

Statistics: Continuous Methods
STAT452/652, Spring 2013

Computer Lab 7

Thursday, May 2, 2013

DMS, 106

1:00-2:15PM

ANOVA (Analysis of Variance)
with



Instructor: Ilya Zaliapin

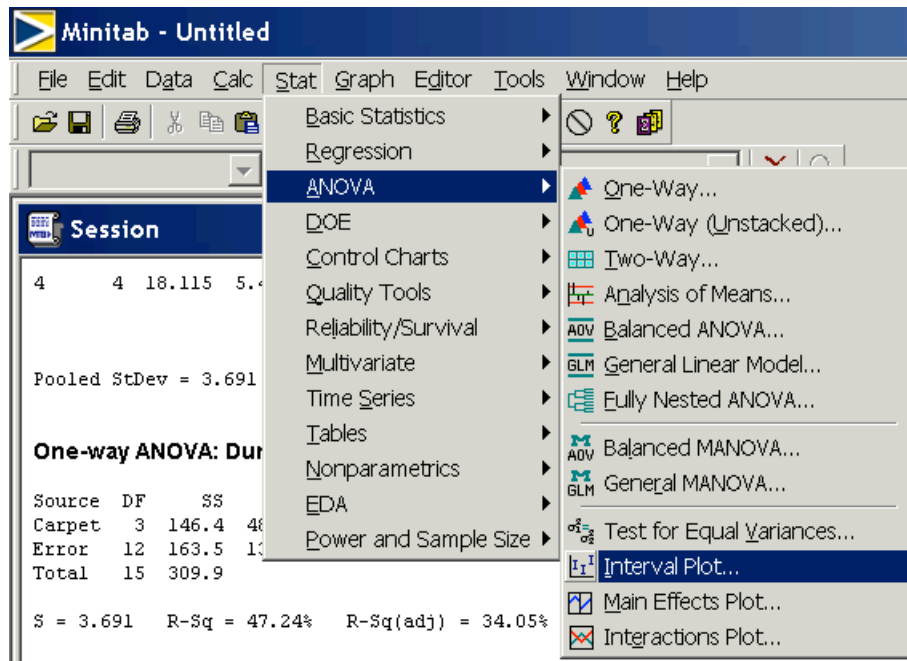
1. Introduction

Analysis of variance (ANOVA) analyzes the effects of *categorical predictors* on a continuous *response*. More specifically, it compares the means of observations that can be affected by different *factors* (also called *levels* or *treatments*). ANOVA can be thought of as an extension of the two-sample *t*-test for comparing the means of two populations to the situation of multiple populations, each of which corresponds to a given factor. ANOVA also is a natural extension of regression methods to the case of categorical predictors.

2. Preliminary data analysis

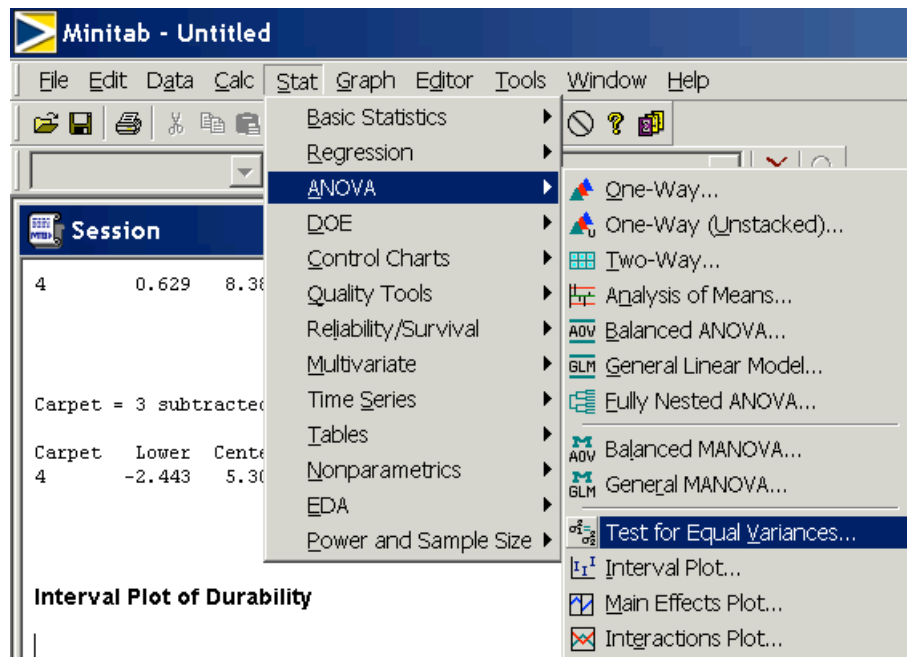
Before starting with the formal ANOVA analysis, we need to look at the data. This can be done with the help of **Interval Plot**, which can be reached via

Stat/ANOVA/Interval Plot...

