Class 2 Clicker Question 1

$$\text{logratio} = \beta_0 + \beta_1 \,\text{range} + \beta_2 \,\text{range} \sin\left((\text{range} - 400)\,\pi/300\right) + \varepsilon$$

Can we use a straightforward least-squares algorithm (`lsfit` or `lm` in `R`) to fit β_0, β_1, and β_2 in this model?

A Yes, because it is a sum of terms

B Yes, because the β_j parameters appear linearly

C No, because it involves the sin function, which is nonlinear

D No, because it is nonlinear in the β_j parameters

E I have no idea.

Class 2 Clicker Question 2

$$
\begin{aligned}
\text{logratio} &= \beta_0 + \beta_1 \text{range} \\
&+ \beta_2 \text{range} \sin\left((\text{range} - 400)\,\pi/300\right) \exp\left(\beta_3 \left(\text{range} - 400\right)/500\right) \\
&+ \beta_4 \text{range} \cos\left((\text{range} - 400)\,\pi/300\right) \exp\left(\beta_5 \left(\text{range} - 400\right)/500\right) \\
&+ \varepsilon
\end{aligned}
$$

Can we use a straightforward least-squares algorithm (`lsfit` or `lm` in `R`) to fit the β_j parameters in this model?

A Yes, because it is a sum of terms

B Yes, because the β_j parameters appear linearly

C No, because it involves the sin, cos, and exp functions, which are nonlinear

D No, because it is nonlinear in the β_j parameters

E I have no idea.

Class 2 Clicker Question 3

For the trades.union data, relating wage to age, does the linear model or the nonlinear model make more sense?

A Linear, because it is simpler

B Linear, because expected wage increases linearly with age

C Nonlinear, because expected wage does not increase linearly with age

D Nonlinear, because expected wage does not increase with age

E I have no idea.

Class 2 Clicker Question 4

Consider a regression model with piecewise linear spline functions

$$f_k(x) = (x - \kappa_k)_+ = \begin{cases} x - \kappa_k & \text{if } x - \kappa_k > 0 \\ 0 & \text{otherwise} \end{cases}$$

Can we use a straightforward least-squares algorithm (`lsfit` or `lm` in `R`) to fit the β_j parameters in this model?

A Yes, because it is linear in the β_j

B Yes, but only if the κ_k knots are known and not to be estimated too

C No, because the basis functions are nonlinear

D No, because the basis functions cannot be differentiated with respect to x

E I have no idea.