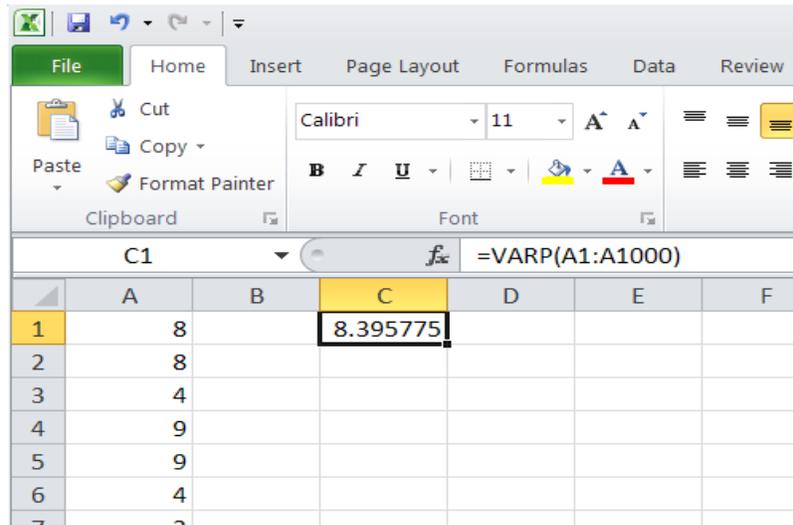


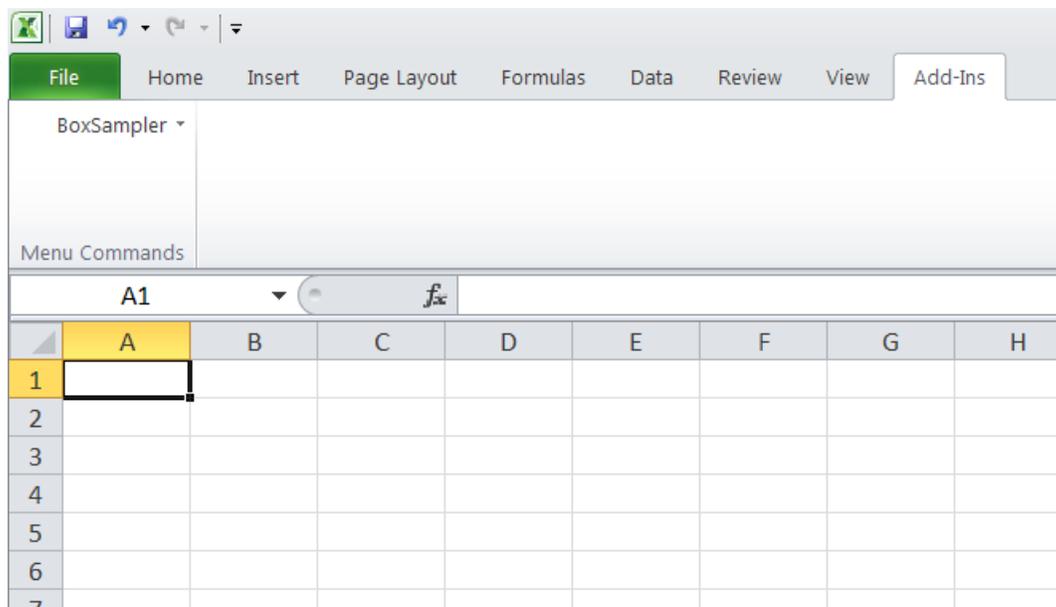
# Box Sampler Tutorial

Using Excel, cells A1 through A1000 each have the formula =RANDBETWEEN(0,9). In cell C1, the formula =VARP(A1:A1000) returns the value 8.395775 as shown in Figure 1-1.



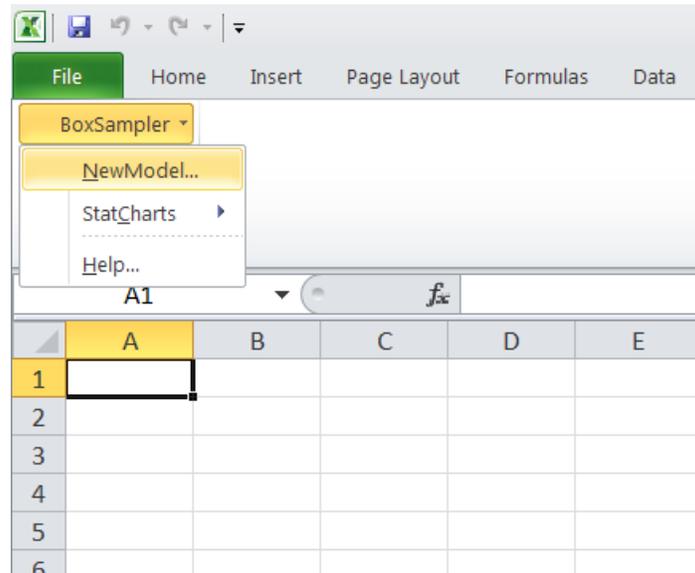
**Figure 1-1:** Population Variance Using 1000 Values

