

16.1: Prelude to Transformations

The focus of statistics courses is the exposition of appropriate methodology to analyze data to answer the question at hand. Sometimes the data are given to you, while other times the data are collected as part of a carefully-designed experiment. Often the time devoted to statistical analysis is less than 10% of the time devoted to data collection and preparation. If aspects of the data preparation fail, then the success of the analysis is in jeopardy. Sometimes errors are introduced into the recording of data. Sometimes biases are inadvertently introduced in the selection of subjects or the miscalibration of monitoring equipment.

In this chapter, we focus on the fact that many statistical procedures work best if individual variables have certain properties. The measurement scale of a variable should be part of the data preparation effort. For example, the correlation coefficient does not require that the variables have a normal shape, but often relationships can be made clearer by re-expressing the variables. An economist may choose to analyze the logarithm of prices if the relative price is of interest. A chemist may choose to perform a statistical analysis using the inverse temperature as a variable rather than the temperature itself. But note that the inverse of a temperature will differ depending on whether it is measured in $^{\circ}F$, $^{\circ}C$, or $^{\circ}K$.

The introductory chapter covered linear transformations. These transformations normally do not change statistics such as Pearson's r , although they do affect the mean and standard deviation. The first section here is on log transformations which are useful to reduce skew. The second section is on Tukey's ladder of powers. You will see that log transformations are a special case of the ladder of powers. Finally, we cover the relatively advanced topic of the Box-Cox transformation.

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