Types of Statistical Inference

Single categorical variable

One-proportion z-interval and test (Chapters 19-21)

Two categorical variables

Two categories each:
Two proportion z-interval and test (Chapter 22)

More than two categories each:
Chi-square tests (Chapter 26)

Single quantitative variable

One sample t-interval and test (Chapter 23)

One categorical, one quantitative variable

Two categories:
2-sample t-interval and test (Chapter 24)
Paired t-interval and test (Chapter 25)

More than two categories:
ANOVA test (Chapter 28)

Two quantitative variables

Regression inference (Chapter 27)

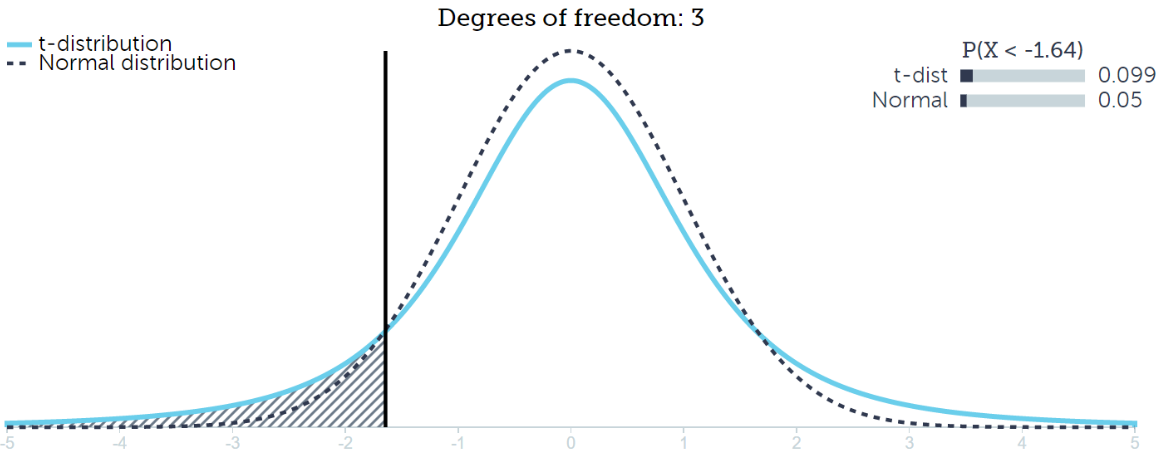
Confidence intervals (one-sample t-intervals)

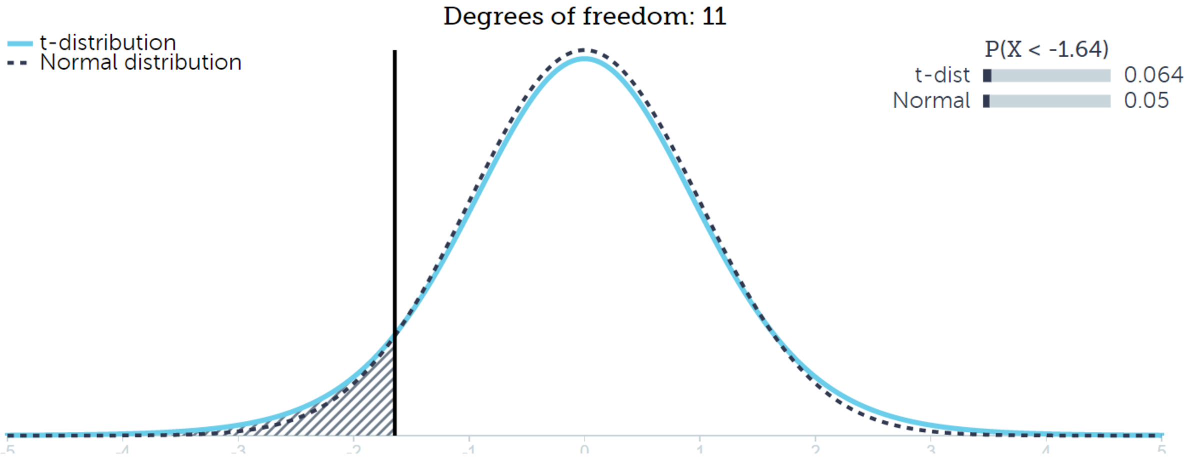
$$observed\ value \pm (critiacal\ value)(standard\ error)$$

$$\bar{y} \pm t^* SE(\bar{y}) \quad \text{or} \quad \bar{y} \pm t^* \frac{s}{\sqrt{n}}$$

is a **one-sample t-interval** for the population mean μ.

The **critical value** t^* depends on the level of confidence (e.g. 95%) and the **degrees of freedom** $df = n - 1$.





Hypothesis tests (one-sample t-tests)

1. State the null and alternative hypotheses.
   The null hypothesis is always $H_0\colon \mu = \mu_0$.
   The alternative is $H_A\colon \mu \neq \mu_0$ or $H_A\colon \mu < \mu_0$ or $H_A\colon \mu > \mu_0$. (Pick one.)
2. Find the t -score of the sample using the null hypothesis:
$$t = \frac{observed - expected}{standard\ error} = \frac{\bar{y} - \mu_0}{SE(\bar{y})} = \frac{\bar{y} - \mu_0}{\left(\frac{s}{\sqrt{n}}\right)}$$
3. Convert the t -score to a P –value using $n - 1$ degrees of freedom.
4. Compare the P -value to the pre-determined
   alpha level, or **α-level**, or **significance level**, usually .10 or .05 or .01.
5. Make a conclusion: We **retain** the null hypothesis if the P-value is greater than α, and **reject** the null hypothesis if the P-value is less than α.
   Report the P-value of the test.