Now we will use Box Sampler to repeatedly draw 100 resamples of size 10. The population variance of each resample will be calculated as well as the mean of all 100 resamples. Begin with a new Excel workbook, load the Box Sampler add-in, and select the “Add-ins” menu as shown in Figure 1-2.



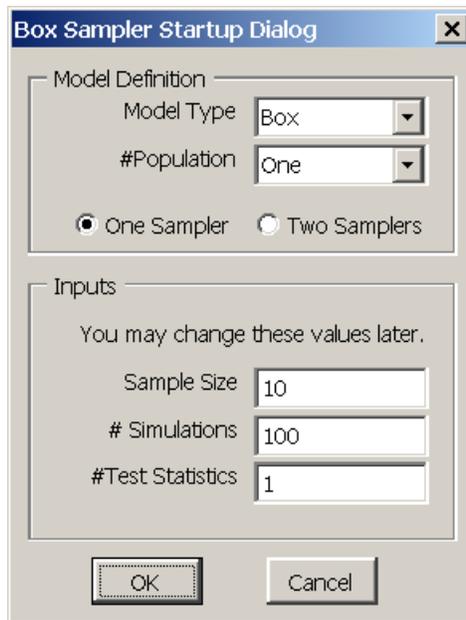
**Figure 1-2:** The BoxSampler Add-ins Menu

Click on the BoxSampler menu and choose “New Model” (Figure 1-3).



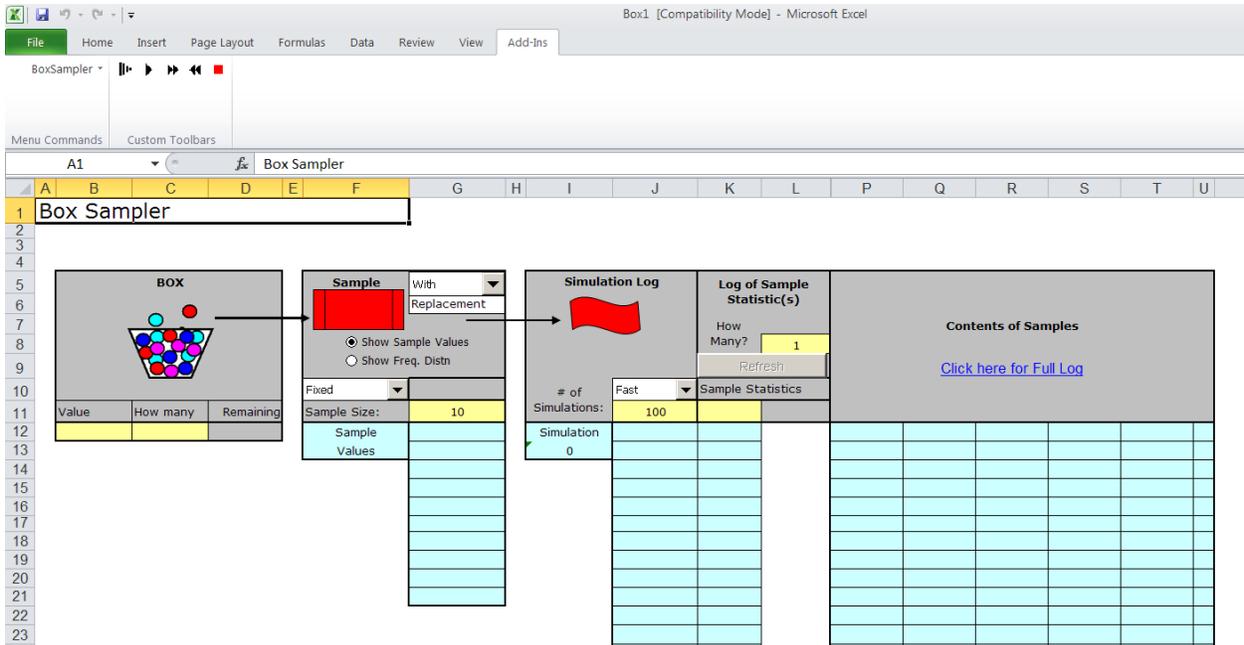
**Figure 1-3:** Create a New Model

The dialog in Figure 1-4 will appear. For this simulation, accept the default settings by clicking “OK”.



