ST495/590 – Assignment 6 – Due 3/16

Extract the number of Atlantic hurricanes each year from 1950-2015 from

`https://en.wikipedia.org/wiki/Atlantic_hurricane_season`

Define Y_t as the number of hurricanes in year $t + 1949$ (so Y_1 is the count in 1950 and Y_{66} is the count in 2015). We will model the counts using the piecewise linear covariates

$$X(t,u) = \begin{cases} 0 & \text{for } t < u \\ t-u & \text{for } t \geq u \end{cases}$$

(1) Using JAGS and uninformative priors, fit the model

$$\begin{aligned} Y_t|\lambda_t &\sim \text{Poisson}(\lambda_t) \\ \lambda_t &= \exp[\beta_0 + \beta_1 X(t,15) + \beta_2 X(t,30) + \beta_3 X(t,45)] \end{aligned}$$

(a) Perform thorough convergence diagnostics.

(b) Plot the data (i.e., a scatter plot of t versus Y_t) versus the fitted values (i.e., the lines λ_t evaluated at the posterior mean of the β_j). Does the model fit the data well?

(c) Is there evidence that the rate of hurricanes is changing over time?

(2) Using JAGS and uninformative priors for the β_j and σ^2, fit the model

$$\begin{aligned} Y_i|\lambda_t &\sim \text{Poisson}(\lambda_t) \\ \lambda_t &= \exp[\gamma_t + \beta_0 + \beta_1 X(t,15) + \beta_2 X(t,30) + \beta_3 X(t,45)] \\ \gamma_t &\sim \text{Normal}(0, \sigma^2) \end{aligned}$$

(a) Perform thorough convergence diagnostics

(b) Is there evidence that the rate of hurricanes is changing over time?

You should turn in your responses to these questions in 3-4 pages (i.e., two pieces of paper with text on both sides). You should also turn in a separate file with carefully commented code. Only output in the 3-4 page document will be graded. Please staple both documents together!