This problem was due extra credit quiz is now available

social office hour Mon. 30 Jul 4pm -

\[ k \to 2 - k \]

9.49)

\[ k = 2 \]

\[ (v_1, v_2) \]

\[ A = A \]

\[ k \to k \to k \to k \to k \to k \]

\[ \det(A) \neq 0 \]

( \( A \) full rank)

\[ E(\overline{D}_n) = \Delta \quad V(\overline{D}_n) = \frac{\sigma^2}{n} \]

\[ SD(\overline{D}_n) = \sqrt{V(\overline{D}_n)} = \frac{\sigma}{\sqrt{n}} \]

\[ \text{standard error} \]

Lupul's (butterfly) vote (butterfly) vote
Given this dataset & little or no info. about \( \Delta \) external to \( D \), we would conclude (infer) that \( \Delta \) is around \( \overline{\Delta_n} = 18.6 \) give or take \( 2.9 \) \( \text{SD} \).
Estimated \( SE(D_n) = \hat{SE} \left( \overline{D}_n \right) = \frac{\hat{S}_d}{\sqrt{n}} \)

\[ = \frac{10.1 \text{ mm Hg}}{\sqrt{12}} = 2.92 \approx 2.9 \text{ mm Hg} \]

(Jerry) (Frequentist)

\( \overline{D}_n \)

\( \Delta \pm 2SE \)

\( \Delta \pm 2SE \)

\( \Delta \approx \overline{D}_n - 2SE \)

\( P(\Delta - 2SE \leq \overline{D}_n \leq \Delta + 2SE) = 0.95 \)

\( \Delta \leq \overline{D}_n + 2SE \)

\( P(\overline{D}_n - 2SE \leq \Delta \leq \overline{D}_n + 2SE) = 0.95 \)

\( \uparrow \) random \( \uparrow \) fixed \( \uparrow \) unknown \( \uparrow \) known

as an approximate 95% confidence interval for \( \Delta \)

Neyman proposed \( \overline{D}_n \pm 2SE(\overline{D}_n) \) for confidence interval for \( \Delta \)
\( -95\% \text{ CI for } \Delta \rightarrow \)

\[
\begin{align*}
18.6 & \quad 18.6 & \quad 18.6 + 5.8 & \quad = 24.4 \\
-5.8 & & & \\
12.8 & & & 
\end{align*}
\]

We're pretty sure (95\% confident) that 0 is between 12.8 and 24.4.

**Devil's Advocate**

\[ \left( \begin{array}{c} 0 \\ 7 \\ 13 \\ 19 \\ 24 \end{array} \right) \rightarrow \]

Since \( \Delta_0 = 0 \) (null value) is not inside the 95\% CI, the diff between 0 & \( \bar{Y}_n = 18.6 \) is statistically significant.

\( \rightarrow \) difficult to attribute to unlucky random sampling \( \rightarrow \) probably real
Confidence ≠ probability

95% of the intervals would be hits

Your confidence is in the process of building the CI, not in the outcome from any single sample
we cheated by pretending $\sigma_0 = 5$.

PDF of $\delta_n$, accounting for uncertainty about $\sigma$.

William Gosset
(1908) (Guinness Brewery)