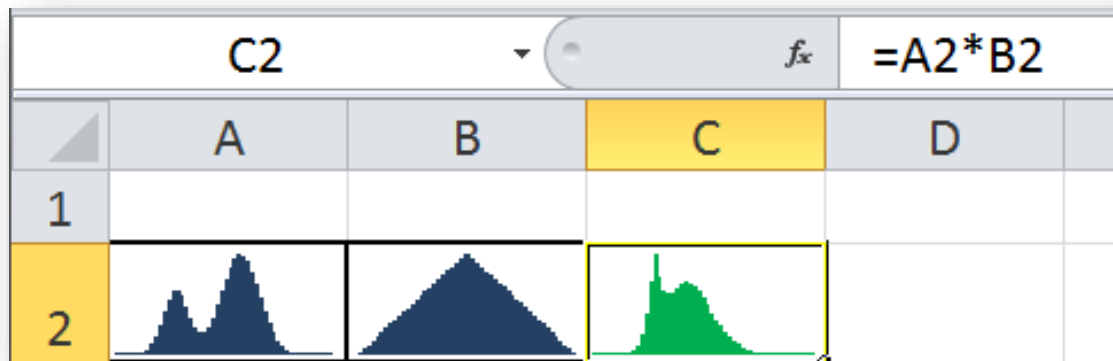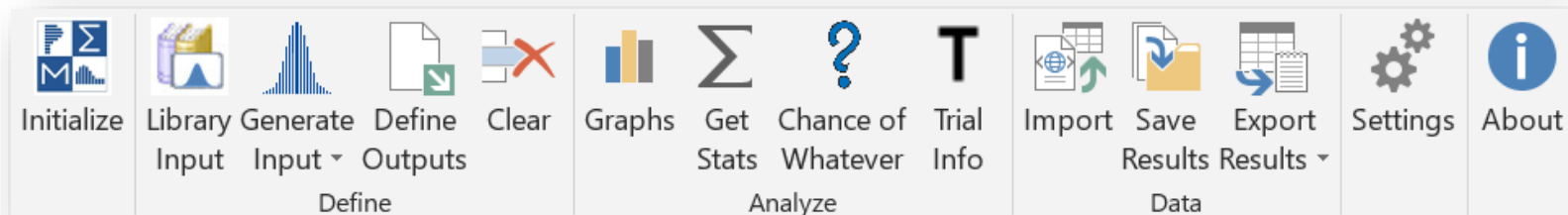# SIPmath™ Modeler Tools
Getting Started Guide*

Rev. Oct 16, 2016

SIPmath™ Modeler Tools Version 3.5.9

* For more details please consult the SIPmath Modeler Tools Reference

The SIPmath Modeler Tools operate in two primary modes:

Generate Mode

Random inputs are generated either with the RAND() function or the seed-able generator from Hubbard Decision Research. This can quickly create interactive Monte Carlo simulations in Excel, in which thousands of trials are run before the user's finger leaves the <Enter> key.

SIP Library Mode

Stochastic library mode utilizes pre-computed Monte Carlo trials (SIPs) to represent the uncertainty in the model inputs as auditable arrays of data. This allows results to be aggregated across applications. A SIP Library may be either built into the model workbook or linked to as an external file, for example in the cloud, so that many users share a common set of trials.

Both modes produce models that run in native Excel. The Tools merely assist in creating such models but are not required to run them. Thus models may be easily distributed and shared across a very wide audience.
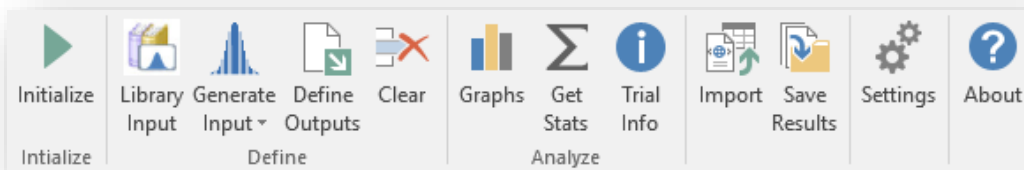
Main Ribbon in Windows and Mac
(Note Mac does not currently include Import)

NOTE Excel Calculate Mode must be Automatic for Interactive Simulation
The Tools turn on Automatic Calculation by default, but this may be controlled under Sittings

Main Ribbon

The *Initialize* tool is where the modeler identifies the Stochastic Library containing the Input SIPs for use in SIP Library mode and specifies the number of trials to run if creating a model to run in Generate mode.

The *Library Inputs* tool is where the modeler identifies the model's input cells and links them to the desired input SIPs. This tool is not required in Generate Mode.

