

Case 1: One Variable (Population)

Assumptions	σ is known	σ is unknown	$n(p_0) > 5$ and $n(1 - p_0) > 5$	Data comes from Normal Population
Parameter of interest:	Mean, μ	Mean, μ	Proportion, p	Variance, σ^2
Confidence Interval Formula:	$\bar{x} \pm z(\alpha/2) \frac{\sigma}{\sqrt{n}}$	$\bar{x} \pm t(df, \alpha/2) \frac{s}{\sqrt{n}}$ with $df = n - 1$	$p' \pm z(\alpha/2) \sqrt{\frac{p'q'}{n}}$	$\frac{(n-1)s^2}{\chi^2(df, \alpha/2)} < \sigma^2 < \frac{(n-1)s^2}{\chi^2(df, 1-\alpha/2)}$ with $df = n - 1$
Name of Hypothesis Test, H_0	One sample z -test, $H_0: \mu = \mu_0$	One sample t -test, $H_0: \mu = \mu_0$	One sample test of proportion $H_0: p = p_0$	One sample test for Variance $H_0: \sigma^2 = \sigma_0^2$
Test Statistic Formula:	$z^* = \frac{\bar{x} - \mu_0}{\sigma/\sqrt{n}}$	$t^* = \frac{\bar{x} - \mu_0}{s/\sqrt{n}}$ with $df = n - 1$	$z^* = \frac{p' - p_0}{\sqrt{\frac{p_0 q_0}{n}}}$	$\chi^{2*} = \frac{(n-1)s^2}{\sigma_0^2}$ with $df = n - 1$
p-value:	$H_a: \mu > \mu_0$, p-value= $P(z \geq z^*)$ $H_a: \mu < \mu_0$, p-value= $P(z \leq z^*)$ $H_a: \mu \neq \mu_0$, p-value= $2 \times P(z \geq z^*)$	$H_a: \mu > \mu_0$, p-value= $P(t(df) \geq t^*)$ $H_a: \mu < \mu_0$, p-value= $P(t(df) \leq t^*)$ $H_a: \mu \neq \mu_0$, p-value= $2 \times P(t(df) \geq t^*)$	$H_a: p > p_0$, p-value= $P(z \geq z^*)$ $H_a: p < p_0$, p-value= $P(z \leq z^*)$ $H_a: p \neq p_0$, p-value= $2 \times P(z \geq z^*)$	$H_a: \sigma^2 > \sigma_0^2$, p-value= $P(\chi^2(df) \geq \chi^{2*})$ $H_a: \sigma^2 < \sigma_0^2$, p-value= $P(\chi^2(df) \leq \chi^{2*})$ $H_a: \sigma^2 \neq \sigma_0^2$, p-value= $2 \times P(\chi^2(df) \geq \chi^{2*})$

Case 2: Two Numerical Variables (Populations)

Assumption	Dependent Samples (Paired Samples)
Parameter of interest:	Mean Difference, $\mu_d = \mu_1 - \mu_2$
Confidence Interval Formula:	$\bar{d} \pm t(df, \alpha/2) \frac{s_d}{\sqrt{n}}$ with $df = n - 1$ where $d = x_1 - x_2$
Name of Hypothesis Test, H_0	Paired samples t -test, $H_0: \mu_1 = \mu_2$
Test Statistic Formula:	$t^* = \frac{\bar{d}}{s_d/\sqrt{n}}$ with $df = n - 1$
p-value:	$H_a: \mu_1 > \mu_2$, p-value= $P(t(df) \geq t^*)$ $H_a: \mu_1 < \mu_2$, p-value= $P(t(df) \leq t^*)$ $H_a: \mu_1 \neq \mu_2$, p-value= $2 \times P(t(df) \geq t^*)$