Please see the class home page for detailed rules about homework.

1. Fit the “BodyWeight” data. Quoting from Pinheiro and Bates:

The body weights of the rats (in grams) are measured on day 1 and every seven days thereafter, until day 64, with an extra measurement on day 44. There are three groups of rats, each on a different diet.

We are interested in the effects of diets on growth and in the underlying variability structure of the data. Note that these animals clearly do not start out at the same weights. This may be because they have been on these diets for some time previous to the first measurement.

Do your analysis in R in the following order.

(a) Print the data by typing “BodyWeight”. At the top you will see the grouped data formula.

(b) Plot the data using “plot(BodyWeight,outer= ~ Diet)”. This reproduces Figure 5.6 in Pinheiro and Bates.

(c) Fit a model including all candidate fixed effects and random effects. In this case fixed effects are intercept, Time, Diet and the Time*Diet interaction and the possible random effects are intercept and Time. Fit the model and plot the residuals. Residuals can be plotted using “plot(lme.out)”.

(d) If the residuals do not seem homoscedastic try transforming the response using either log, square root, or cube root.

(e) Once you have residuals you are happy with try reducing the fixed effects (probably won’t work in this case given the data plot) or the random effects (try removing the random effect for slope). Check the residuals again. If they no longer look homoscedastic do not remove the term. If they are still OK test for significance of the terms you have removed. Significant → leave in, non-significant → remove.

(f) Try adding AR1 correlation to your model. Does it improve the fit? How does it effect the residuals?

(g) Plot the random effects using “pairs(lme.out)”. There is one unusual point. Can you explain this? Do you think further modeling is required?

2. Use PROC MIXED. in SAS to repeat the chick data analysis on pages 35-42 of my Analysis of Functional Data notes. The data file “chick.early” is provided on the class schedule web page.

Reproduce:

• The final fit (including all parameter estimates and tests).
• Plots 2.9 and 2.10