

Generating Bootstrap statistics using Resampling in XLSTAT

[demoBOOT.xls](#)

XLSTAT has a resampling toolbox which can be used to obtain bootstrap resamples, standard deviation and confidence intervals. It allows you to construct graphics based on the bootstrap distribution.

Dataset to generate Bootstrap statistics using Resampling

An Excel sheet with both the data and the results can be downloaded by clicking [here](#).

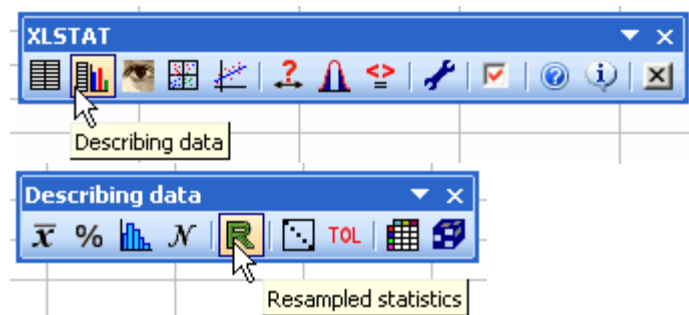
The data correspond to a sample of 150 irises for which 4 variables were measured. The flowers belong to 3 different species. Fisher used this dataset, now famous, when he developed his discriminant analysis theory. In this particular example, we decided to analyze the variable Sepal length of the flowers.

Goal of this tutorial

Using XLSTAT resampling toolbox, we want to obtain bootstrap means, bootstrap standard deviations and bootstrap confidence intervals for some statistical measures. These bootstrap statistics are obtained without any distributional assumption. We will study the mean and standard deviations of the Sepal length variable.

Setting up a resampling

Once XLSTAT is open, select the **XLSTAT / Describing data / Resampled Statistics** command, or click on the corresponding button of the **Describing data** toolbar (see below).

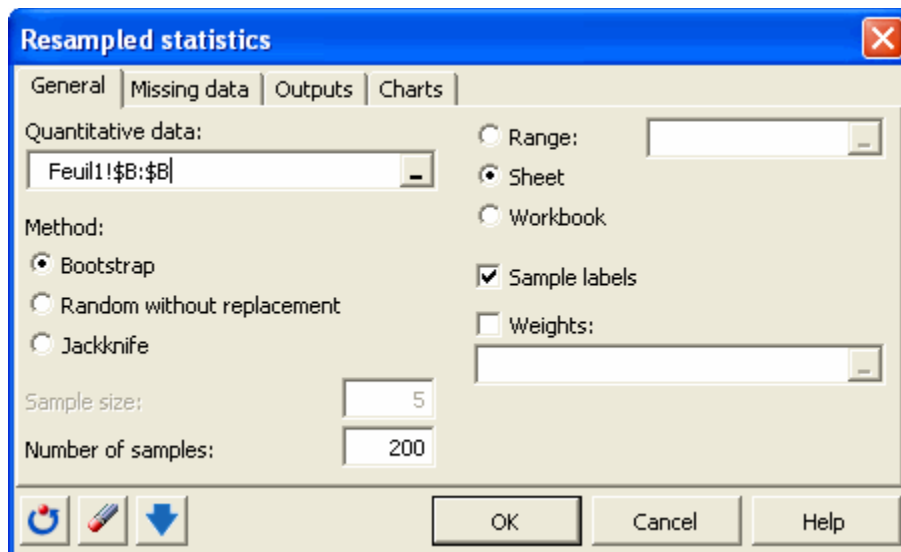


Once you have clicked on the button, the **Resampled Statistics** dialog box appears. The data corresponding to the variable "Sepal length" were selected on the Excel sheet.

Note that for a resampling, the data must be numerical data.

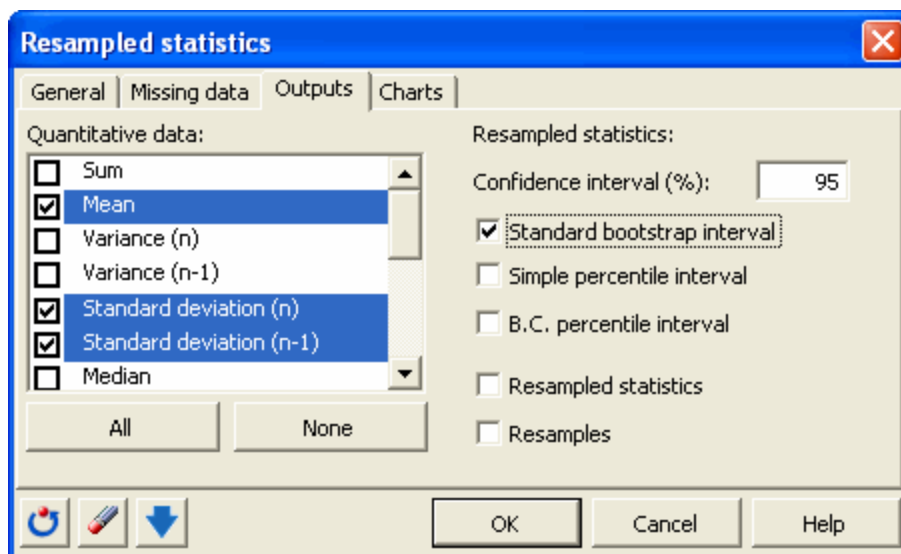
As the name of the variable was included in the selection, the **Labels included** option was also selected.

The **Sheet** option was selected because we wanted the results displayed on a new sheet of the workbook. The chosen resampling method is the **bootstrap** method with **200 resamples**.

