

Replications and Normal Probability Plots

Which effects are distinguishable from error? As the number of replications increases, our ability to distinguish effects from background noise should improve. In this exercise, with $n = 1$ replication, all effects should be indistinguishable from error. As n increases, the variance of the negligible effects decreases and the slope of the error line in the normal probability plot increases, revealing the real effects.

You first need to download **sim.txt**, a Minitab macro, from the course webpage to a local drive (I've used the stat 506 folder on my z drive here). In Minitab, you need to go to **Edit** on the main menu and select **Command Line Editor**. Then enter

```
%'z:\stat 506\sim.txt' 1
```

to run the macro for $n = 1$ replication (note that all macro commands in Minitab start with a percentage sign). Do any effects seem to be important? Repeat the macro a few times with 1 rep—what do you observe?

Try the macro using the following values for the number of replications (change the 1 in the command line to the number of replications you wish to run): 2, 5, 10, 20, 50, 100. It is always worthwhile to repeat the macro a few times for the same number of replications. As you increase the number of replications, notice that the significant effects never change in magnitude but the slope of the negligible effects does. Which effects are present in this experiment? How many replications are needed before each of these effects becomes distinguishable from error? What are the magnitudes of these effects?