**Figure 1-4:** Box Sampler Startup Dialog

Box Sampler will create a preliminary model of the resampling simulation (see Figure 5-1). The next step will be to add values and formulas to calculate the population variance of each resample.



**Figure 1-5: The Box Sampler Preliminary Setup**

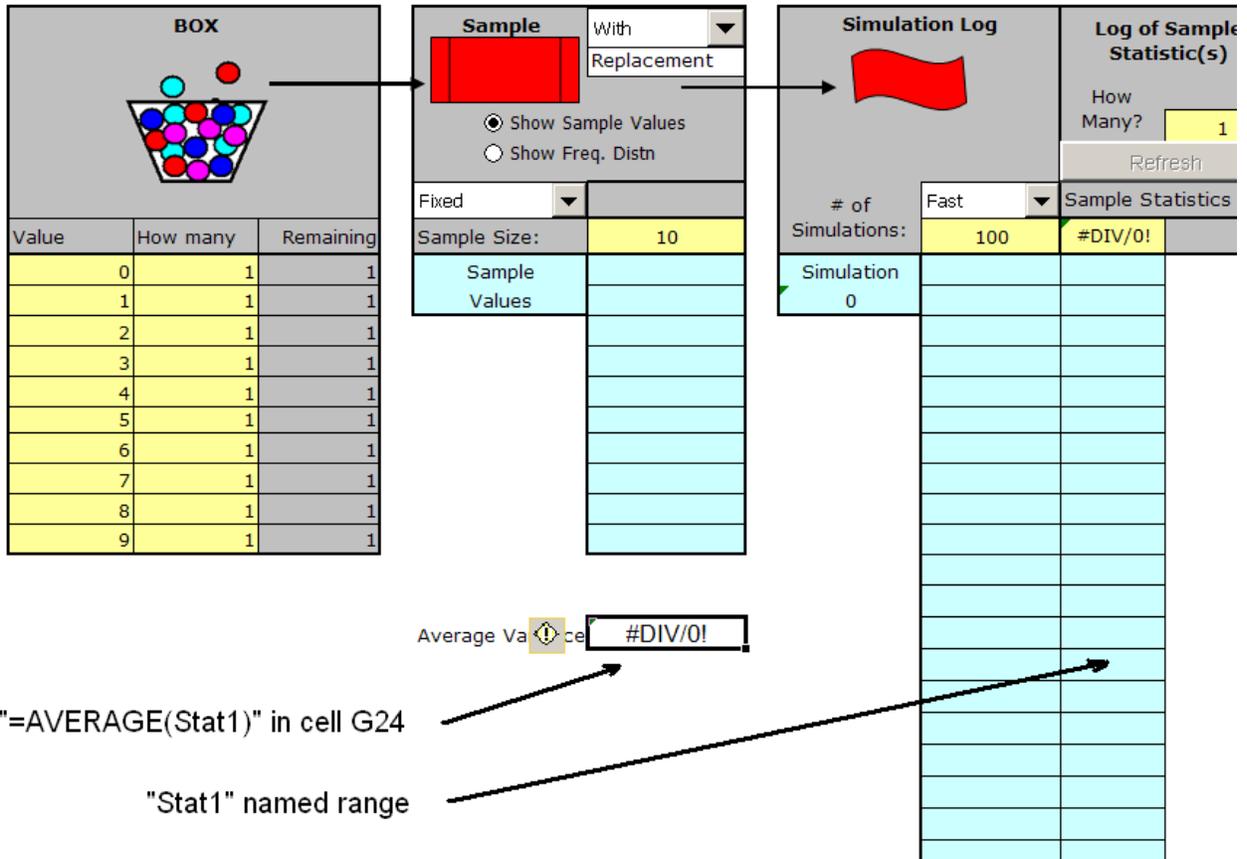
Here are the step-by-step instructions for completing and running the simulation:

- 1) As illustrated in Figure 1-6, populate the “Value” and “How many” columns. The numbers 0-9 in the “Values” column will be resampled with replacement “from the box”.

