

Biostatistics 537: Longitudinal Data Analysis - Fall 2009

Problem Set 4 - Due: Thursday October 22, 2009

The data for this problem are from the Riesby *et al.*, article that we have discussed in class. This study examined the relationship in depressed inpatients between the drug plasma levels - the antidepressant imipramine (IMI) and its metabolite desimipramine (DMI) - and clinical response as measured by the Hamilton Depression Rating Scale (HDRS). In class, we noted that there was a significant relationship across time between the drug plasma levels (specifically, desimipramine) and depression. What I would like you to do for this assignment is examine the degree to which this posited relationship is influenced by the variance-covariance structure (of the dependent measure across time) that characterizes different statistical models of the data. The dataset RIESBYT4.DAT is available on the class website and contains the following variables:

field 1: Patient ID

field 2: HDRS change from baseline score

field 3: a field of ones (is “one” the loneliest variable?) - *ignore this variable*

field 4: Week - from 0 (week 2) to 3 (week 5)

field 5: sex (0 = male 1 = female) - *ignore this variable*

field 6: diagnostic group (0 = non-endogenous 1 = endogenous)

field 7: Imipramine (IMI) plasma levels (in ln units)

field 8: Desimipramine (DMI) plasma levels (in ln units)

For this problem (as in problem 3), I would like you to combine the drug plasma levels into one variable - the natural log (ln) of the ratio of DMI to IMI (*i.e.*, $\ln \text{DMI} - \ln \text{IMI}$). Let's denote this variable as LDIM. For this problem set do the following:

1. Consider a model with fixed effects of WEEK, WEEK², LDIM, ENDOG, and the interaction of ENDOG by LDIM. Decide on either ML or REML estimation and then perform a covariance structure selection using ideas discussed in class. What covariance structure do you settle upon (note: you may want to consider a few models with random effects, or covariance pattern models, or random effects plus autocorrelated errors of some sort)? What criteria do you use to make this selection? What is your interpretation of the covariance structure and the fixed effects in your model? Summarize your findings.
2. Suppose Researcher A says “covariance structure, my foot! If compound symmetry is good enough for my hairstyle, it's good enough for me!” and decides to do an analysis using the same fixed effects as above, but only allowing for a CS structure on the dependent variable across time. Is Research A likely to report any dubious findings with regards to the fixed effects in the model?
3. Suppose Researcher B says “covariance structure, my eye! If unstructured is good enough for my closet, it's good enough for me!” and decides to do the same analysis, but using an unstructured covariance structure for the dependent variable across time. Is Researcher B likely to report any dubious findings with regards to the fixed effects in the model?
4. Summarize your feelings regarding covariance structure selection, and its place in statistical modeling of longitudinal data.