Generating Random Numbers

In-Class Exercise

EVS 430 Advanced Quantitative Methods

Generating random numbers can be valuable in many applications:

- determining sampling locations,
- adding noise to a signal to test the effect, and
- Monte Carlo simulation—testing a model for which no analytical solution is available and data is limited.

As we will learn later, many possible distributions are available for which we may generate random noise. However, three will prove sufficient for our present purposes:

Uniform: If we generate a set of random numbers between 0 and 1, then we are saying that the likelihood of any particular number is exactly the same as any other.

Normal (or Gaussian): A normally distributed set of random numbers is clumped around its average. That it, it is more likely that a number chosen randomly from the set is near than the mean than far from it. We will learn later on what *far* means and how to characterize it. For now, let's simply say that the variance is a number that characterizes how clumped the data is. (The standard deviation is the square root of the variance.)

Log-Normal: A log-normally distributed set of numbers is also clumped around it's mean, but it has a few values that are extremely large. If we take the logarithm of the data, the logarithms are normally distributed.

Assignment

1. Suppose that you are to take 10 soil samples along a transect that is 100 feet long. Generate random locations for those samples.
2. Suppose that you are to take 10 soil samples in a plot of land that is 20 m by 20m. Generate random locations for those samples.
3. Suppose that you are to take soil samples in a plot of land that is 100m by 100m. Further suppose that the plot is broken in to 10m by 10m subplots. Generate random locations for the samples such that one occurs in each subplot.
4. Porosity is often assumed to be normally distributed. Suppose that we believe that the average porosity in a sand layer is 30%, with a standard deviation of 7.5%. Generate a set of 50 porosity values. Construct a histogram of porosity.
5. In the file *HistogramsofDistributions.xlsx* are three columns. Create a histogram of each. What distribution does each represent?