

Question #5

a) $H_0: \mu_N - \mu_S = 0$

$H_a: \mu_N - \mu_S > 0$

$\alpha = 0.05$

This one-tailed right t-test.

From data, we get

$n_N = 10$

$n_S = 10$

$\bar{x}_N = 5.08$

$\bar{x}_S = 3.85$

$s_N = 2.32$

$s_S = 1.01$

Degrees of freedom $= n_N + n_S - 2 = 10 + 10 - 2 = 18$

The critical value of $t = 1.734$ (From table)

Test statistic of $t = \frac{(\bar{x}_N - \bar{x}_S) - (\mu_N - \mu_S)}{\sqrt{\frac{(n_N - 1)s_N^2 + (n_S - 1)s_S^2}{n_N + n_S - 2}} \sqrt{\frac{1}{n_N} + \frac{1}{n_S}}}$

$$= \frac{(5.08 - 3.85) - 0}{\sqrt{\frac{(10 - 1)2.32^2 + (10 - 1)1.01^2}{10 + 10 - 2}} \sqrt{\frac{1}{10} + \frac{1}{10}}}$$
$$= \frac{1.23}{0.7995}$$
$$= \underline{\underline{1.539}}$$

Since $1.539 < 1.734$, fail to reject the null hypothesis.

or $p\text{-value} = 0.0707 > 0.05$.

Therefore, fail to reject the null hypothesis and conclude that there is Not significant evidence of the mean mortality rate in northern states is higher than that in Southern states at a 5% significance level.

Question #5

(b) $H_0: \sigma^2 = 0$

$H_a: \sigma^2 \neq 0$

$\alpha = 0.05$

This is two-tailed F-test.

$df_1 = 10 - 1 = 9$

$df_2 = 10 - 1 = 9$

The critical value of $F = 4.0260$ (From table)

$$F = \frac{S_N^2}{S_S^2} = \frac{5.364}{1.022} = \underline{\underline{5.222}}$$

Since $5.222 > 4.0260$, Reject the null hypothesis.

or $p\text{-value} = 0.0217 < 0.05$

Therefore, Reject the null hypothesis and conclude that there is a significant evidence of the variances of mortality rates in northern States and southern states are not equal.