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 .

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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	α	df_1: 20
25	0.05	2.01
p-value	0.025	2.30

$\leftarrow F$

So p-value $\in (0.025 , 0.05)$

p-value $\leq \alpha$

$(0.025, 0.05) \leq 0.05$

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

بدور على F بين قيمتين

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

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

$2.05 \ngtr 2.3$

Q16:

$n_1 = 26$ $\quad\quad$ $n_2 = 25$

$S_1 = 170$ $\quad\quad$ $S_2 = 100$

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

$H_0: \sigma^2 \leq \sigma_0^2$ $\quad$ (population 1 is 4 year old automobiles).

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

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

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

df_2	α	25 (df_1)
24	0.01	2.64
→	p-value	F ←

p-value < 0.01

p-value ≤ α

So we reject H_0 ($\alpha = 0.01$)

Q17:

هاد pop.1 لانه الفيريانس فيه اكبر

$n_2 = 25$ $\quad$ Note حسب $n_1 = 26$

$S_2^2 = 2.1$ $\quad\quad$ $S_1^2 = 11.1$

test the hypotheses that the population variances in the salaries are <u>equal</u>. At $\alpha = 0.05$ What is your conclusion.

Two tail test.

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

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

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

df_2	α	25 (df_1)
24	0.01	2.64
	↑ p-value	$\boxed{F}$

p-value < $\underbrace{0.01}$ < 0.05

p-value ≤ α

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

By critical approach:

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

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

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

← طالأول لأنه S فيه أكبر

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

$S_2 = 8.89$ $S_1 = 13.03$

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

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

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

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

df_2	α	df_1 25
25	0.05	1.96
p-value →	0.025	2.23

← F

p-value $\in (0.025, 0.05)$

p-value $\leq \alpha$

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

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

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

test for equality of the two population variances:

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

df_2	α	df_1 30
24	0.05	1.94
p-value →	0.025	2.21

← F

p-value $\in (0.025, 0.05)$

p-value ≤ 0.1

so we reject H_0 (0.1)