THT 2 | 8 1(D)

ex. $(Y_i \mid \mu\, \sigma\, [SM:N]\, \mathcal{B}) \overset{IID}{\sim} N(\mu, \sigma^2) \quad (i = 1, \dots, n)$

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(D) extra 04

①

$\hat{\mu}_{MLE} = \bar{y}$

fact: $s^2 = \frac{1}{n-1} \sum_{i=1}^{n} (y_i - \bar{y})^2$

$\hat{\sigma}^2_{MLE} = \frac{1}{n} \sum_{i=1}^{n} (y_i - \bar{y})^2 \longrightarrow E_{\underline{\underline{RS}}}(s^2) = \sigma^2$,

i.e., s^2 is unbiased for σ^2

$$\sigma^2 = E_{RS}(s^2) = E\left[\frac{1}{n-1} \cdot \underline{\sum_{i=1}^{n} (Y_i - \bar{Y})^2}\right]$$

$$\text{so} \quad (n-1)\,\sigma^2 = E\left[\sum_{i=1}^{n} (Y_i - \bar{Y})^2\right]$$

$$E(\hat{\sigma}^2_{MLE}) = E\left[\frac{1}{n} \sum_{i=1}^{n} (Y_i - \bar{Y})^2\right]$$

$$\text{so} \quad n\, E(\hat{\sigma}^2_{MLE}) = E[\quad] = (n-1)\,\sigma^2 \qquad \underline{\underline{O}}\left(\tfrac{1}{n}\right)$$

$$\text{so} \quad E(\hat{\sigma}^2_{MLE}) = \frac{n-1}{n}\,\sigma^2 = \sigma^2 - \frac{1}{n}\sigma^2 \quad \text{bias}$$

MCMC dataset

$$
\begin{array}{c|c|c|c|c|c|c|c|c}
 & \mu & \tau_\theta & \theta_1 & \theta_2 & \cdots & \theta_6 & \sigma = \frac{1}{\sqrt{\tau_\theta}} & I(\mu > 0) \\
\hline
0 & & & & & & & & \\
1 & & & & & & & & \\
\vdots & & & & & & & & \\
B & & & & & & & & \\
\hline
B+1 & & & & & & & & \\
\vdots & & & & & & & & \\
B+m & & & & & & & &
\end{array}
$$

$P(A|B) = E[I(A|B)]$

RJAGS:

$$
\text{step}(mu) = \begin{cases} 1 & \text{if } mu > 0 \\ 0 & \text{else} \end{cases}
$$

$P(\mu > 0 \mid y\ [SM][PM]\ B)$

effect of aspirin on mortality in the ~~[illegible]~~ pop. $\left[\left(\underline{\overset{C}{\text{mortality}}} \right) - \left(\underline{\overset{T}{\text{mortality}}} \right) \right]$