Looking for Unequal Variances

Let's use PROC GLM to generate a box plot of the data in the **mydata.pressure2** data set. We will examine the ANOVA to determine whether the drugs have different effects on the change in blood pressure values and also verify the assumptions of the ANOVA.

We use the ODS Graphics statement IMAGEMAP=ON to specify whether data tips are generated. Let's run the following code.

```
ods graphics / imagemap=on;
ods select modelanova overallanova QQPlot ResidualHistogram boxplot
   HOVFTest;
proc glm data=mydata.pressure2 plots (unpack)=all;
   class drug;
   model bpchange=drug;
   means drug / hovtest;
   id drug;
run;
quit;
```

Let's look at the results.

Based on the graphs, the residuals appear to be normally distributed. The variances in **Bpchange** do not seem to be constant across different types of drugs. Notice that **Drug** is not significant (*p*-value = 0.0974) in this model.

The *p*-value for Levene's test is extremely small. Therefore, you reject the null hypothesis and conclude that the variances are not equal. This ANOVA assumption was violated. In this case, you met the normal distribution assumption but not the equal variance assumption. If you attempt to transform the response variable, you might be able to stabilize the variances, but you might violate the assumption of normality in the process.

Analysis with the GLM procedure assumes independence, constant variance, and normality. Other SAS/STAT procedures, such as MIXED, GLIMMIX, GENMOD, and SURVEYREG, fit statistical models to data with correlations or nonconstant variability.

One approach is to adopt a model that allows for nonconstant variance. You can modify your assumption of constant variance to enable the variance to be estimated for each level of drug.