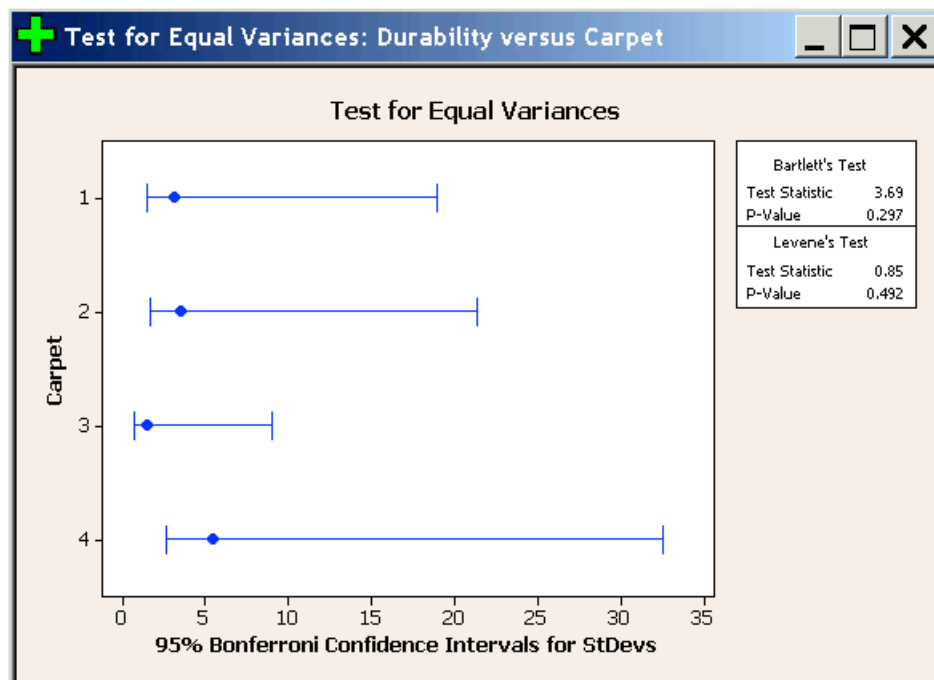


The next step is checking the main assumption of ANOVA. Recall that the ANOVA inference is based on the assumption that the observations from different levels are normally distributed with the same variance. To test the equality of the variances, go to

Stat/ANOVA/Test for Equal Variances...



You will be asked to select the response and factor variable. The result is presented in the figure like the one below. It shows the Bonferroni 95% CI for the samples' standard deviation and gives results of two tests (Bartlett's and Levene's).

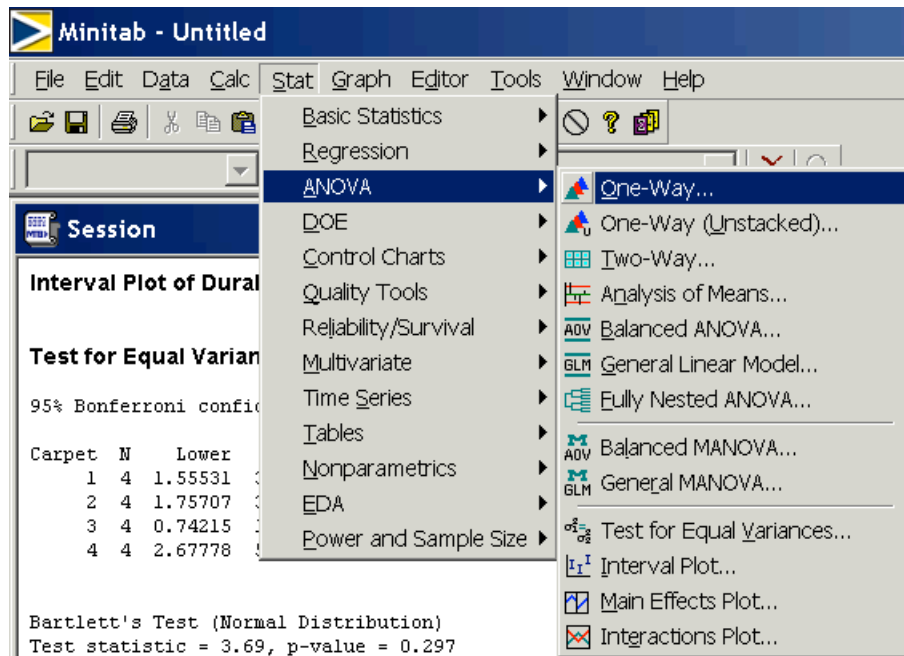


If the data pass the equal variance test, we can proceed with the ANOVA.

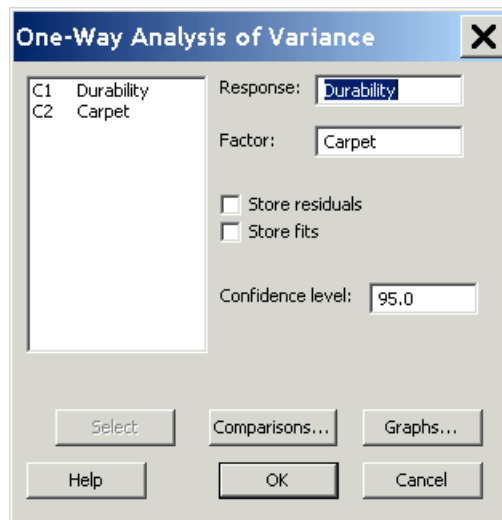
3. One-way ANOVA

The main menu for one-way ANOVA is

Stat/ANOVA/One-Way...



