SMM637 Answers - GLM

1. In this model it is assumed that clotting time has a gamma distribution with mean equal to the reciprocal of a linear function of the explanatory variables. The explanatory variables are `lconc`, an indicator variable `lot`, for the lot of thromboplastin and an interaction term.

   [Strictly speaking, a gamma distribution has two parameters. We should add the assumption that the variance of the gamma distribution is proportional to the square of its mean, which is what assuming a constant 'dispersion parameter' implies].

2. The significant interaction term in the model implies that the relationship is different for the two lots. According to this model, reciprocal mean clotting time increases by 0.008256 per unit of `lconc` more with lot 2 material than with lot 1.

3. For lot 1, the fitted equation is

$$E[\texttt{clottime}] = \frac{1}{-0.016554 + 0.015343\texttt{lconc}}$$

   And, the fitted equation for lot 2 is

$$\begin{aligned} E[\texttt{clottime}] &= \frac{1}{(-0.016554 - 0.007354) + (0.015343 + 0.008256)\texttt{lconc}} \\ &= \frac{1}{-0.023908 + 0.023599\texttt{lconc}} \end{aligned}$$

   If the plasma concentration was 50% and lot 2 was used, we would predict a clotting time of

$$\frac{1}{-0.023908 + 0.023599\log(50)} = \frac{1}{0.0684} = 14.62 \text{ seconds}$$

4. Since exponential regression is a special case of gamma with the dispersion parameter equal to 1, we look at the estimated scale (dispersion) parameter. According to the fit of the model, the preferred model, the estimated dispersion parameter is 0.00210, which is not close to 1, so that exponential regression would not be appropriate.