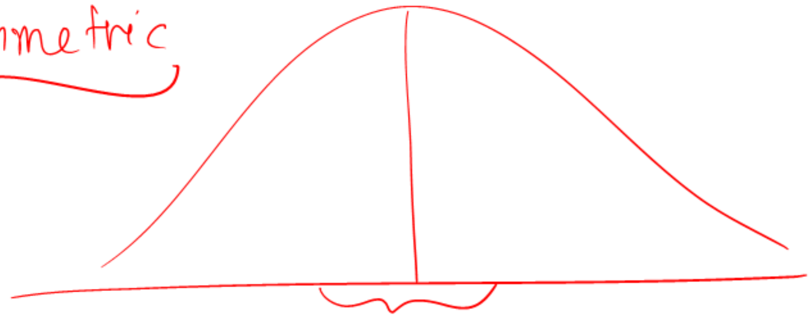
in pop : symmetric



$\bar{X}$

real value of para : θ $\Rightarrow$ bias $:= E(\theta - \hat{\theta})$

estimator of para : $\hat{\theta}$ var of estimator : $var(\hat{\theta})$.

$MSE := bias^2 + var(\hat{\theta})$: it is a criteria to evaluate the estimator. Estimator with smaller MSE is better.

eg : pop. mean $= \mu$

sample mean : $\bar{X}$ is an estimator of μ.

bias $= 0$: $E(\bar{X} - \mu) = \mu - \mu = 0$.

$var(\bar{X})$

$MSE(\bar{X}) = var(\bar{X})$

θ : para has 2 estimators : $\hat{\theta} \longleftrightarrow \theta'$

$MSE(\hat{\theta})$ vs $MSE(\theta')$

generating 50 values from $N(100; \sigma = 15)$.

70 $\rightarrow$ 145 160

rnorm (- --)

Interpretation of 95% CI : with the same statistical method, 95% of the 95%CIs constructed will cover true parameter.

1^{st} sample, $n = 1K$, $\Rightarrow$ 95% CI for para

2^{nd} sample, $n = 1K$, $\Rightarrow$ 95% CI for para

⋮

N^{th} sample, $n = 1K$, $\Rightarrow$ 95% CI for para

95% of these N CIs will cover para.

Comparing estimators of μ : mean

can use different estimators to estimate mean $\underline{\underline{\mu}}$:

- Sample mean $\bar{X}$
- Sample median $q_{0.5}$
- Sample trimmed mean $\bar{X}_{0.1}$

$\begin{cases} \text{which estimator is better?} \\ \text{which criteria to determine the goodness?} \end{cases}$

para : θ

an estimator of θ : $\hat{\theta}$; bias $:\stackrel{def}{=} E(\hat{\theta}) - \theta$

eg: μ : pop. mean.

an estimator of μ is $\bar{X}$; For this $\bar{X}$ the bias:

$$\underline{E(\bar{X}) - \mu = 0}.$$