

Homework 5

Due Tuesday, October 22

Show all your work. Data files available on class website.

- Suppose that we have a model of the form $Y_i = \beta_0 + \beta_1 x_i + \beta_2 x_i^2 + e_i$, where $i = 1, 2, \dots, 8$, with $\mathbf{x} = (x_1, \dots, x_8)' = (1, 1, 0, 0, -1, -1, 0, 0)'$ and $\mathbf{Y} = (Y_1, \dots, Y_8) = (17, 2, 9, 19, 12, 15, 4, 10)'$. Write down the design matrix \mathbf{X} , find $\mathbf{X}'\mathbf{X}$ and $(\mathbf{X}'\mathbf{X})^{-1}$ (try to do these without R first), then run this model using `lm()` in R and verify the numbers from summary with matrix computation.
- From lecture, please confirm the numbers from `summary(ex0.lm)` by R matrix computation.
- Consider the dataset `twins` (from `alr4` package; see also `?twins`). Treat `IQf` as the response and `C` as the factor. Perform the ANOVA by writing down a model, providing a boxplot, reporting the summary and ANOVA table of `lm()`, and verifying `summary()` numbers by matrix computations in R. Repeat for response `IQb` and factor `C`. Interpret and comment.
- Consider the dataset `Ornstein` from `library(alr4)` (see `?Ornstein`).
 - Take `assets` as the response and `nation` as the factor. Perform the ANOVA by following the steps outlined in Problem 3.
 - Repeat part (a) with `sector` as the factor, but you may skip the `summary()` and matrix computation part.
 - Perform the two-way ANOVA with both factors, with and without the interaction (write down the models, provide the ANOVA tables and interaction plots). Interpret and comment on the results.
- Perform the two-way ANOVA with the following data, as outlined in Problem 4, part (c). Interpret and comment on the results.

	B_1	B_2	B_3
A_1	20,21	20, 26 22	30, 19
A_2	25, 28, 29	24, 22	29, 31, 28

- Please find the dataset `anova2.txt` (this will have the same set up as `anova1.txt` in lecture). Perform the three-way ANOVA, first with all possible interactions. What happens here? Re-run the model without some terms and report the results (please provide all appropriate tables and plots).
- Please find the dataset `anova3.csv`. Here, Y is the response variable, and A , B , C are factors. Perform the three-way ANOVA, first with all possible interactions. Then, run some different models, initially with no interactions, and then gradually adding the interaction terms (please provide all appropriate tables and plots). Comment on the results.