

Summary

Ex 8.4

Based on the t-test results presented earlier, we cannot conclude that Filter Agent 1 (Variable 1) is more effective than Filter Agent 2 (Variable 2). In fact, the results indicate the opposite trend, as the mean value for Variable 2 (8.68) is greater than that of Variable 1 (8.25).

Examining the one-tailed p-value from the results ($P(T \leq t)$ one-tail: 0.157821259), we observe that it exceeds the commonly accepted significance level of 0.05. This implies that we fail to reject the null hypothesis, which states that Filter Agent 1 is equally or less effective than Filter Agent 2.

Ex 8.6

To assess whether the population mean income for males is greater than that of females, an Independent Samples Two-sample T-test assuming equal variances is appropriate. This statistical test is specifically used to compare the means of two unrelated groups. In this case, a one-tailed test is justified since the hypothesis focuses on whether males earn more than females, rather than simply detecting any difference.

The validity of this test relies on several important assumptions:

- The samples must be independent, meaning there is no connection between individuals in one group and those in the other.

- The data in each group should be approximately normally distributed. Although the histogram reveals some deviation, the t-test is generally robust to moderate violations of normality, especially when the sample size is reasonably large (typically $n > 30$). Here, both groups consist of 60 observations.
- The variances of the two groups should be roughly equal. An F-test for equality of variances was conducted and showed no significant difference, supporting the assumption of equal variances.