Estimating Means and Proportions

Estimating Proportions

$\hat{p} = \frac{x}{n}$

α = 1 – confidence interval

find $\left(Z_{\frac{\alpha}{2}}\right)$ in Excel = normsinv(1- $\frac{\alpha}{2}$)

upper bound $\hat{p} + \left(Z_{\frac{\alpha}{2}}\right) * \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$

lower bound $\hat{p} - \left(Z_{\frac{\alpha}{2}}\right) * \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$

$$n = \frac{\left(Z_{\frac{\alpha}{2}}\right)^2 * \hat{p}(1-\hat{p})}{(error)^2}$$

Margin of Error

$$\left(Z_{\frac{\alpha}{2}}\right) * \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$\hat{p}$= population portion
σ = population standard deviation
n = sample size
s = sample standard deviation
c = confidence interval
s^2= sample variance
α = alpha
degrees of freedom (df) = n-1
Find $t_{\frac{\alpha}{2}}$ = look up df and $\frac{\alpha}{2}$ on table
X^2= chi
Find $X^2{}_{\frac{\alpha}{2}}$ = look up df and $\frac{\alpha}{2}$ on the table
Find $X^2{}_{(1-\frac{\alpha}{2})}$ = look up df and (1 - $\frac{\alpha}{2}$) on the table

Intro to Estimating Population Means

1. Is population standard deviation (σ) know?

Yes-Is the population normally distributed or is the sample size at least 30?

- Yes-use normal distribution
- No-Use more advanced statistical techniques

No-Is the population normally distributed or is the sample size at least 30?

- Yes-Use t distribution
- No-Use more advanced statistical techniques

Estimating Means: Sigma Known

$$n = \left(\frac{\left(Z_{\frac{\alpha}{2}}\right) * \sigma}{error}\right)^2$$

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Margin of Error (MOE) (σ known)

$$E = \left(Z_{\frac{\alpha}{2}}\right) * \left(\frac{\sigma}{\sqrt{n}}\right)$$

Bounds $\bar{x}$ + E and $\bar{x}$ – E

Estimating Means: Sigma Unknown

$$\bar{x} \pm \left(Z_{\frac{\alpha}{2}}\right) * \left(\frac{\sigma}{\sqrt{n}}\right)$$

$$\bar{x} \pm \left(t_{\frac{\alpha}{2}}\right) * \left(\frac{s}{\sqrt{n}}\right)$$

Estimating Population Variance

Confidence intervals for population variance

$$\frac{(n-1)s^2}{X^2{}_{\frac{\alpha}{2}}} < \sigma^2 < \frac{(n-1)s^2}{X^2{}_{(1-\frac{\alpha}{2})}}$$

Confidence intervals for population standard deviations

$$\sqrt{\frac{(n-1)s^2}{X^2{}_{\frac{\alpha}{2}}}} < \sigma < \sqrt{\frac{(n-1)s^2}{X^2{}_{(1-\frac{\alpha}{2})}}}$$

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