The Generate Input tool allows the modeler to define input cells whose values are computed by Excel formulas for 13 different standard distributions. Rand() or seed-able HDR modes supported.

The *Define Outputs* tool is where the modeler identifies the model's output cells and links them to the data table to create the Output SIPs, which are created in either mode.
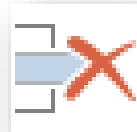
The Clear tool allows the modeler to remove inputs and outputs from the model.

The *Graphs* tool provides an easy way to create histograms and cumulative distributions from the output SIPs in either mode. It may also be used to graph pre-existing data arrays.

Windows

Main Ribbon continued

Σ The Get Stats tool facilitates the use of Excel's native statistical formulas with the output SIPs. It is useful for formulas such as AVERAGE() and STDEV() etc. Click button on a blank cell for instructions.

? The Chance of Whatever tool inserts a formula that computes the chance that an output cell is greater (or less) than a specified target value. Warning: be sure to use a valid comparison: <= is valid; =< is wrong.

T The Trial Info tool provides a simple way to step through the input SIPs or HDR variates one trial at a time or view optional meta data in SIP Library mode only.

The Import tool allows the modeler to import SIP Library files stored in XML or CSV format.

The Save Results tool allows the modeler to convert a model's simulated data to an Excel format SIP Library.
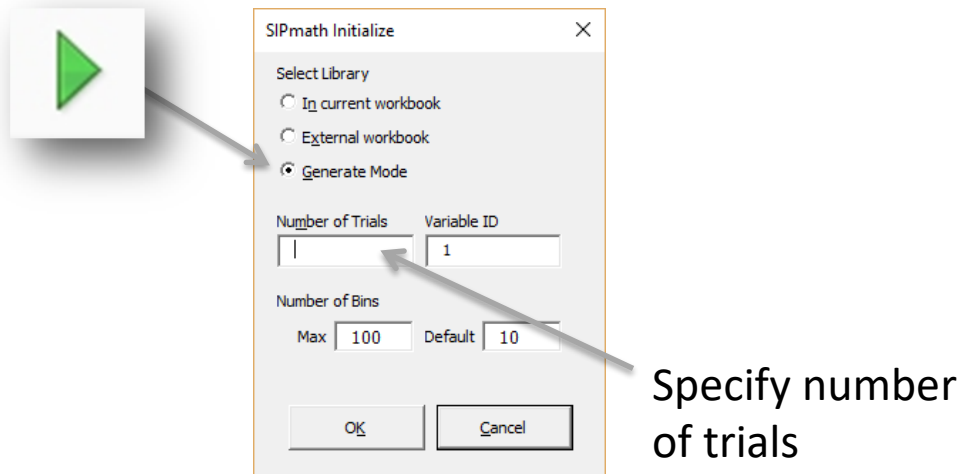
The Settings tool specifies Automatic Calculation options, sets the default number of Bins for charts, and activates Crystal Ball or @Risk interface if they are installed.
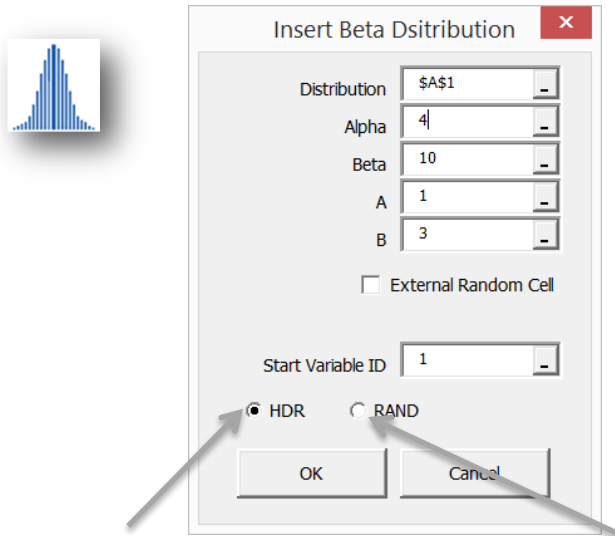
i The About tool displays version and copyright information.
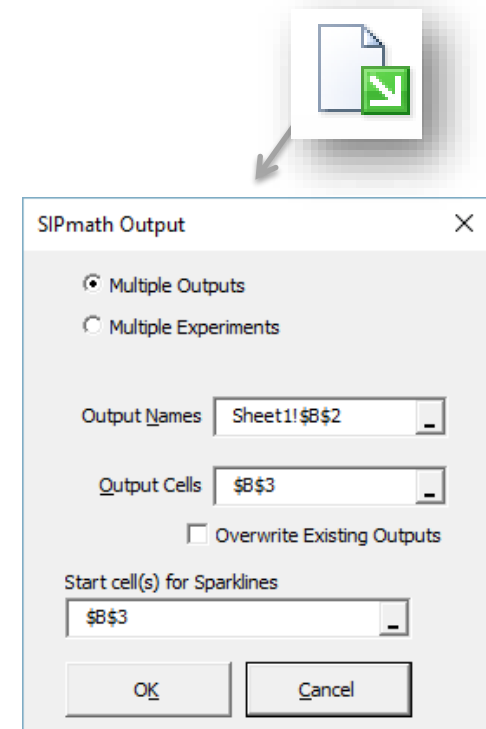
Generate Mode

