# PLANT-GROWTH EXPERIMENT

10.   Checking the Model Assumptions

The test procedures of ANOVA described in the previous sections are valid only if it is assumed that all heights are independent of one another, the dependent variable is normally distributed and that variances are equal for all treatment groups.

The most serious violation of the above assumptions is a lack of independence among observations. If the experiment is conducted according to the rules discussed in Section 4, there is no reason to suspect that the assumption might be violated.

There are twelve treatment groups, each consisting of two observations. Under the circumstances, it is very difficult to detect non-normality or obtain strong evidence that the assumption of equal variances is violated. Even visual inspection of the data shows that the spread of observations in all the groups is similar. In particular, it is easy to check that the variance for nine of the groups is 2. Moreover, the spread versus level plot displayed below also indicates strong support for the assumption.
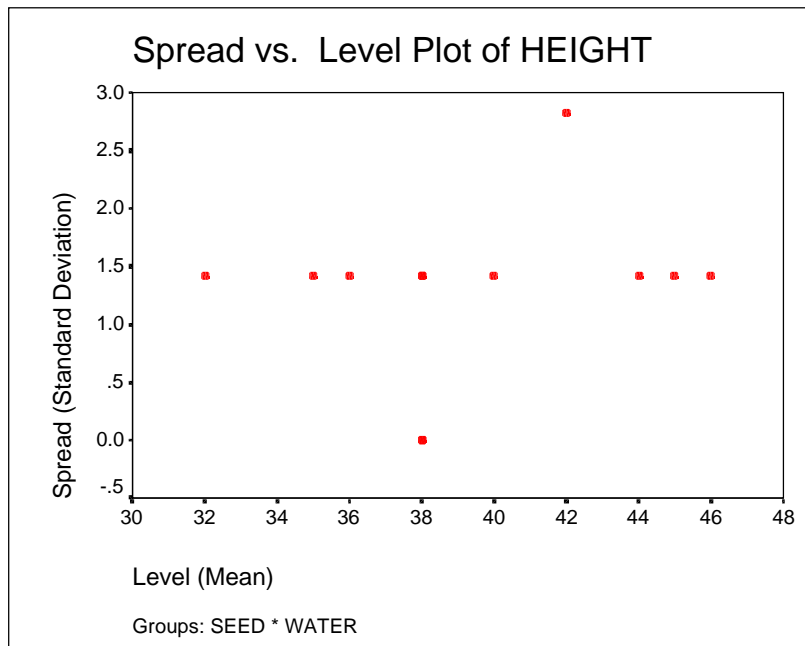
In general, analysis of variance is robust to departures from normality, although the data should be symmetric.

The matrix scatterplot of residuals is shown below. The plots are useful for checking assumptions about the data.

Dependent Variable: HEIGHT
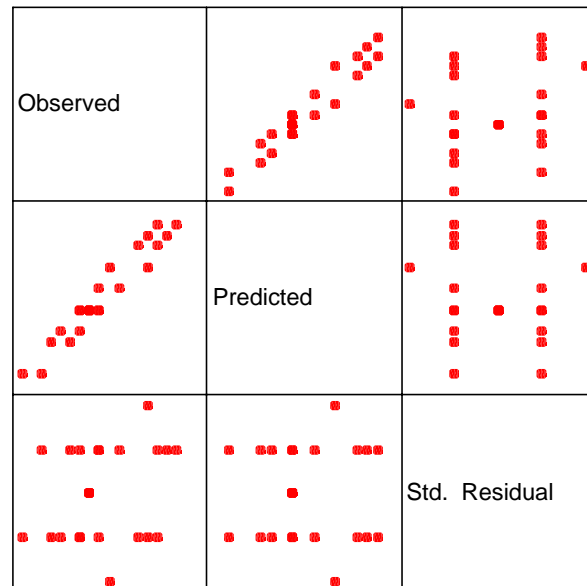
Model: Intercept + SEED + WATER + SEED*WATER

The plot of predicted versus observed values (left middle plot) is close to a straight line, which indicates a good fit. The standardized residuals versus the predicted values (middle lower plot) shows some non-random effects. As there are just two observations in each group, it is very difficult to make strong claims about non-normality or non-homogeneity of the variance.