STAT 506, Spring 2017: Homework 3

- Consider the data of Ex. 6.3, on the lethal dosage of cardiac relaxants on guinea pigs.

  (a) Fit the oneway ANOVA (separate means) model to these data and obtain the standard residual plots from R. Also obtain side-by-side boxplots of the data across groups. Is constant variance reasonable?

  (b) Obtain the `boxcox` analysis for these data and model (available in the `MASS` package); what transformation is suggested?

  (c) Use the transformation suggested in (b) and obtain an overall F-test of $H_0 : \mu_1 = \mu_2 = \mu_3 = \mu_4$. Follow this up with Tukey's procedure for SCI (which also protects SFER) using `lines` and `pairwise`. Which drugs are significantly different?

  (d) Comment on R's diagnostic panel for the data analyzed using the transformation: specifically, is constant variance reasonable? How about normality?

  (e) Let's analyze the data on the original scale. Assess normality within each group by looking at a NPP for dosage within each drug:

  ```
  library(oehlert)
  attach(ex06.3)
  par(mfrow=c(2,2))
  qqnorm(dosage[drug==1])
  qqnorm(dosage[drug==2])
  qqnorm(dosage[drug==3])
  qqnorm(dosage[drug==4])
  ```

  Are they reasonably straight? Obtain p-values for $H_0 : \mu_1 = \mu_2 = \mu_3 = \mu_4$ using both Welch and Brown-Forsythe; what do you conclude at the 5% level? Use the Games and Powell approach to pairwise comparisons as shown in the notes; this works for normal data where the groups have non-constant variance.

- Consider Ex. 6.4 data on the breakage rates of delivery companies A, B, C, and D.

  (a) Find a good power transformation using `boxcox` for the oneway ANOVA model.

  (b) Use Dunnett's procedure via `compare.to.best` to find the company (or companies) with the significantly lowest delivery rates at the 5% level using the transformed data.

  (c) Comment on R's standard residual plots, focusing on the residuals vs. fitted and the NPP (for the analysis using transformed data).

- Ex. 6.5.

- Ex. 7.2. To clarify, find the power when $n_1 = n_2 = n_3 = 6$. What sample sizes $n = n_1 = n_2 = n_3$ are needed to achieve power of at least 0.9?

- Pr. 7.2. What is the actual power for these sample sizes?