

Exercise 7.1.

Answer:

Based on the t-test results provided earlier, we cannot conclude that Filter Agent 1 (Variable 1) was more effective than Filter Agent 2 (Variable 2). In fact, the data suggests the opposite direction, as the mean for Variable 2 (8.68) is higher than Variable 1 (8.25).

Looking at the one-tailed p-value in the results ($P(T \leq t)$ one-tail: 0.157821259), we see that it exceeds the conventional significance threshold of 0.05. This means we fail to reject the null hypothesis that Filter Agent 1 is equal to or less effective than Filter Agent 2.

Exercise 7.2.

Answer:

To determine if the population mean income for males exceeds that of females, Independent Groups Two-sample T-test assuming equal variances would be appropriate. This test is specifically designed to compare means between two unrelated groups. Particularly, we would use a one-tailed test since we are specifically testing whether males' income exceeds females' income (rather than just testing for any difference).

The validity of this test depends on several key assumptions:

- The samples must be independent of each other, meaning there is no relationship between the individuals in one group compared to the other.
- The data should be approximately normally distributed in each group. The histogram shows some deviation from this, however the t-test is robust to mild

departures from normality, especially with larger sample sizes (typically $n > 30$).

We have 60 samples in each group.

- Both groups should have approximately equal variances. The F test for equal variances was applied, showing no significant difference between the two groups, indicating equal variances.

Bibliography:

Shaker (2023) Assumptions: Independent samples t-test. *STM1001 Topic 6: t-tests for two-sample hypothesis testing @ La Trobe University*. Available from: <https://bookdown.org/content/f9d035ed-86ea-4779-ad01-31acc973f0dd/1.1-assumptions-independent-samples-t-test.html> [Accessed 29 March 2024]