Lab 3

Psychology 319 (GCM)

Instructions. Work through the lab, saving the output as you go. If you work in Microsoft Word, you can easily copy any graph to Word via the clipboard. Numerical output may also be copied easily by highlighting, moving it to the clipboard, then copying into Word. However, you should format R output in TrueType Courier New font so that it is *monospaced*. Output from this lab is to be handed in by Monday, February 15. Your output file should be named `LAST_FIRST_LAB3.DOC`, where `LAST` is your last name, and `FIRST` is your first name. Any additional files should have the same naming scheme, except the file extension should be correct. You may add any description text you wish after `LAB3` in the file name.

Preamble. Today's lab involves longitudinal analysis of some data from a pharmacological experiment.

1 Introduction

The file *REISBY5.TXT* contains data from a study by Reisby, et al., in the 1977 *Psychopharmacology 54*, 263–272, which can be downloaded through the Vanderbilt library system. This study is discussed at great length by Don Hedeker and Robert Gibbons in their text, *Longitudinal Data Analysis*. They describe the study as follows:

> This study focused on the longitudinal relationship between imipramine (IMI) and desipramine (DMI) plasma levels and clinical response in 66 depressed inpatients. Imipramine is the prototypic drug in the series of compounds known as tricyclic antidepressants, and is commonly prescribed for the treatment of major depression [Seiden and Dykstra, 1977]. Since imipramine biotransforms into the active metabolite desmethylimipramine (or desipramine), measurement of desipramine was also done in this study. Major depression is often classified in terms of two types. The first type, non-endogenous or reactive depression, is associated with some tragic life event such as the death of a close friend or family member, whereas the second type, endogenous depression, is not a result of any specific event and appears to

occur spontaneously. It is sometimes held that antidepressant medications are more effective for endogenous depression [Willner, 1985]. In this sample, 29 patients were classified as non-endogenous and the remaining 37 patients were deemed to be endogenous.

The study design was as follows. Following a placebo period of 1 week, patients received 225 mg/day doses of imipramine for four weeks. In this study, subjects were rated with the Hamilton Depression Rating Scale (HDRS) [Hamilton, 1960] twice during the baseline placebo week (at the start and end of this week) as well as at the end of each of the four treatment weeks of the study. These HDRS scores represent the dependent variable that is measured across time. Higher scores on the HDRS represent higher levels of depression and lower scores indicate less depression. Plasma level measurements of both IMI and its metabolite DMI were made at the end of each week; these will be treated as time-varying covariates. The sex and age of each patient was recorded and a diagnosis of endogenous or non-endogenous depression was made for each patient. These time-invariant (i.e., individual-level) variables are all potential covariates, though our analyses will only focus on diagnosis. Although the total number of subjects in this study was 66, the number of subjects with all measures at each of the weeks fluctuated: 61 at week 0 (start of placebo week), 63 at week 1 (end of placebo week), 65 at week 2 (end of first drug treatment week), 65 at week 3 (end of second drug treatment week), 63 at week 4 (end of third drug treatment week), and 58 at week 5 (end of fourth drug treatment week). Of the 66 subjects, only 46 had complete data at all time points. Thus, complete-case analysis under repeated measures MANOVA, for example, would discard approximately one-third of the data set. MRM, alternatively, uses the data that are available from all 66 subjects. (p. 53–54)

2 Lab Activities

Here is what I want you to do:

1. Load the data into R. The file I have provided has `ID` as the subject identification variabe, `WEEK` as the time variable, `HDRS` as the outcome variable, and `ENDOGENOUS` as the depression diagnosis.

2. Do a "double spaghetti plot" of the subjects individual trajectories, with the two plots representing `ENDOGENOUS = 1` and `ENDOGENOUS = 0`. What interesting trends (if any) do you detect?

3. Fit a random intercepts model in which the intercepts vary randomly across subjects, *but the slopes do not*. In this model, and the ones that follow, use `lmer`, and add the `REML = FALSE` option in order to get maximum likelihood estimates. Save the fit object as `model.1`

4. Fit a random slope and random intercept model in which both the slopes and intercepts vary randomly across subjects. Save the fit object as `model.2`. What is the intraclass correlation? Compute a deviance-based statistic to compare this model with the previous one. (Hint, you can use the `anova` command to compare the models.)

5. Add `ENDOGENOUS` as a predictor of both slopes and intercepts at level 2. Fit the new model and save the fit object as `model.3`. Perform a deviance test comparing this model with the preceding one.

6. By taking your estimates from `model.3`, you should be able to compute and plot overall estimated trajectories for `ENDOGENOUS = 1` and `ENDOGENOUS = 0`. What interesting trends (if any) do you detect?