

## CHAPTER 2

# Tutorial

### A. INTERFACE LAYOUT

Open the STATsimple application and sequentially follow the sections in this chapter. The STATsimple window consists of three main areas:

- i) The **Toolbar Area** is located at the top of the window and provides one-click shortcuts to some menu commands.
- ii) The **Samples Area** is located to the right of the window and provides a one-click method of adding samples to statistical routines.
- iii) The remaining area is the **Viewing Area**. This is where data or statistical results are viewed.

The Toolbar Area 

The Samples Area 

The Viewing Area 

Figure 2.1: The User Interface consists of a Toolbar Area, a Samples Area and a Viewing Area

## B. OPENING DATA FILES

Click the "OPEN" icon in the Toolbar Area. A standard Open File dialog box will be presented (Figure 2.2). Locate and open the "Samples" folder. You will see two sub-folders with the names "Heating Study" and "Temperature Measurement". Open the "Heating Study" folder. You will then see four data files listed. Open the file "Apr-Sep Temp. (°C)". Click the "OPEN" icon again and open the file "Apr-Sep Heating (\$)". Repeat this action and open the files "Oct-Mar Temp. (°C)" and "Oct-Mar Heating (\$)".

The Samples Area should look similar to that shown in Figure 2.4. Note that the most recently opened file, "Oct-Mar Heating (\$)", is shown as an open container with a flag to its immediate right.

Figure 2.2: The Standard Open File dialog box

## C. SETTING DECIMAL PLACES

From the "Format" menu, select "0.00" to set the number precision to two decimal places. The data shown in the Viewing Area will now be displayed with a precision of two decimal places.

Figure 2.3: Choosing "0.00" from the Format menu will display numbers correct to two decimal places.

**D. EDIT MODE**

If the "EDIT" icon in the Toolbar Area is not already selected, then click it now. The Viewing Area shows the data contained in the currently selected sample (the sample with the small flag to its immediate right). Click on the other samples to see their data.

Figure 2.4: In Edit Mode, the data of the currently selected (flagged) sample are shown in the Viewing Area.

**E. VIEWING DESCRIPTIVE STATISTICS**

Click on the "DESC" icon in the Toolbar Area. The Viewing Area shows some descriptive statistics of the currently selected (flagged) sample including the Mean, Standard Deviation and Standard Error of the Mean (SEM). Click on the other samples to see their descriptive statistics.

Figure 2.5: In Descriptive mode, the Viewing Area shows some descriptive statistics of the flagged sample.

**F. PLOTTING A HISTOGRAM**

Click on the "HIST" icon in the Toolbar Area to view a histogram plot. Initially, STATsimple will estimate the lower and upper plotting limits as well as the number of classes. To set your own plotting parameters, double-click anywhere on the plot and you will be presented with a dialog box that allows you to set the Number of Classes, Lower Limit, Upper Limit, and Bar Pattern. If you wish, you can set these parameters then click the "OK" button. Click on the other samples to see their histogram plots.

Figure 2.6: In Histogram mode, the Viewing Area shows a histogram plot of the flagged sample.

**G. USING THE STUDENT'S T-TEST**

Click on the "T-TEST" icon in the Toolbar Area. The Viewing Area shows a framework for t-test results. Click on the sample labelled "Apr-Sep Temp. (°C)". The Viewing Area now shows the t-test framework with "Apr-Sep Temp. (°C)" added. Now click on the sample labelled "Oct-Mar Temp. (°C)". The framework shows the results of a two-tailed, unpaired Student's t-test comparing the two samples. It shows the t- and p-values as well as the critical t-values for the 90%, 95% and 99% levels. Note that the Samples Area now shows both containers as open since they are both involved in the results displayed in the Viewing Area. To perform a t-test on "Apr-Sep Heating (\$)" and "Oct-Mar Heating (\$)", simply click on these two samples.

Figure 2.7: The Student's two-tailed t-test for unpaired data.

