

Assessing the Impact of Skewed Distributions on T-Test Accuracy

Research Question

How do different skewed distributions and sample sizes impact the reliability of a one-sample t-test?

Objective

1. Examine if and how different types of skewed distributions lead to misleading t-test results.
2. How increasing sample size might mitigate the impact of skewed data on the t-test results.

Methods:

1. Simulate Data with Different Types of Skewness:
 - Symmetric Distribution: Normal distribution (no skew) to serve as a baseline, more types of symmetric baseline distributions might be included.
 - Moderate Skew:
 - Exponential distribution.
 - Chi-square distribution with a low degree of freedom (e.g., $df = 2$).
 - High Skew:
 - Log-normal distribution with large-scale parameters.
 - Weibull distribution with shape parameters that produce high skew.
2. Set Sample Sizes:
 - Small, medium, and large.
3. Conduct One-Sample T-tests:
 - For each distribution and sample size, perform a one-sample t-test with the null hypothesis that the mean is zero.
 - Repeat each test 1,000 times to observe the variability and tendency of the test to produce extreme results.
4. Analyze the Distribution of Test Results:
 - Compare the range and variability of the t-test results across different distributions and sample sizes.
 - Observe how skewness and sample size interact to either stabilize or amplify the t-test outputs.