Here are some important comments about procedures for determining whether data are from a normally distributed population:

- If the requirement of a normal distribution is not too strict, simply look at a histogram and find the number of outliers. If the histogram is roughly bell-shaped and the number of outliers is 0 or 1, treat the population as if it has a normal distribution.
- Normal quantile plots can be difficult to construct on your own, but they can be generated with a TI-83/84 Plus calculator or suitable computer software, such as STATDISK, SPSS, SAS, Minitab, Excel, or StatCrunch.
- In addition to the procedures discussed in this section, there are other, more advanced procedures for assessing normality, such as the chi-square goodness-of-fit test, the Kolmogorov-Smirnov test, the Lilliefors test, the Anderson-Darling test, and the Ryan-Joiner test (discussed briefly in Part 2).

Part 2: Beyond the Basics of Assessing Normality

The following is a relatively simple procedure for manually constructing a normal quantile plot, and it is the same procedure used by STATDISK and the TI-83/84 Plus calculator. Some statistical packages use various other approaches, but the interpretation of the graph is basically the same.

Manual Construction of a Normal Quantile Plot

Step 1: First sort the data by arranging the values in order from lowest to highest.

Step 2: With a sample of size n, each value represents a proportion of $1/n$ of the sample. Using the known sample size n, identify the areas of $\frac{1}{2n}, \frac{3}{2n}, \frac{5}{2n}$, and so on. These are the cumulative areas to the left of the corresponding sample values.

Step 3: Use the standard normal distribution (software or a calculator or Table A-2) to find the z scores corresponding to the cumulative left areas found in Step 2. (These are the z scores that are expected from a normally distributed sample.)

Step 4: Match the original sorted data values with their corresponding z scores found in Step 3, then plot the points (x, y), where each x is an original sample value and y is the corresponding z score.

Step 5: Examine the normal quantile plot and conclude that the population has a normal distribution if the pattern of the points is reasonably close to a straight line and the points do not show some systematic pattern that is not a straight-line pattern.

Example 2 Earthquake Magnitudes

Data Set 16 in Appendix B includes Richter-scale magnitudes of earthquakes. Let's consider this sample of five magnitudes: 0.70, 2.20, 1.64, 1.01, 1.62. With only five values, a histogram will not be very helpful in revealing the distribution of the data. Instead, construct a normal quantile plot for these five values and determine whether they appear to come from a population that is normally distributed.

Solution

The following steps correspond to those listed in the procedure above for constructing a normal quantile plot.

continued