

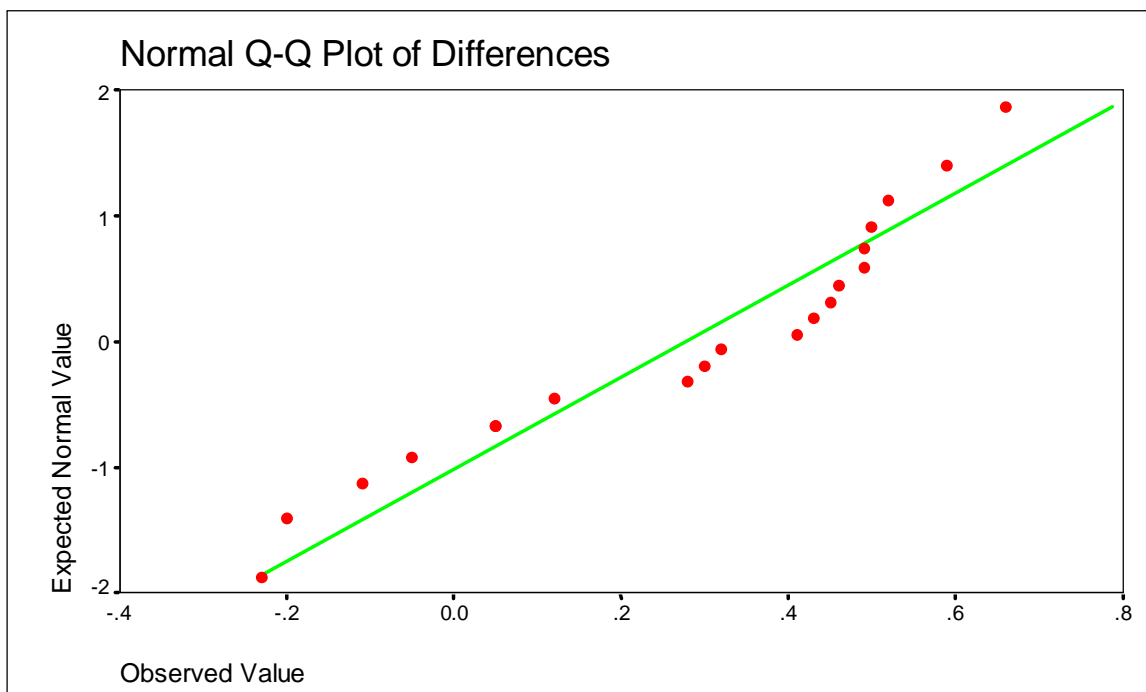
COMPARING THE DURABILITY OF TIRES

6. Checking Normality

In Section 3 we illustrated how matched pairs data in our case study can be restated as single-sample data by taking differences within each pair. Hence, in order to make the inferences about the data, we will be using the statistical tools for single populations. In particular, we will use the t-test for the mean of a single population and a confidence interval for the population mean. However, the t-tools can be applied if the assumption of normality of the population is not violated. Do the differences come from a population following a normal distribution? In order to answer the question, we will use some statistical procedures available in SPSS to check the normality of the data.

In order to determine whether or not a variable is normally distributed, you can use one of the two available procedures in SPSS: *Normal Q-Q Plot* or *Normal P-P Plot*. The *Normal Q-Q* plot plots the quantiles of a variable's distribution against the quantiles of the normal distribution. If the data come from a normal distribution, the plot should resemble a straight line.

The normal probability plot (Normal Q-Q plot) for the the observed is displayed below.



The plot displays some slight departures from the straight line indicating that the assumption of normality necessary to apply the t-tools might be violated. Fortunately, the t-tools are quite robust against nonnormality of the population except in the case of outliers and strong skewness. In our case, there are no outliers and the skewness is only moderate. Moreover, as the sample size $n=20$ is not small, the Central Limit Theorem makes the sampling distribution of the sample mean reasonably close to a normal distribution. Thus the t-tools can be used in the case, although with some caution.