Gulf University for Science & Technology | **ECON-380: Business Statistics**
Department of Economics & Finance | **Dr. Khalid Kisswani**

Assignment 3

1. If you are interested in testing:

$H_0: \sigma^2 = 150$
$H_1: \sigma^2 \neq 150$

And the following information is found from a random sample:

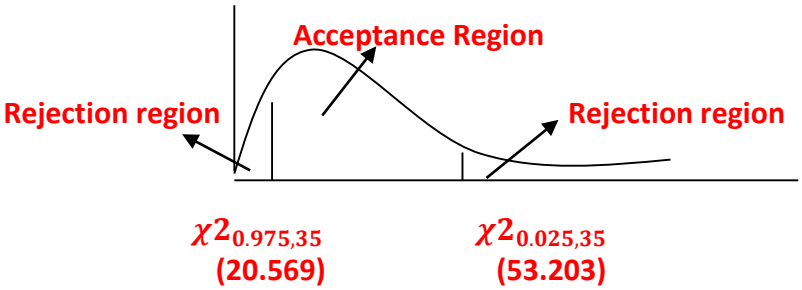
n = 36 $\quad \bar{x} = 24.6 \quad$ S = 15

a. calculate the test statistic for this test

$$\chi^2\ (test\ statistic) = \frac{(n-1)S^2}{\sigma^2_0} = \frac{35(15^2)}{150} = 52.5$$

b. at α = 5%, create your critical region and state the decision accordingly

Critical region:



Decision:
Since the $\chi^2\ (test\ statistic)$ falls in acceptance region $\Longrightarrow$ accept the null (H_0) at α = 5%,

c. find the p-value for this test and write the decision accordingly

p-value = 2 (0.025 to 0.05) = 0.05 to 0.10 = 5% to 10%

p-value < α =10% $\Longrightarrow$ reject the null (H_0) at α = 10%,

2. Assume the following test:

$H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$
H_1: at least one mean is different

With the following data: SSTR = 6,750 SSE = 8,000 $n_T = 20$

a. Using 4-steps approach, run the test at α = 5%

F- Statistics = $\frac{MSTR}{MSE}$

MSTR = $\frac{SSTR}{k-1}$ = $\frac{6750}{5-1}$ = 1687.5

MSE = $\frac{SSE}{n_T - K}$ = $\frac{8000}{20-5}$ = 533.33

Then, F- Statistics = $\frac{1687.5}{533.33}$ = 3.16

Critical $F_{0.05, 4, 15}$ = 3.06

F- Statistics > $F_{0.05, 4, 15}$ $\Longrightarrow$ reject H_0 at $\alpha = 5\%$

b. Find the p-value for this test and state the decision accordingly

p-value = 0.025 to 0.05 = 2.5% to 5%

p-value < α =5% $\Longrightarrow$ reject the null (H_0) at α = 5%,

c. Create your ANOVA table for this problem

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F
Treatment	**6750**	**4**	**1687.5**	**3.16**
Error	**8000**	**15**	**533.33**	
Total	**14750**	**19**		

3. A statistics teacher wants to see if there is any difference in the abilities of MBA students enrolled in statistics today and those enrolled five years ago. A sample of final examination scores from students enrolled today and from students enrolled five years ago was taken. You are given the following information.

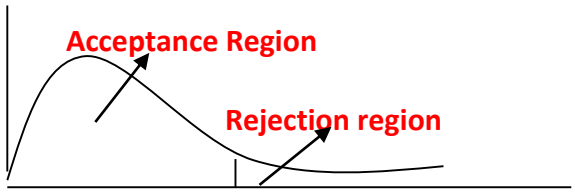
	Today	Five Years Ago
$\bar{x}$	83	88
S^2	112.5	54
n	45	36

a. test at α = 5% if the variance of the MBA students enrolled today and those enrolled five years ago is the same or different, using 4-steps

H_0: $\sigma^2(1) = \sigma^2(2)$
H_1: $\sigma^2(1) \neq \sigma^2(2)$

F-statistic = $\frac{S^2(1)}{S^2(2)} = \frac{(112.5)}{(54)} = 2.08$

Critical region:



$F_{0.025\ ,44\ ,35}$

(1.8)

Decision:

Since the $F\ (test\ statistic) > F_{0.025\ ,44\ ,35}$ $\Longrightarrow$ **reject the null (H_0) at α = 5%**

b. find the p-value of your test and write the decision accordingly

p-value = 2 (less than 0.01)= less than 2%

p-value < α =5% $\Longrightarrow$ **reject the null (H_0) at α = 5%,**

c. create a 95% confidence interval for the variance of the MBA students enrolled today

$$\frac{(n-1)S^2}{\chi 2_{0.025,44}} \leq \sigma^2 \leq \frac{(n-1)S^2}{\chi 2_{0.975,44}} = \frac{44(112.5)}{65.41} \leq \sigma^2 \leq \frac{44(112.5)}{28.366}$$

$$= 75.68 \leq \sigma^2 \leq 174.5$$