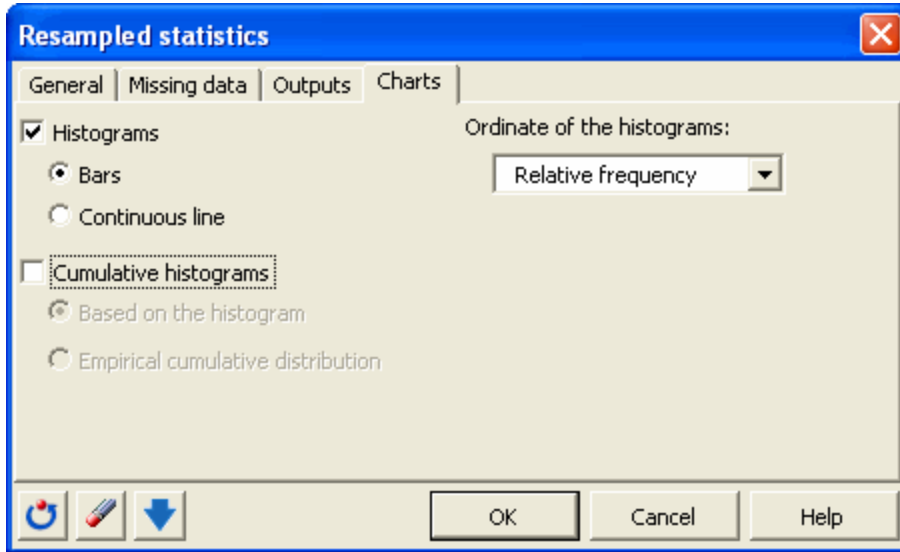


In the **Outputs** tab, select the statistics to be studied. We select the **mean and both standard deviations**.

The **95 % standard bootstrap interval** is selected. You can display all 200 samples and resampled statistics using **Resamples** and **Resampled statistics** options.



In the **Charts** tab, histograms have been selected.



Click on **OK** to launch the analysis.

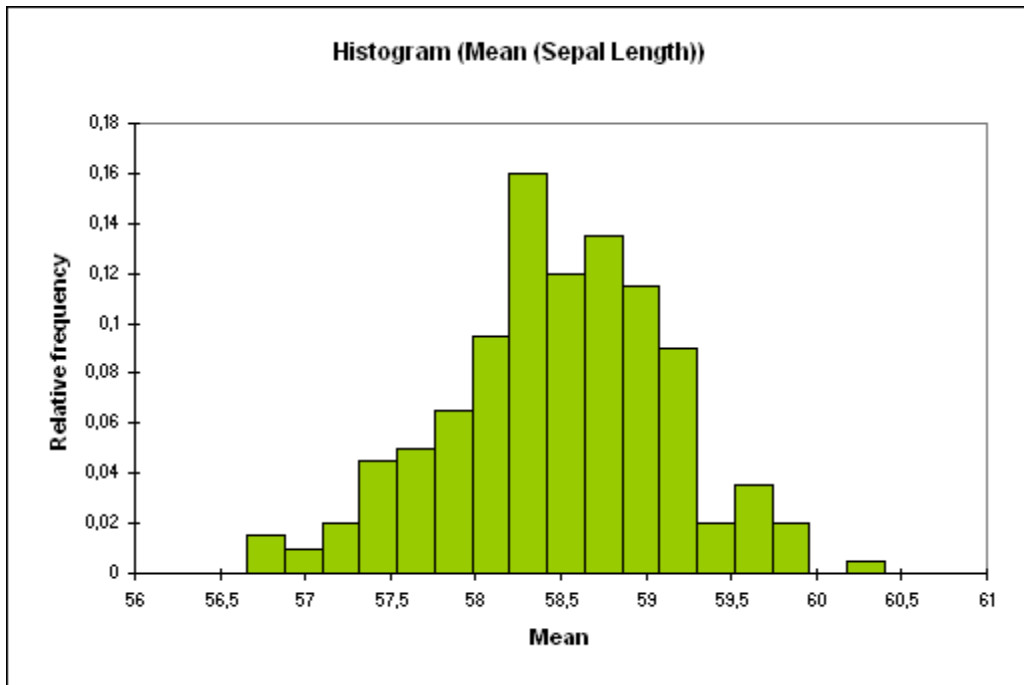
Interpreting the results of the resampled statistics

The results are displayed on the new sheet named "Resampling".

The following table gathers the obtained bootstrap statistics for the sample mean and standard deviations. We can see that bootstrap estimates are very close to the original estimates even with only 200 resamples. For the mean, the 95 % standard bootstrap confidence interval is very narrow. For the standard deviations, we can see that the sample-based and the population-based standard deviations are very close and that bootstrap estimates are very similar to original estimates. Confidence intervals are also very narrow even with 200 resamples.

Results of the resampling (Sepal Length):					
Parameters	Parameters	Mean (Bootstrap)	Standard deviation (Bootstrap)	Standard bootstrap interval	Standard bootstrap interval
Mean	58,433	58,475	0,651	57,147	59,720
Standard deviation (n)	8,253	8,254	0,398	7,466	9,040
Standard deviation (n-1)	8,281	8,282	0,400	7,491	9,071

Histograms can be used to visualize the bootstrap distribution of the mean and standard deviations. For the mean, we see that 56 of the 200 values are in the range [58.2, 58.64], which also includes the mean over the original sample. The table of intervals is also given in order to better understand the distribution. The resampling tool automatically decides the number of intervals. If you wish to adapt it to your analysis, simply use the "Histograms" function of XLSTAT on the resampled statistics obtained when the "Resampled statistics" is selected on the "Outputs" tab.



This tool allows you to calculate different types of confidence intervals on a large number of descriptive statistics. The addition of weight and the treatment of several variables simultaneously are also possible.