Confidence Interval Information

Confidence Intervals if \( \sigma \) is Known

Point estimate \( \pm \)

EBM (Error bound for a population mean)

*EBM is also known as the "Margin of Error"

\( \alpha \) = 1-CL

\( \frac{\alpha}{2} = \frac{1 - \text{CL}}{2} \)

Confidence Intervals if \( \sigma \) is Not Known

Use the “sample standard deviation” or \( s \) instead. Because of this, we have to use \( t \) distributions.

Point estimate \( \pm \)

EBM (Error bound for a population mean)

*EBM is also known as the “Margin of Error"

\( \bar{x} \pm t_{\frac{\alpha}{2}}(\frac{s}{\sqrt{n}}) \)

Confidence Intervals for Proportions

\( \hat{p} \) (\( p \) hat) OR \( p'(p) \) = sample proportion (think number of successes from Binomial Distributions)

If it’s wearing a “hat” it’s from a sample, not a population. No “hat” then it’s a population parameter!

Point estimate \( \pm \)

EBM (Error bound for a population mean)

\( \hat{p} = \frac{x \text{ (number of successes)}}{n \text{ (sample size)}} \)

*EBM is also known as the “Margin of Error”

\( \hat{p} \pm z_{\frac{\alpha}{2}}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \)
We use the “Standard Normal Distribution” to calculate \( z_{\frac{\alpha}{2}} \)

\[ \frac{\alpha}{2} = 1 - CL \]

To find \( z_{\frac{\alpha}{2}} \) using Desmos:

\[ \text{inversecdf(normaldist}(0,1), \text{CL} + \frac{\alpha}{2}) \]

We are trying to capture the true population mean (\( \mu \), this is a parameter) with this confidence interval!

\( \hat{q} \) or \( \hat{p} \pm z_{\frac{\alpha}{2}} \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \)

Where \( \hat{q} = 1 - \hat{p} \)

Point estimate \( \pm \) EBP (Error bound for a population proportion)

*EBP is also known as the “Margin of Error”

DF=Degrees of Freedom= \( \text{}(n - 1) \)

CL=Confidence Level

\[ \frac{\alpha}{2} = \frac{1 - CL}{2} \]

We use the “Standard Normal Distribution” to calculate \( z_{\frac{\alpha}{2}} \)

To find \( z_{\frac{\alpha}{2}} \) using Desmos:

\[ \text{inversecdf(normaldist}(0,1), \text{CL} + \frac{\alpha}{2}) \]

We are trying to capture the true population mean (\( \mu \), this is a parameter) with this confidence interval!

\( \hat{q} \) or \( \hat{p} \pm \text{EBP} \) (Error bound for a population proportion)

*EBP is also known as the “Margin of Error”

DF=Degrees of Freedom= \( \text{}(n - 1) \)

CL=Confidence Level

\[ \frac{\alpha}{2} = \frac{1 - CL}{2} \]

We use the “Standard Normal Distribution” to calculate \( z_{\frac{\alpha}{2}} \)

To find \( z_{\frac{\alpha}{2}} \) using Desmos:

\[ \text{inversecdf(normaldist}(0,1), \text{CL} + \frac{\alpha}{2}) \]

We are trying to capture the true population mean (\( \mu \), this is a parameter) with this confidence interval!
We are trying to capture the true population proportion (\(p\)), this is a parameter) with this confidence interval!

by Katryn Weston