REPEATED MEASURES

Assignment 10

This lab is intended to give you experience in working with RM-ANOVA models to analyze repeated measures data. You will use the `NHL-wide.csv` data to examine whether the latitude of an NHL team is related to FCI. Please submit your responses to each of the questions below in a printed document. Label the sections as indicated below within your printed document. All graphics should be resized so that they don't take up more room than necessary and have an appropriate caption. Any equations should be appropriately typeset within the document. There are 11 points possible for the assignment (each question is worth one point unless otherwise noted).

PREPARATION

To begin the assignment, you will need to first remove any cases with missing data. This should result in a data frame with 29 rows and 18 columns. Next, you will need to *melt* the complete cases data into the long format and assign it to another data frame for use in some of the analyses. You do not need to write a response to anything in this section; only follow the instructions to prepare your data for analysis. The instructions assume that the complete cases data are assigned to an object called `nhl2`

```
library(reshape2)
nhlLong = melt(
        nhl2,
        id = c("team", "lat"),
        measure = c("X2002", "X2003", "X2006", "X2007", "X2008",
                    "X2010", "X2011", "X2013", "X2014")
        )
```

This should result in a data frame with 261 rows and 4 columns. Then, do the following:

- Change the `variable` and `value` variable names to `year` and `fci` respectively.

- Change the levels of the `year` variable to remove the X from each level (e.g., X2002becomes 2002, etc.).

RM-ANOVA MODELS I

Answer the following questions. Please label this section as "RM-ANOVA MODELS I" in your document. For the questions in this section you will use the `lm()` function to fit the RM-ANOVA models. *Do not use the `ezANOVA()` function.*

1. Fit the RM-ANOVA model that one could use to appropriately test for the effect of `year`. Present the ANOVA table for this analysis in a table suitable for publication.

2. Compute the appropriate F-value to appropriately test for the effect of `year` using the results from the ANOVA table. Show your work.

3. Compute the p-value for the F-test to appropriately test for the effect of `year` using the `pf()` function. Show your syntax for full-credit.

4. Fit the RM-ANOVA model that includes the predictors of `year` and `latitude`. Present the ANOVA table for this analysis in a table suitable for publication. Be sure the appropriate F-values and p-values for the effects of year and latitude are also included in this table.

5. What do the results of this analysis suggest about the effect of latitude? Explain.

RM-ANOVA MODELS II

Answer the following questions. Please label this section as "RM-ANOVA MODELS II" in your document. For the questions in this section you will use the `ezANOVA()` function to fit the RM-ANOVA models.

6. Fit the RM-ANOVA model that only includes the `year` predictor. What do the non-epsilon-adjusted results of this analysis suggest about the effect of time? Explain.

7. Write the null-hypothesis associated with Mauchly's Test for Sphericity.

8. What do the results of Mauchly's Test suggest about whether the assumption of sphericity is adequately satisfied? Explain.

9. Based on the Greenhouse–Geisser estimate of epsilon, which epsilon-adjustment method should be reported. Explain.

10. Compute the epsilon-adjusted degrees of freedom associated with the appropriate F-test based on your answer to the previous question. Verify that the p-value for the F-test reported in the output is correct by verifying it using the `pf()` function. Show your syntax for full-credit. Report the results of this analysis (as if you were writing them up for publication) in no more than five sentences of text.

11. Fit the RM-ANOVA model that includes the predictors of `year` and `latitude`. What do the results of this analysis suggest about the effect of latitude? Explain.