After choosing this analysis, you will be asked for the response and factor variables as well as for other analysis options:

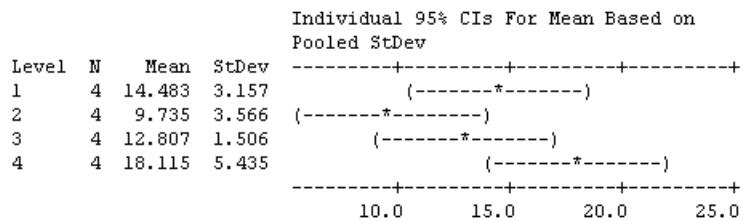


The results of ANOVA are shown in the session window:

One-way ANOVA: Durability versus Carpet

Source	DF	SS	MS	F	P
Carpet	3	146.4	48.8	3.58	0.047
Error	12	163.5	13.6		
Total	15	309.9			

S = 3.691 R-Sq = 47.24% R-Sq(adj) = 34.05%



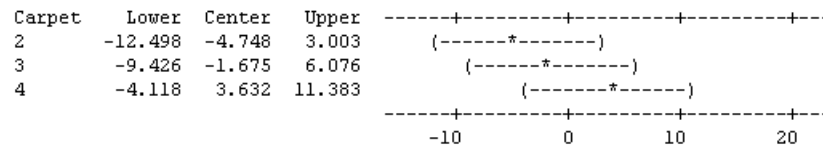
Pooled StDev = 3.691

The other outputs may include the pair-wise comparisons (Tukey's in this case)

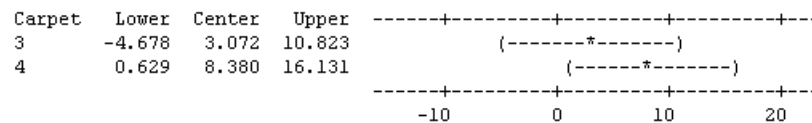
Tukey 95% Simultaneous Confidence Intervals
All Pairwise Comparisons among Levels of Carpet

Individual confidence level = 98.83%

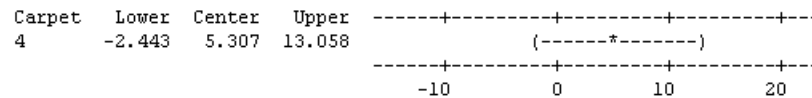
Carpet = 1 subtracted from:



Carpet = 2 subtracted from:



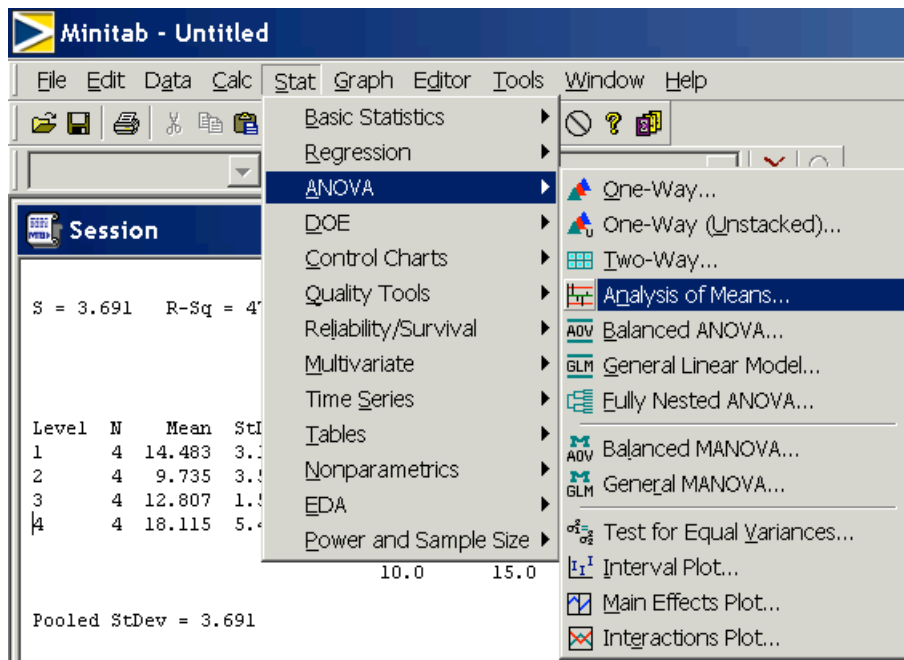
Carpet = 3 subtracted from:



4. Analysis of Means

An alternative way of visualizing the ANOVA results is provided by the menu

Stat/ANOVA/Analysis of Means...



which summarizes the mean statistics in a plot:

