression and Correlation Analysis

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### 1 Problems

2.5

(a)  $t(0.95; 43) = 1.6811$ ,  $15.0352 \pm 1.6811(.4831)$ ,  $14.2231 \leq \beta_1 \leq 15.8473$

(b)  $H_0 : \beta_1 = 0$ ,  $H_a : \beta_1 \neq 0$ .  $t^* = (15.0352 - 0) / .4831 = 31.122$ . If  $|t^*| \leq 1.681$  conclude  $H_0$ , otherwise  $H_a$ . Conclude  $H_a$ . P-value = 0+

(d)  $H_0 : \beta_1 \leq 14$ ,  $H_a : \beta_1 > 14$ .  $t^* = (15.0352 - 14) / .4831 = 2.1428$ . If  $t^* \leq 1.681$  conclude  $H_0$ , otherwise  $H_a$ . Conclude  $H_a$ . P-value = 0.0189

2.8

(a)  $H_0 : \beta_1 = 3.0$ ,  $H_a : \beta_1 \neq 3.0$ .  $t^* = (3.57 - 3.0) / .3470 = 1.643$ ,  $t(.975; 23) = 2.069$ .

If  $|t^*| \leq 2.069$  conclude  $H_0$ , otherwise  $H_a$ . Conclude  $H_0$ .

(b)  $\delta = |0.5| / 0.35 = 1.43$ , power = 0.30 (by linear interpolation)

2.14

(a)  $\hat{Y}_h = 89.6313$ ,  $s\{\hat{Y}_h\} = 1.3964$ ,  $t(0.95; 43) = 1.6811$ ,  $89.6313 \pm 1.6811(1.3964)$ ,

$87.2838 \leq E\{Y_h\} \leq 91.9788$

(b)  $s\{pred\} = 9.0222$ ,  $89.6313 \pm 1.6811(9.0222)$ ,  $74.4641 \leq Y_{h(new)} \leq 104.7985$ , yes, yes

(c)  $87.2838 / 6 = 14.5473$ ,  $91.9788 / 6 = 15.3298$ ,  $14.5473 \leq \text{Mean time per machine} \leq 15.3298$

2.30

(a)  $H_0 : \beta_1 = 0, H_a : \beta_1 \neq 0. s\{b_1\} = 41.5743,$

$$t^* = (-170.575 - 0) / 41.5743 = -4.1029, t(0.995; 82) = 2.63712.$$

If  $|t^*| \leq 2.63712$  conclude  $H_0$ , otherwise  $H_a$ . Conclude  $H_a$ . P-value = 0.000096

(b)  $-170.575 \pm 2.63712(41.5743), -280.2114 \leq \beta_1 \leq -60.9386$

2.31

(a)

Source	df	SS	MS
Regression	1	93,462,942	93,462,942
Error	82	455,273,165	5,552,112
Total	83	548,736,107	

(b)  $H_0 : \beta_1 = 0, H_a : \beta_1 \neq 0. F^* = 93,462,942 / 5,552,112 = 16.8338, F(0.99; 1, 82)$

$= 6.9544.$  If  $F^* \leq 6.9544$  conclude  $H_0$ , otherwise  $H_a$ . Conclude  $H_a$ .  $(t^*)^2 = (-4.102895)^2 =$

$16.8338 = F^*. [t(0.995; 82)]^2 = (2.63712)^2 = 6.9544 = F(0.99; 1, 82).$  Yes.

(c)  $SSR = 93,462,942, 0.1703$

(d) -0.4127

2.32

(a) Full model:  $Y_i = \beta_0 + \beta_1 X_i + \epsilon_i,$  Reduce model:  $Y_i = \beta_0 + \epsilon_i$

(b) (1)  $SSE(F) = 455,273,165,$  (2)  $SSE(R) = 548,736,107,$  (3)  $df_F = 82,$  (4)  $df_R = 83,$

(5)  $F^* = [(548,736,107 - 455,273,165) / 1] \div [455,273,165 / 82] = 16.83376,$

(6) If  $F^* \leq F(0.99; 1, 82) = 6.95442$  conclude  $H_0$ , otherwise  $H_a$ .

(c) Yes