One-Way ANOVA and Multiple Comparisons

To make the sample code easier to understand, everything is named for what it represents (for example, the response variable is called “response”). The factor variable has four levels lettered A-D.

Note: Make sure to load the tidyverse, ggfortify, and emmeans packages with the library() function before performing this analysis.

```
#Generate Model
anova.fit <- aov(response ~ factor, data = dataset)
summary(anova.fit)
```

You can fit an ANOVA using the aov() function. The summary() function is used on the ANOVA object to generate output (F-statistic, p-value, degrees of freedom, etc.).

```
#Check Assumptions
autoplot(anova.fit)
```

The autoplot() function generates the four plots used to check the assumptions. This function is also used on the ANOVA object.

```
#Use emmeans
anova.mc <- emmeans(anova.fit, "factor")
```

```
#Tukey Test
contrast(anova.mc, "pairwise")
confint(contrast(anova.mc, "pairwise"))
plot(contrast(anova.mc, "pairwise"))
```

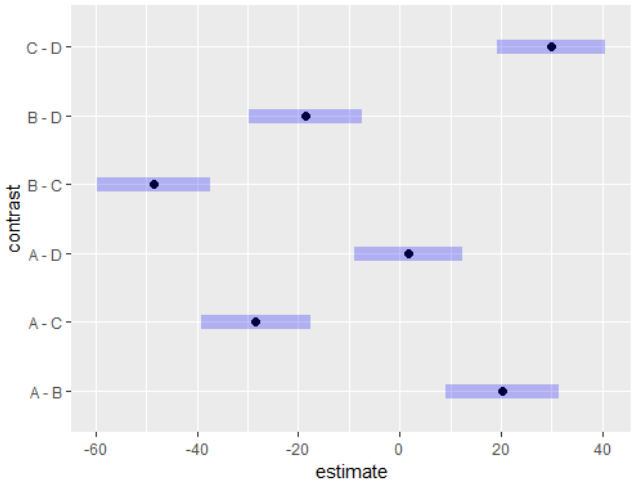
The Tukey Test is used when you want to see all possible combinations of factor levels (see left plot). Specifying “pairwise” is how R knows to use a Tukey Test (as opposed to other multiple comparison tests).

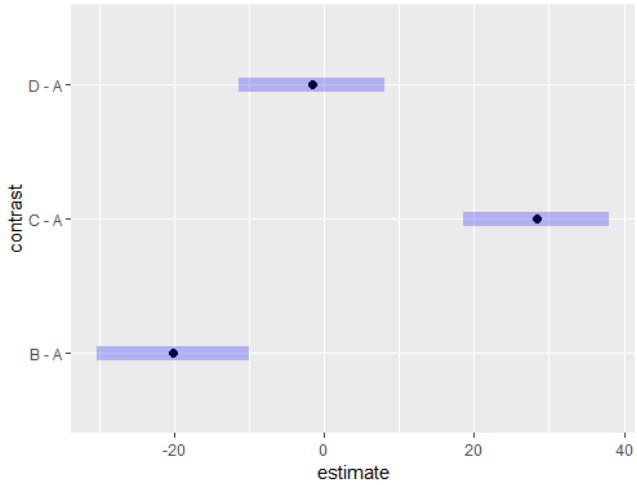
- Use the contrast() function to get p-values and determine significance.
- Use the confint() function to get confidence intervals for each comparison (remember that if a CI includes zero, it is not significant).
- Use the plot() function to visualize both the point estimate and the confidence interval (the plots below are examples of this function).

```
#Dunnet Multiple Comparisons
contrast(anova.mc, "trt.vs.ctrl", ref=2)
confint(contrast(anova.mc, "trt.vs.ctrl"))
plot(contrast(anova.mc, "trt.vs.ctrl"))
```

The Dunnett Test is used when you want to compare factor levels to a specified control level (see right plot). The syntax for Dunnett is the same as for the Tukey Test with two key differences:

- Use “trt.vs.ctrl” instead of “pairwise” (this is an abbreviation for treatment vs. control).
- Use ref= to set which factor level is the control. The first level is the default control.





Source: This sample data appears as the R dataframe `introoneway.RData` in the repository `http://users.miamioh.edu/hughesmr/sta363/.`