BOX		
Value	How many	Remaining
0	1	1
1	1	1
2	1	1
3	1	1
4	1	1
5	1	1
6	1	1
7	1	1
8	1	1
9	1	1

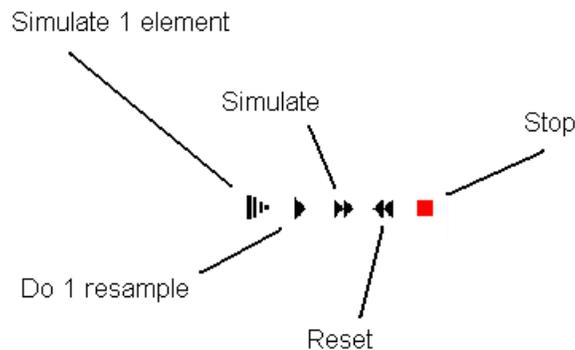
**Figure 1-6: Resampled Values**





**Figure 1-8:** Calculate the Average Variance of 100 Resamples

4) Using either the BoxSampler menu or the control buttons (Figure 1-9) step through a few resamples and watch the model change. Then click "Simulate" to finish all 100 resamples. How does the average of the resampled "population" variances compare with the variance of the original 1000 values?



**Figure 1-9:** Box Sampler Control Buttons

Figure 1-10 illustrates the results of a complete simulation of this model in Box Sampler.

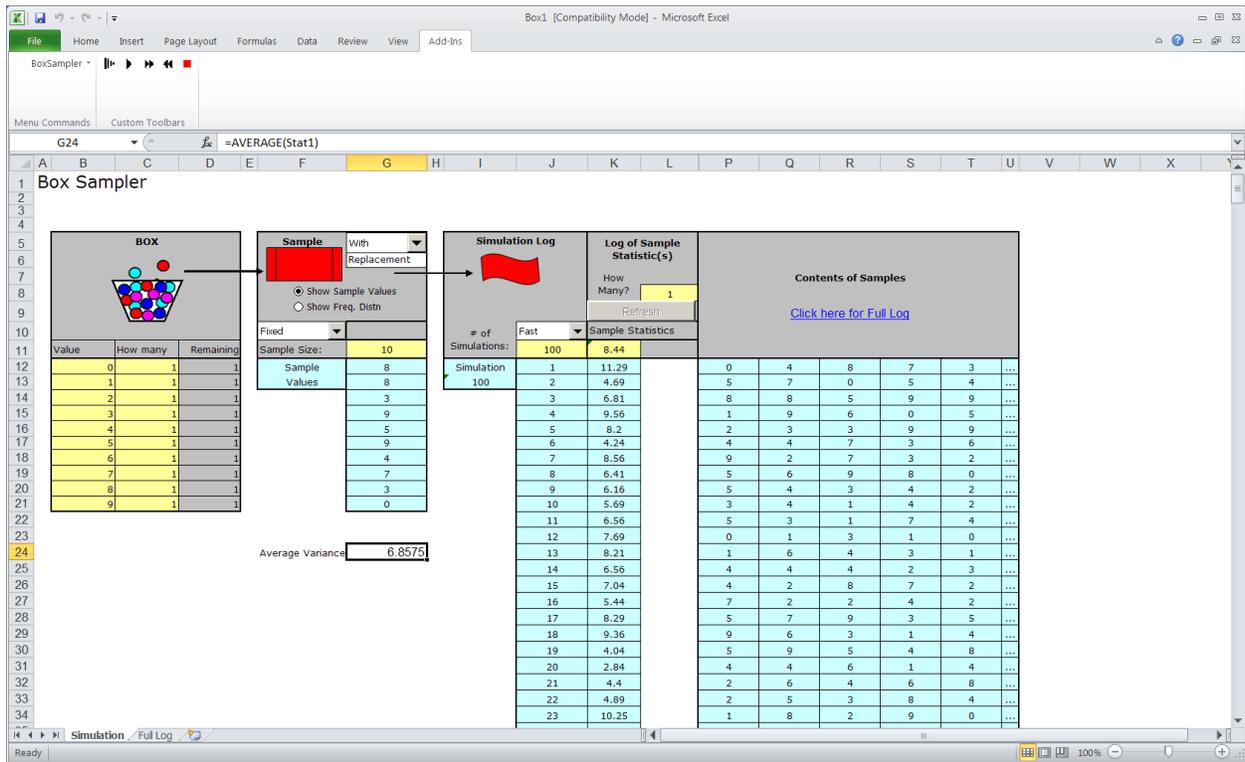


Figure 1-10: The Results of a Single Simulation in Box Sampler

A macro-enabled version of this Box Sampler model may be downloaded by clicking [here](#).