1. Initialize SIPmath in generate mode

Specify number of trials

3. Specify model outputs
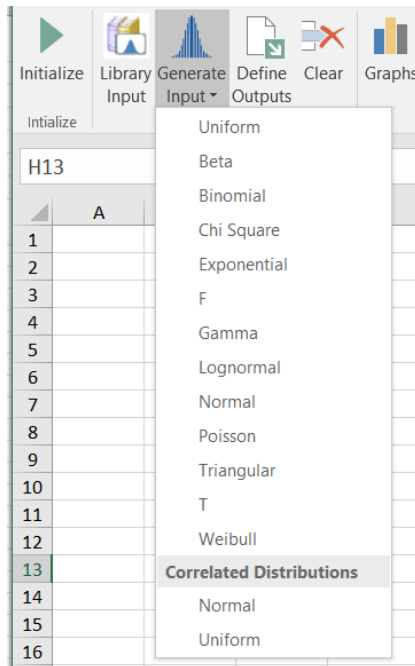

2. Insert random numbers into model:

Choose HDR Seed-able or RAND() generator

4. Graph and explore the output SIP
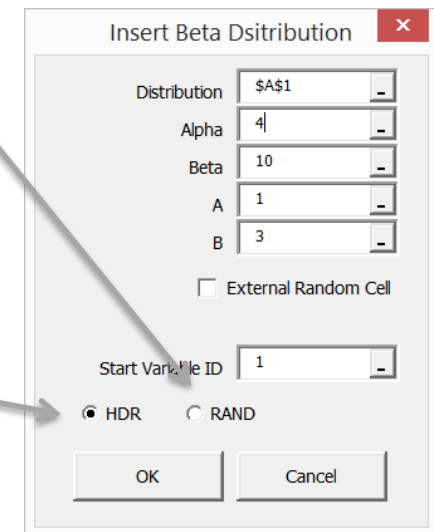
Generating Random Inputs

"Anyone who attempts to generate random numbers by deterministic means is, of course, living in a state of sin." - John von Neumann (Mathematician and father of the modern computer)

The SIPmath Modeler Tools may either read Inputs as data in SIP Library Mode, or generate its own results as demonstrated here. For any of the distributions listed in the Generate Input dialog you may use three types of pseudo random number generators as described below.

1. The Excel RAND() function. This produces a different simulation every time you press the calculate key. The results are not repeatable or auditable.

2. The HDR generator. This is an experimental generator from Hubbard Decision Research. It produces repeatable results with native Excel formulas, without needing to store entire SIPs of data, that is, it is seed-able by changing the Start Variable ID.

   It has undergone some testing, but is not pedigreed. However, this is the recommended generator for quick modeling. As newer and more proven generators are discovered, they will be added to the SIPmath Tools.

Insert Beta Dsitribution

Distribution	$A$1
Alpha	4
Beta	10
A	1
B	3

☐ External Random Cell

Start Variable ID 1

⦿ HDR   ○ RAND

OK   Cancel

3. You may generate SIP libraries from your favorite pseudo random number generator or sources such as Random.org.

☑ External Random Cell

Random Cell Sheet1!$M$18

Start Variable ID 1

○ HDR   ○ RAND   ⦿ User

OK   Cancel
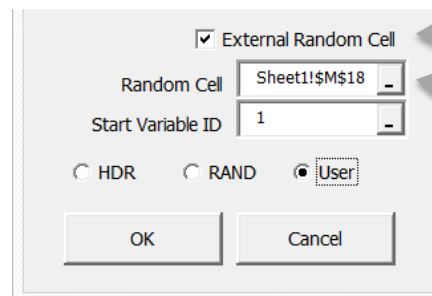
Select External Random cell.

Then point to the cell where you will place the input for your own random number using Library Input Mode.

SIP Library Mode

1. Initialize in the Library mode (current or external workbook)

2. Designate input cells

SIPmath Initialize   ✕

Select Library
- ○ In current workbook
- ● External workbook
- ○ Generate Mode

[   ] Browse...

