

### Exercises :

Q13: Find the following F distribution values .

a.  $F_{0.05}$  with df 5 and 10 = 3.33

b.  $F_{0.025}$  with df 20 and 15 = 2.76

Just by calculating we get

c.  $F_{0.01}$  with df 8 and 12 = 4.50

d.  $F_{0.1}$  with df 10 and 20 = 1.94

Q15: consider the following hypothesis test  $H_0: \sigma_1^2 = \sigma_2^2$

$$H_1: \sigma_1^2 \neq \sigma_2^2$$

a. What is your conclusion if  $n_1=21$ ,  $S_1^2=8.2$ ,  $n_2=26$ ,  $S_2^2=4.0$  ?

use  $\alpha=0.05$  and the p-value approach :

$$F = \frac{S_1^2}{S_2^2} = \frac{8.2}{4} = 2.05, \quad df_1=20, \quad df_2=25$$

$df_2$	$\alpha$	$df_1$	
25	0.05	2.01	$p\text{-value} \leq \alpha$
0.025	2.30	$F$	$(0.025, 0.05) \leq 0.05$

So we reject  $H_0$  ( $\alpha=0.05$ )

b. Repeat the test using the critical value approach :  $F \geq F_{\frac{\alpha}{2}}$

$$F_{0.025} = 2.3 \rightarrow F \geq F_{0.025}$$

$$2.05 > 2.3$$

Q16:

$$n_1 = 26$$

$$n_2 = 25$$

$$S_1 = 170$$

$$S_2 = 100$$

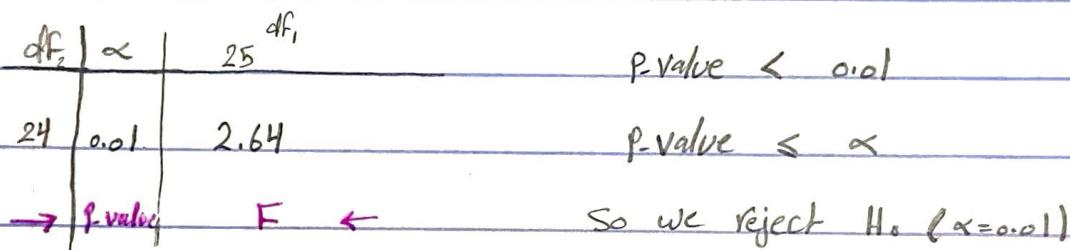
- a. state the null and alternative hypothesis if the research hypothesis is that the variance in annual repair costs is larger for the older cars.

$$H_0: \delta^2 \leq \delta_0^2 \quad (\text{population 1 is 4 year old automobiles})$$

$$H_1: \delta^2 > \delta_0^2$$

- b. At  $\alpha = 0.01$ , what is your conclusion? What is the p-value?

$$F = \frac{S_1^2}{S_2^2} = 2.89, \quad df_1 = 25, \quad df_2 = 24$$



Q17:

$$n_1 = 25$$

note  $n_2 = 26$  {  
since only 1 is pop. 1 →}

$$S_1^2 = 2.1$$

$$S_2^2 = 11.1$$

test the hypotheses that the population variances in the salaries are equal. At

$\alpha = 0.05$  what is your conclusion.

T-test test.

$$H_0: \delta^2 = \delta_0^2$$

By critical approach:

$$H_1: \delta^2 \neq \delta_0^2$$

$$F_{\frac{\alpha}{2}} = F_{0.025} = 2.26$$

$$\rightarrow F = \frac{S_1^2}{S_2^2} = 5.29, \quad df_1 = 25, \quad df_2 = 24$$

$df_2$	$\alpha$	$df_1$
24	0.01	25

$df_2$	$\alpha$	$df_1$
24	0.01	25

p-value  $< 0.01 < 0.05$

$$F \geq F_{\frac{\alpha}{2}}$$

so we reject  $H_0$  ( $\alpha = 0.05$ )

p-value  $\leq \alpha$   
So we reject  $H_0$  ( $\alpha = 0.05$ )

Q18:  $n_1 = 26$   $n_2 = 26$

$$S_2 = 8.89 \quad S_1 = 13.03$$

conduct a hypothesis test to determine whether the small cap growth fund is riskier than the large cap growth fund. Use  $\alpha = 0.05$ . upper-tail test

$$H_0: \sigma^2 \leq \sigma_0^2$$

$$H_1: \sigma^2 > \sigma_0^2$$

$$F = \frac{(13.03)^2}{(8.89)^2} = 2.15 \text{ with } df_1 = 25, df_2 = 25.$$

$df_2$	$\alpha$	$df_1$	p-value $\in (0.025, 0.05)$
25	0.05	25	1.96
25	0.025	25	2.23 $\leftarrow F$

p-value  $\leq \alpha$   
so we reject  $H_0$  ( $\alpha = 0.05$ )

Q19:  $n_1 = 31$   $n_2 = 25$ ,  $\alpha = 0.1$

$$S_1^2 = 25 \quad S_2^2 = 12$$

test for equality of the two population variances:

$$F = \frac{25}{12} = 2.08, \quad df_1 = 30, \quad df_2 = 24$$

$df_2$	$\alpha$	$df_1$	p-value $\in (0.025, 0.05)$
24	0.05	30	1.94
24	0.025	30	2.21 $\leftarrow F$

p-value  $\leq 0.1$   
so we reject  $H_0$  (0.1)