Mr. Neyman's 99.9% CI in Quiz 3 (captopril case study) (same as Mr. Fisher)

STAT 206
14 Feb 21

DD extra OH

$\hat{\Delta} \pm t_{n-1}^{-1} \, \hat{SE}(\hat{\Delta})$

$t_{n-1}^{-1}\left(1 - \frac{\alpha}{2}\right)$

99.9% = 100(1 − α)% with α = .001

n = 12

0.9995

(1) $t_{11}^{-1} \doteq t_{n-1}^{-1}$

.0005   0.999   .0005

0   4.44

d t
p t
q t
r t quantiles

$\hat{SE}(\hat{\Delta}) = \frac{s_D}{\sqrt{n}} \doteq 2.9$ mmHg

$\hat{\Delta} \doteq 18.6$ mmHg

$s_D \doteq 6.1$ mmHg

$\hat{\Delta} \pm 4.44 \, \hat{SE}(\hat{\Delta})$

18.6 ± 4.44(2.9) = (5.7, 31.5) mmHg
mmHg   mmHg

99.9% CI for Δ

0   5.7   18.6   31.5   mmHg

(devil's advocate) (null) ($\Delta = 0$), with Δ_0 marking the 0

since 0 is not in our 99.9% CI, the diff. between $\hat{\Delta} = 18.6$ mmHg & $\Delta_0 = 0$ mmHg is statsig to bias-adjust this interval if we suspect a positive bias of (say) 6 mm Hg, we would <u>shift</u> the interval to the left by 6 mm Hg (i.e., by subtracting 6 from $\hat{\Delta}$), & the result would no longer be <u>stat</u> sig

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the unreasonable power of the (like-IID, no bias) assumption in data science

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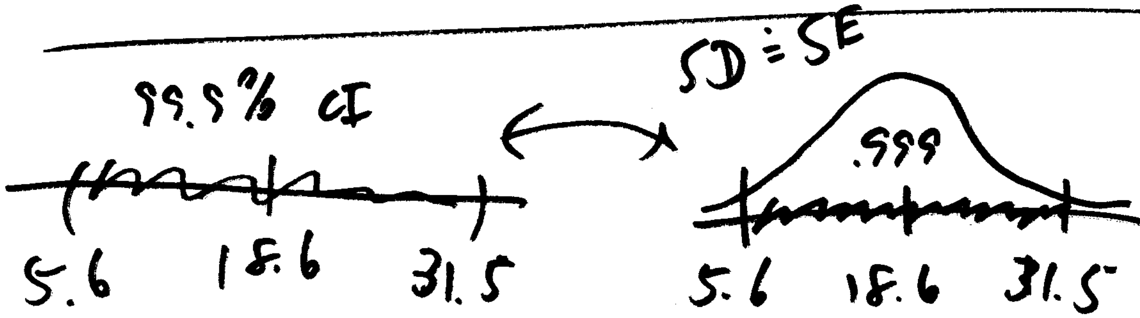

$p(\Delta \mid y \wedge \mathcal{NB} \wedge \mathcal{I})$ — no bias, prior

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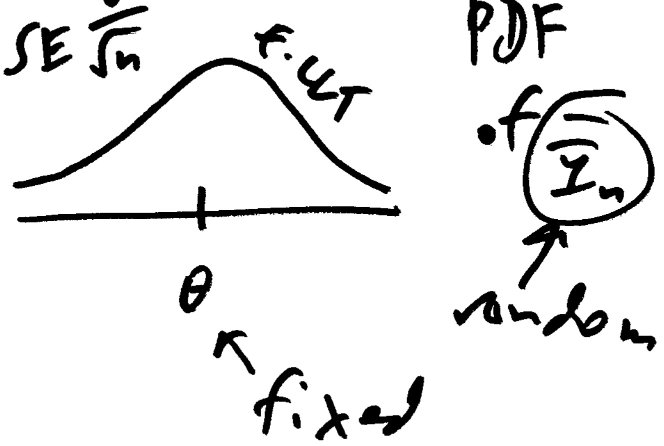
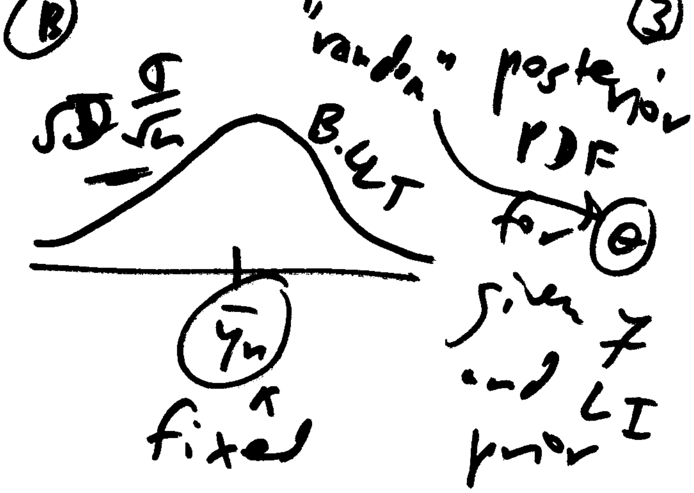
$\sigma = 1$ $\qquad \dfrac{b}{SE} = c$ $\quad\Big|\quad$ $\dfrac{b}{\sigma / \sqrt{n}} = \dfrac{b\sqrt{n}}{1} = c$





Normal PDF

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$$c_1 \exp\left[-c_2(\bar{Y}_n - \theta)^2\right] \qquad \bar{y}_n$$

$$\overset{c_1}{\cancel{c_3}} \exp\left[-\overset{c_2}{\cancel{c_4}}(\theta - \bar{y}_n)^2\right]$$

when n is (large) (CLT) & a LI prior is appropriate from $\mathbb{C}$,

$$C_1 \exp\left[-c_2(\bar{y}_n - \theta)^2\right]$$

$$\left(\text{frequentist inference}\right) \doteq \left(\text{Bayesian inference}\right)$$

Bernstein-von Mises theorem

if you draw k inferential conclusions, each at $100(1-\alpha)\%$ confidence level, your overall chance of at least one false-(~~positive~~ discovery) mistake is higher than $\alpha\%$

(~~multiple-comparisons~~ multiplicity) problem

Bonferroni adjustment (to be continued)

$$P(1 \text{ or more H in 4 tosses}) =$$

$$1 - P(0 \text{ H in 4 tosses}) =$$

$$1 - \left(\tfrac{1}{2}\right)^4 \doteq 0.94$$