ECEN321 : Engineering Statistics
Assignment 11 Submission

Daniel Eisen : 300447549

June 25, 2020

Hypothesis Tests

1. (Navidi 6.11.4) x=[12.18 11.77 12.09 12.03 11.87 11.96 12.03 12.36 12.28 11.85], n = 10

$$\bar{x} = 12.042,\ \ s^2 = 0.036284,\ \ s = 0.1905$$

$$H_0 \Rightarrow \sigma = 0.01$$
$$\chi^2 = \frac{10-1}{0.01}0.1905^2 = 32.66$$
$$df = 9$$

Two tailed p-value from table, $P = 0.01$ hence can reject null.

2. (Navidi 6.14.6)

(a)

$$t = \frac{\bar{X} - \mu_0}{s/\sqrt{n}}$$

$$t_A = 2.655,\ t_A = -2.832,\ t_A = -0.377,\ t_A = -3.450,\ t_A = -1.382,$$

$df = 9$, from student t distribution p values obtained,

$$P_A = 0.987\ P_B = 0.0098,\ P_C = 0.36,\ P_D = 0.0036,\ P_E = 0.1,$$

Bonferroni correction is the product of the N of tests, ie 5 times.

$$P_A = 4.935 \Rightarrow no\, rejection\, of\, null$$

$$P_B = 0.049 \Rightarrow rejection\, of\, null$$
$$P_C = 1.8 \Rightarrow no\, rejection\, of\, null$$
$$P_D = 0.018 \Rightarrow rejection\, of\, null$$
$$P_E = 0.5 \Rightarrow no\, rejection\, of\, null$$

(b) iii)

Regression

3. (Navidi 7.3.8) $n = 27,\ \bar{x} = 0.8404,\ \bar{y} = 0.8267$

(a)

$$\beta_1 = \sum(x+\bar{x})(y-\bar{y})/\sum(x-\bar{x})^2 = 2.8972/2.9679 = 0.976$$
$$\beta_0 = \bar{y} - \beta_1 \cdot \bar{x} = 0.0063$$

(b) Finding the correlation.

$$r = \frac{2.8972}{\sqrt{2.9679}\cdot\sqrt{2.9446}} = 0.98$$
$$s^2 = (1-0.98^2)(2.9446)/27 - 2 = 0.00466$$

$H_0 : \beta_0 = 0,\ df = 25$

$$t = \frac{0.0063 - 0}{s\sqrt{1/n + \bar{x}^2/\sum(x-\bar{x})^2}} = 0.176$$

P=0.80, fail to reject null

(c) $H_0 : \beta_0 = 0,\ df = 25$

$$t = \frac{\beta_1 - 1}{s/\sqrt{\sum(x-\bar{x})^2}} = -0.601$$

P=0.80, fail to reject null

(d) As we cannot provide sufficient evidence to reject (b, c), so cannot conclude that the method is inaccurate.

(e) $95\% \rightarrow t_{(1-0.95)/2} = 2.06$

$$E = 2.06\sqrt{0.00466(1/27 + (0.8-0.8404)^2/2.968)} = 0.0273$$

$$0.7873 \pm 0.0273$$

(f) the interval [0.76, 0.815] does not contain 0.75, indicate it is unlikely that mean prediction is $0.75\mu m$. So can conclude claim is false.

4. (Navidi 7 supplementary 10)

$$n = 23,\ \bar{x} = 28.0783,\ \bar{y} = 29.2217$$

(a)

$$\beta_1 = -347.2191/287.99 = -1.2056$$
$$\beta_0 = \bar{y} - \beta_1 \cdot \bar{x} = 63.07$$

Line is therefore 63.07 - 1.21x

(b)

$$r = -347.22/(\sqrt{287.99}\cdot\sqrt{1692.18}) = -0.4974$$
$$s^2 = (1-(-0.4974)^2(1692.1791))/23 - 2 = 60.64$$
$$df = 21,\ t_{(1-0.95)/2} = 2.08$$