std error measure the spread of the sample mean around true population mean.

Date * reflect how much variability you would expect if you were to take many d/f samples from same pop.

Consider the following example that out of 1211 voters about 51% votes were for miss hyde Smith and remaining we none....

Bernoulli Problem
X

No. of sampled voters for Ms. smith $\Rightarrow 1211(0.51) \Rightarrow 618$

No. of sample " not for " " $\Rightarrow 1211(0.49) \Rightarrow 593$.

$E(X) \Rightarrow (1)(0.51) + (0)(0.49)$.

$$\text{std unbiased}\{x\} \Rightarrow \sqrt{\frac{1}{N-1} \Sigma (X_i - X)}$$

$$\Rightarrow \sqrt{\frac{1}{1211-1} \quad 618(1-0.51)^2 + 593(0-.51)^2} \Rightarrow 0.5$$

$$\text{std err}\{x\} \Rightarrow \frac{0.5}{\sqrt{1211}} \Rightarrow 0.014.$$

CONFIDENCE INTERVALS.

Defined in a fraction it tells about how many units of std err are being covered. e.g.

95% CI suggests (of realizied sample means) that the population mean lies in.

[sample mean + 2 std err, sample mean - 2 std err].

68% CI "

[sample mean - std err, sample mean + std err]

99.7% [sample mean - 3 std err, sample mean + 3 std err]

Date

Example:-

As there canbe two outcome letsdefined the Random variables

$X=1$ apples are fuji $21/30 \Rightarrow 0.7$
$X=0$ apples are gala $9/30 \rightarrow 0.3$

$E[X] = \Sigma x P(x)$ or $1/n \Sigma X_i$ $V(X) = E(X^2) - E(X^2)$

$= (1)(0.7) + 0.(0.3) \Rightarrow 0.7.$ ✓

or $\sigma = \sqrt{V(X)}$
$\Rightarrow 0.466.$

$$\text{std unbiased}(\{x\}) = \sqrt{\frac{1}{30-1} \times (21 \times (1-0.7)^2 + 9(X)(0-0.7)^2}$$

$$\Rightarrow \sqrt{0.21724} \qquad \Rightarrow 0.466.$$

Confidence interval of Mean

95% CI = ?

$\bar{X} \pm Z_{\alpha/2} \frac{\sigma}{\sqrt{n}}.$

$\bar{X}$: expected value → complete samplemean

$Z_{\alpha/2}$: Zcritical value deduced and defined by confidence interval.

confidence level = $1-\alpha$
$\Rightarrow 1 - 0.95$
$\Rightarrow 0.05$
$\Rightarrow 0.025$ at each tail.

Right tail   left tail.

0.025   0.975

the Zcritical values are -1.96 $+1.96$.

∴ 95% CI of our given problem is.

$\Rightarrow [0.7 + (1.96)(0.085), 0.7 - (1.96)(0.085)]$

$\Rightarrow [0.534, 0.866]$ Ans!

Example:-

Sample $\Rightarrow \{2.5, 7.4, 8.0, 4.5, 7.4, 9.2\}$

$n = 6$

Sample mean $= 6.50$. Std. deviation $= 2.2$.

Z critcal values for 95% CI are given as.

$\Rightarrow +1.96$

$\Rightarrow -1.96$.

$6.50 \pm (1.96) \frac{2.2}{\sqrt{6}} \Rightarrow [4.74, 8.26]$

dof controls shaple as it ↑ it comes close to normal.

and bell shaped