Statistics 601, Spring 2018

Assignment 1

On the course web page in the folder Handouts and Extras is a copy of a 1935 paper by C.J. Bliss that is one of the classic papers on the analysis of quantal response data. This paper contains the so-called 'Bliss Beetle Data' – see Table IV in the paper.

Using data from both acute toxicity experiments (called 'Series' in the paper), conduct an analysis using a generalized linear model having a binomial random component and using Pregibon's one-parameter link as given in expression (1.20) in the course notes. Note that in the course notes Table 1.1 presents these data *summed across* the two individual experiments. You should use the individual values. As part of your analysis:

1. Test the model with estimated link against the simpler model with a fixed logit link. Do this separately for each of the 'Series' for which data are given in the paper. Provide details about the procedure you used to accomplish this.

2. Determine whether there are any differences between the two Series. That is, would you prefer two different models, one for each Series, or just one model that applies to both? Use whatever statistical procedure you believe is appropriate to make this determination. Provide details about the procedure you select.

3. Present your final model along with estimated response curve(s) and 90% pointwise confidence band(s). Also plot the estimated tolerance distribution(s). Provide relevant details about how this was accomplished (if not already provided).

4. Assess your model fits for whatever final model you have arrived at (some

combination of one versus two groups and logit versus estimated link). For example, if you determine there is no difference between the two Series and a model having a logit link is your preferred model, then assess a basic glm with binomial random component and logit link fit to the combined data set. Provide details of the procedure you choose to accomplish this assessment.

5. Provide a sentence or two that indicates how you accomplished computation for this assignment, such as writing your own code, writing code to expand on functions provided in Stat 520, searching the web for an R package that someone wrote to accomplish this, etc.

NOTE: The phrase "Provide details about . . ." means you should include material similar to what you would put in a manuscript, if you were preparing one on this topic.