Comparing Two Population Variances

Right-tail test	Left-tail test	two-tail test
$H_0: \sigma_1^2 = \sigma_2^2$	$H_0: \sigma_1^2 = \sigma_2^2$	$H_0: \sigma_1^2 = \sigma_2^2$
$H_a: \sigma_1^2 > \sigma_2^2$	$H_a: \sigma_1^2 < \sigma_2^2$	$H_a: \sigma_1^2 \neq \sigma_2^2$

two samples $\quad n_1 \quad\quad n_2$

$\quad\quad\quad\quad s_1^2 \quad\quad s_2^2$

Conditions

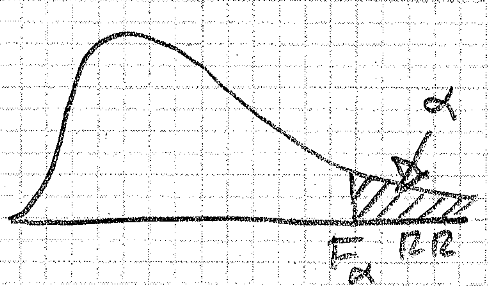
1) The samples are random and independent
2) Both populations are normally distributed

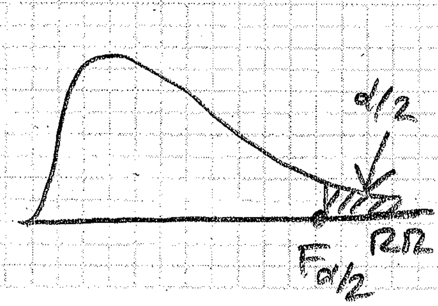
Test statistic

$$F = \frac{s_1^2}{s_2^2} \qquad F = \frac{s_2^2}{s_1^2} \qquad F = \frac{\text{Larger Sample Variance}}{\text{Smaller Sample Variance}}$$

Rejection Region

$F > F_\alpha$	$F > F_\alpha$	$F > F_{\alpha/2}$
$df_{numerator} = n_1 - 1$	$df_{num} = n_2 - 1$	$df_{num} =$
$df_{denominator} = n_2 - 1$	$df_{den.} = n_1 - 1$	$df_{den} =$





Example:

Sample 1					Sample 2				
50	48	49	51	52	46	50	48	54	56
47	51	51	49	50	45	48	53		

$n_1 = 10$ $\qquad$ $n_2 = 8$

$s_1^2 \approx 1.55^2 = 2.40$ $\qquad$ $s_2^2 = 3.96^2 = 15.68$

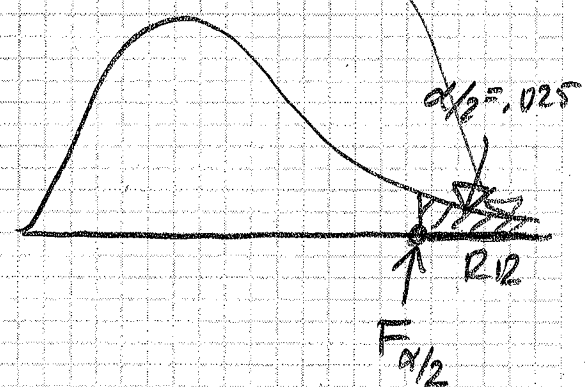
$H_o: \sigma_1^2 = \sigma_2^2$

$H_a: \sigma_1^2 \neq \sigma_2^2$ $\qquad \alpha = .05 \Rightarrow \alpha/2 = .025$

two-tail test

test stat

$$F = \frac{15.68}{2.40} \approx 6.53$$



$\alpha/2 = .025$

$df_{num} = n_2 - 1 = 8 - 1 = 7$

$df_{denom} = n_1 - 1 = 10 - 1 = 9$

C.V

4.2

RR: $F > 4.2$

Decision: Reject H_o

Conclusion: the data provide sufficient evidence to conclude that the two population variances are different