

FES 524: Natural Resources Data Analysis

Reading 4.2: Transformations

Contents

1 Transformations	1
1.1 Changes to relative spacing	1

1 Transformations

Transformations are still commonly used in statistical analyses. It is important to understand why we sometimes use transformations as well as modern alternatives to transformations.

The use of transformations is generally to change the scale of the response variable. Because the spacing changes, transformations also lead to changes in relationships among variables. Make sure you can recognize what amounts to a transformation vs a location or scale shift after seeing the examples below.

1.1 Changes to relative spacing

Changing the scale of the response variable with a transformation means we are changing the relative spacing among observations.

Figure 1 is a graphic showing two plots. In the top plot you can see observations from a variable Y labeled as A-O based on the rank of the particular value (i.e., A represents the lowest observed value and O represents the highest observed value). The bottom plot shows the same set of values after taking the natural logarithm of Y .

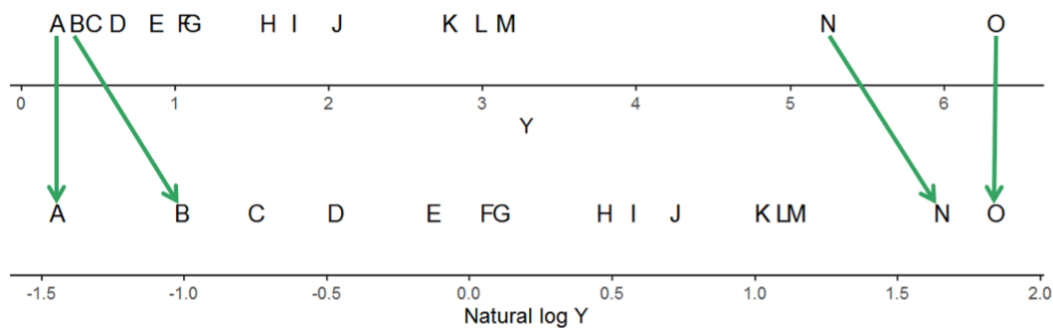


Figure 1: Two number lines, one showing the original space with specific points labeled A - O, the second showing the transformed space and where points A - O land on the transformed line.

You can see that the relative spacing among the observations changed after taking the natural logarithm of Y compared to the relative spacing among the original Y values. Taking the logarithm of a variable is a transformation. Notice that we are not talking specifically about what happens to specific values of Y when we pass them through a certain function, but actually what happens to the whole number line and how a

transformation stretches or squishes the original space. For this example, all the space that did lie in the interval $(0, 1)$ got stretched out to $(-\infty, 0)$,

We can see something similar when using the square root of Y . The relative spacing of the observations changed compared to the original spacing of Y . Taking the square root of a variable is a transformation.