CI for a single population proportion (p)

Conditions

1) The data comes from a random sample.
2) $n * \widehat{p} \geq 10$ (Success Condition)
3) $n * (1 - \widehat{p}) \geq 10$ (Failure Condition)

Note: Success and Failure conditions count the # of successes and # of failures respectively.

Formula

$\widehat{p} \pm z^* \times \sqrt{\frac{\widehat{p}(1-\widehat{p})}{n}}$

z^* is the appropriate value from the normal distribution that gives us the Confidence % that we want

- 95% Confidence $\rightarrow z^* = 1.96$
- 80% Confidence $\rightarrow z^* = 1.282$
- 90% Confidence $\rightarrow z^* = 1.645$
- 99% Confidence $\rightarrow z^* = 2.576$

CI for a difference in population proportions $(p_1 - p_2)$

Conditions

1) Data for both groups comes from a random sample.
2) $n_1 * \widehat{p}_1 \geq 10$ (Success Condition Grp 1)
3) $n_1 * (1 - \widehat{p}_1) \geq 10$ (Failure Condition Grp 1)
4) $n_2 * \widehat{p}_2 \geq 10$ (Success Condition Grp 2)
5) $n_2 * (1 - \widehat{p}_2) \geq 10$ (Failure Condition Grp 2)

Note: Success and Failure conditions count the # of successes and # of failures respectively.

Formula

$(\widehat{p}_1 - \widehat{p}_2) \pm z^* \times \sqrt{\frac{\widehat{p}_1(1-\widehat{p}_1)}{n_1} + \frac{\widehat{p}_2(1-\widehat{p}_2)}{n_2}}$

z^* is the appropriate value from the normal distribution that gives us the Confidence % that we want

- 95% Confidence $\rightarrow z^* = 1.96$
- 80% Confidence $\rightarrow z^* = 1.282$
- 90% Confidence $\rightarrow z^* = 1.645$
- 99% Confidence $\rightarrow z^* = 2.576$

Confidence Interval for a Single Mean

Conditions

1) The *population* is Normal **OR** the sample size $n \geq 30$
2) There was a random sample

95% Confidence Interval Formula (σ known)

$\overline{x} \pm 1.96 \times \frac{\sigma}{\sqrt{n}}$

100(1-α)% Confidence Interval Formula (σ known)

$\overline{x} \pm z^* \times \frac{\sigma}{\sqrt{n}}$

value of z^* determined by confidence level.

Common values of z^*:

- 95% confidence $\rightarrow z^* = 1.96$
- 80% confidence $\rightarrow z^* = 1.28$
- 90% confidence $\rightarrow z^* = 1.64$
- 99% confidence $\rightarrow z^* = 2.58$

100(1-α)% Confidence Interval Formula (σ unknown)

$\overline{x} \pm t_{(1-\alpha/2, df=n-1)} \times \frac{s}{\sqrt{n}}$

where $t_{(1-\alpha/2, df=n-1)}$ is the $1 - \alpha/2$ quantile for a t-distribution with n-1 degrees of freedom (use `qt()` to get final values).

Confidence Interval for Difference in Means

Conditions

1) The *populations* are Normal **OR** the both sample sizes $n_1 \geq 30$ and $n_2 \geq 30$
2) There was a random sample for both groups.

100(1-α)% Confidence Interval Formula (σ unknown)

$(\overline{x}_1 - \overline{x}_2) \pm t_{(1-\alpha/2, df)} \times \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$

where $t_{(1-\alpha/2, df)}$ is the $1 - \alpha/2$ quantile for a t-distribution with degrees of freedom $df = min(n_1, n_2) - 1$ (use `qt()` to get final values).