## H. PERFORMING A LINEAR REGRESSION

Click on the "REG" icon in the Toolbar Area. The Viewing Area shows a framework for a regression plot. Click on the sample labelled "Apr-Sep Temp. (°C)". At this point, STATsimple adds the selected sample to the X-axis of the plot. Now click on the sample labelled "Apr-Sep Heating (\$)". The Viewing Area now shows a linear regression plot. The upper right section of the plot shows the regression equation in the form " $Y = aX + b, (r)$ ", where "r" is the regression coefficient.

Initially, STATsimple will estimate the lower and upper plotting limits for both axes. Double-click anywhere on the plot and you will be presented with a dialog box that allows you to set the plotting limits and increments for both axes. If you wish, you can change the plotting limits and then press "OK". Another Linear Regression can be immediately performed by clicking on "Oct-Mar Temp. (°C)" and then on "Oct-Mar Heating (\$)".

Figure 2.8: The Linear Regression Plot.

## I. USING KEYBOARD SHORTCUTS

All of the Toolbar buttons have keyboard shortcuts in the form **Command-f**, where *f* is the first letter of the button's name. (The **Command** button is the button on your keyboard with the Apple symbol). Try these:

Command-T	Shows the last t-test performed.
Command-H	Shows a histogram of the currently flagged sample.
Command-D	Shows descriptive statistics of the currently flagged sample.

Now select any sample and type **Command-W**. This will close the sample and remove it from the Samples Area. Close the other samples using this technique.

Now use the keyboard shortcut **Command-O** to open some more samples. The standard Open File dialog box will be presented. Locate and open the "Samples" folder again. This time, select and open the "Temperature Measurement" sub-folder. You will see four data files listed. Open the file "Alcohol". Use **Command-O** to open the other three files; "Mercury", "Platinum RTD" and "Thermocouple".

**J. THE ONE-WAY ANALYSIS OF VARIANCE (ANOVA)**

Click on the "ANOVA" icon in the Toolbar Area. The Viewing Area shows a framework for a one-way analysis of variance. Click on the sample labelled "Alcohol". The Viewing Area now shows the framework with one sample added. Now click on the sample labelled "Mercury" and you will see the complete ANOVA results for the two selected samples. Add "Platinum RTD" and "Thermocouple" to the analysis by clicking on them. The framework now shows the complete ANOVA results for the four samples. It shows the F- and p-values as well as the critical F-values for the 90%, 95% and 99% levels. Note that the Samples Area now shows the four sample containers as open since they are all involved in the results displayed in the Viewing Area. As an exercise, remove "Thermocouple" by clicking on it. Note the changes to the ANOVA results. Now click on it again to put it back into the analysis.

Figure 2.9: The one-way Analysis of Variance for the four selected samples.



### K. BONFERRONI MODIFIED T-TESTS

With all four samples selected for the ANOVA, click the "BON-T" button in the Toolbar Area. The Viewing Area now shows a grid of all the possible t-test comparisons using the Bonferroni inequality. Comparisons with a p-value less than or equal to 0.01 are shown with a grey pattern. Comparisons with a p-value less than or equal to 0.05 are shown with a hatched pattern, and comparisons with a p-value less than or equal to 0.10 are shown with a dotted pattern.

In this example, four groups ( $m=4$ ) are involved in the analysis, and so there are six possible comparisons to be made ( $k = m[m-1] \div 2 = 6$ ). Note that the four cells along the top-left to bottom-right diagonal are null cells since they compare A with A, B with B, etc., and that the six cells to the right of this diagonal are a mirror image of the six cells to the left of the diagonal.

The Bonferroni t-tests are linked to the ANOVA routine. To demonstrate this, remove "Thermocouple" by clicking on it. Note the changes in the results. Now click the "ANOVA" button and you will see that "Thermocouple" is also excluded from the ANOVA.

Figure 2.10: Bonferroni modified t-tests for the four selected samples.

### L. QUITTING TIME

You can now quit by selecting the **Quit** menu item from the **File** menu, or by clicking in the Closebox located at the top left of STATsimple's window (Figure 3.6). On the other hand, you can forget about quitting and start analysing every bit of data you have ever collected!