Number of Bins

Max [100]   Default [10]

[OK]   [Cancel]

4. Specify outputs

SIPmath Output   ✕

- ● Multiple Outputs
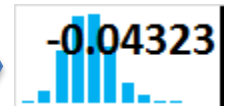- ○ Multiple Experiments

Output Names [Sheet1!$B$2]
Output Cells [$B$3]
☐ Overwrite Existing Outputs

Start cell(s) for Sparklines
[$B$3]

[OK]   [Cancel]

From Library   ✕

Starting Cell for Input Values
[Sheet1!$C$6]

[Open SIP Library]

- ○ Multiple inputs as Row
- ● Multiple inputs as Column

Filter (case-sensitive)
[   ]

Starting Cell for Metadata
[Sheet1!$D$6]

Select Input

Metadata to include
- ☑ Name
- ☐ Average
- ☐ 5th%
- ☐ 95th%

SNormal01
SNormal02
SNormal03
SNormal04
SNormal05
SNormal06
SNormal07
SNormal08
SNormal09
SNormal10
SNormal11
SNormal12
SNormal13
SNormal14

☐ Include Metadata Headings

Starting Cell(s) for Sparklines
[Sheet1!$C$6]

[OK]   [Cancel]

3. Build a model using uncertain inputs

0.019945

-0.14445
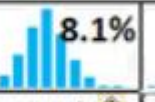
-0.13153

-0.13284

model

-0.04323

Get Stats Σ

When you specify outputs, the results appear in the PM_table sheet in ranges with the assigned names. You may apply any of Excel's native statistical formulas to these ranges.

For example, suppose you have created four outputs in cells D9 through G9, named Portfolio1 through Portfolio4. To calculate the variance of each portfolio you could create the formula =VAR(Portfolio1) in cell D10. But this formula cannot be copied because the range names are an absolute reference.

The Get Stats button allows you to copy statistical formulas as shown on the right.

Step 1: Create and copy statistical formulas across output cells

G10		fx	=VAR(G9)

	D	E	F	G
8	Portfolio1	Portfolio2	Portfolio3	Portfolio4
9	4.5%	6.3%	8.1%	9.9%
10	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

Step 2: Select the statistical formulas and then click

Σ Convert Stats

G10		fx	=VAR(Portfolio4)

	D	E	F	G
8	Portfolio1	Portfolio2	Portfolio3	Portfolio4
9	4.5%	6.3%	8.1%	9.9%
10	0.002097	0.0018	0.001899	0.002396

All selected formulas will be converted to point to output SIPs

SIP Library Sheet Format

Libraries are free-format, with information conveyed in Excel variable names & range names.
Other Formats include XML and CSV.

Optional Indexed Meta Data Values may be appended to the ends of the SIPs. The labels and index positions must be stored in arrays with special names. In this case, for example, the "Average" is stored one position beyond the last trial in the SIP

Number of realizations is stored in a cell named: PM_Trials. NOTE Do NOT count the Meta Data, just the Trials

Range name: PM_Meta

Library Provenance is stored in a cell named: PM_Lib_provenance

Range name: PM_Meta_INDEX

SIP Libraries created with SIPmath Tools group the rows containing SIP data for easy expanding and hiding data. Use the + and – buttons in the margins to show and hide data.

SIPs may be stored as Rows or Columns, but must be named. for example, the SIP in D10:D19 is named Uniform

If a SIP includes Meta Data, then the SIP together with its Meta Data should be named with a name ending in .MD. For example, the SIP and Meta Data in D10:D21 is named Uniform.MD

	C	D	E	F
2	PM_Trials	10		
3	PM_Lib_Provenance	SIPmath		
4				
			Meta Data	Index
			Average	11
			Stdev	12
8	Click [+] to show data			
9			Uniform	Beta	Binomial
10	1	0.37674	1.50535	0
	2	0.910832	1.586694	2
3	3	0.629857	1.654299	
4	4	0.680313	1.492371	2
5	5	0.208309	1.781952	4
6	6	0.679557	1.853316	2
16	7	0.920952	1.68269	2
17	8	0.717421	1.380467	2
18	9	0.055563	1.456218	0
19	10	0.602761	1.208679	1
20	Average	0.578231	1.560...	
21	Stdev	0.283242	0.192626	1.159502

Stay in Touch

Questions?

Come visit ProbabilityManagement.org for the newer software distributions and examples

Check SIPmath Modeler Tools Reference Manual for more information

The SIPmath Modeler Tools Reference contains tutorials and a more detailed description

Submit suggestions & bug reports

Send an e-mail to Dave@probabilitymanagement.org with OS version, Excel version, SIPmath Modeler version and exact sequence of events that need an improvement

Contribute for code & standards development

ProbabilityManagement.org is a non-profit organization depending on sponsor contributions and volunteer work. If interested, please contact us at Melissa@probabilitymanagement.org