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Chapter: 10 – Uber/Lyft

Problem Definition: Does the data from Uber and Lyft arrival times have equal variances to allow for a pooled or exact t test.

Hypothesis:

$$H_0: \sigma_u^2 \leq \sigma_l^2$$

$$H_1: \sigma_u^2 > \sigma_l^2$$

Decision Rule: If the critical ratio is greater than the critical value 2.27 then the null is rejected.

Test:

Ratio of Variances

Estimated Ratio	95% Lower Bound for Ratio using F
1.34505	0.592

Test

Null hypothesis $H_0: \sigma_1^2 / \sigma_2^2 = 1$
Alternative hypothesis $H_1: \sigma_1^2 / \sigma_2^2 > 1$
Significance level $\alpha = 0.05$

Test				
Method	Statistic	DF1	DF2	P-Value
F	1.35	17	17	0.274

Conclusion:

- 1) The critical ratio of 1.35 does not exceed the critical value 2.27, failing to reject the null. There is a chance of a type 2 beta error.
- 2) P-value of 0.274 > 0.05 alpha α failing to reject the null hypothesis.

Interpretation: The pooled or exact form of the t test of equal means will be used to test for ride-sharing analysis.

Problem Definition: My friends and I want to determine if there is a difference between two ride-share service providers, Lyft or Uber. If there is a difference, which of them has a faster pickup time on average after receiving a request from the customer.

Hypothesis:

$$H_0: \mu_{\text{Uber}} = \mu_{\text{Lyft}}$$

$$H_1: \mu_{\text{Uber}} \neq \mu_{\text{Lyft}}$$

Decision Rule: If the critical ratio is greater than the critical value 2.032 or less than the critical value -2.032 then the null is rejected.

Test:

Estimation for Difference

Difference	Pooled StDev	95% CI for Difference
-2.97	3.27	(-5.18, -0.75)

Test

Null hypothesis	$H_0: \mu_1 - \mu_2 = 0$	
Alternative hypothesis	$H_1: \mu_1 - \mu_2 \neq 0$	
T-Value	DF	P-Value
-2.72	34	0.010

Conclusion:

- 1) The critical ratio of -2.72 is less than critical value -2.032, rejecting the null. There is a chance of a type 2 beta error.
- 2) P-value of 0.01 < 0.05 alpha α rejecting the null hypothesis.
- 3) The hypothesized value of equality or 0 difference does not fall within the confidence interval bounds of (-5.18, -0.75) rejecting the null hypothesis.

Interpretation: There is a significant difference between Uber and Lyft's arrival times. On average Uber arrives 2 minutes and 58 seconds faster than Lyft. Recommending Uber as the carrier of choice when arrival time is of concern.

Assumptions: With an independently and randomly selected sample size of 18 per ride-share provider, a boxplot of the data is used to approximate normality. The medians are centered, the whiskers are approximately equal, and the variability is similar on both sides of the IQR. Approximate normality can be assumed under the central limit theorem.

