Appendix 12.2 - Multiple Regression Analysis Using MegaStat

The instructions in this section begin by describing the entry of data into an Excel worksheet. Alternatively, the data may be downloaded from this book’s website. Please refer to Appendix 1.1 for further information about entering data, saving data, and printing results in Excel. Please refer to Appendix 1.2 for more information about using MegaStat.

**Multiple regression:**

- Enter the fuel consumption data as shown—temperature (with label Temp) in column A, chill index (with label Chill) in column B, and fuel consumption (with label FuelCons) in column C. Note that Temp and Chill are contiguous columns (that is, they are next to each other). This is not necessary, but it makes selection of the independent variables (as described below) easiest.
- Select Add-Ins : MegaStat : Correlation/Regression : Regression Analysis
- In the Regression Analysis dialog box, click in the Independent Variables window and use the autoexpand feature to enter the range A1 : B9. Note that if the independent variables are not next to each other; hold the CTRL key down while making selections and then autoexpand.
- Click in the Dependent Variable window and enter the range C1 : C9.
- Check the appropriate Options and Residuals checkboxes as follows:
  1. Check “Test Intercept” to include a y-intercept and to test its significance.
  2. Check “Output Residuals” to obtain a list of the model residuals.
  3. Check “Plot Residuals by Observation,” and “Plot Residuals by Predicted Y and X” to obtain residual plots versus time, versus the predicted values of y, and versus the values of each independent variable.
  4. Check “Normal Probability Plot of Residuals” to obtain a normal plot.
  5. Check “Diagnostics and Influential Residuals” to obtain diagnostics.
  6. Check “Durbin-Watson” to obtain the Durbin-Watson statistic and check “Variance Inflation Factors”.

To obtain a **point prediction** of y when temperature equals 40 and chill index equals 10 (as well as a confidence interval and prediction interval):

- Click on the drop-down menu above the Predictor Values window and select “Type in predictor values.”
- Type 40 and 10 (separated by at least one blank space) into the Predictor Values window.

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Predictions can also be obtained by placing the values of the predictor variables into spreadsheet cells. For example, suppose that we wish to compute predictions of y for each of the following three temperature—chill index combinations: 50 and 15; 55 and 20; 30 and 12. To do this:

- Enter the values for which predictions are desired in spreadsheet cells as illustrated in the screenshot—here temperatures are entered in column F and chill indexes are entered in column G. However, the values could be entered in any contiguous columns.
- In the drop-down menu above the Predictor Values window, select “Predictor values from spreadsheet cells.”
- Select the range of cells containing the predictor values (here F1 : G3) into the predictor values window.
- Select a desired level of confidence from the Confidence Level drop-down menu or type in a value.
- Click OK in the Regression Analysis dialog box.

Multiple regression with indicator (dummy) variables:

- Enter the sales volume data—sales volume (with label Sales) in column A, store location (with label Location) in column B, and number of households (with label Households) in column C. Again note that the order of the variables is chosen to allow for a contiguous block of predictor variables.
- Enter the labels DM and DD into cells D1 and E1.
- Following the definitions of the dummy variables DM and DD enter the appropriate values of 0 and 1 for these two variables into columns D and E as shown in the screen.
- Select Add-Ins : MegaStat : Correlation/Regression : Regression Analysis.
- In the Regression Analysis dialog box, click in the Independent Variables window and use the autoexpand feature to enter the range C1 : E16.
- Click in the Dependent Variable window and enter the range A1 : A16.

To compute a prediction of sales volume for 200,000 households and a mall location:

- Select “Type in predictor values” from the drop-down menu above the Predictor Values window.
- Type 200 1 0 into the Predictor Values window.
- Select or type a desired level of confidence (here 95%) in the Confidence Level box.
- Click the Options and Residuals checkboxes as shown (or as desired).
- Click OK in the Regression Analysis dialog box.