



**Real Options Valuation, Inc.**  
**Software Technical Support**  
**HELPFUL TIPS AND TECHNIQUES**

**FOR PUBLIC DISSEMINATION**

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## Helpful Tips and Techniques

The following are some quick helpful tips and shortcut techniques for advanced users of **Risk Simulator**. For details on using specific tools, refer to the relevant sections in the user manual.

### *TIPS: Assumptions (Set Input Assumption User Interface)*

- Quick Jump—select any distribution and type in any letter and it will jump to the first distribution starting with that letter (e.g., click on *Normal* and type in *W* and it will take you to the Weibull distribution).
- Right-Click Views—select any distribution, right-click, and select the different views of the distributions (large icons, small icons, list).
- Tab to Update Charts—after entering some new input parameters (e.g., you type in a new mean or standard deviation value), hit **TAB** on the keyboard or click anywhere on the user interface away from the input box to see the distributional chart automatically update.
- Enter Correlations—enter pairwise correlations directly here (the columns are resizable as needed), use the multiple distributional fitting tool to automatically compute and enter all pairwise correlations, or, after setting some assumptions, use the edit correlation tool to enter your correlation matrix.
- Equations in an Assumption Cell—only empty cells or cells with static values can be set as assumptions; however, there might be times when a function or equation is required in an assumption cell, and this can be done by first entering the input assumption in the cell and then typing in the equation or function (when the simulation is being run, the simulated values will replace the function, and after the simulation completes, the function or equation is again shown).

### *TIPS: Copy and Paste*

- Copy and Paste using *Escape*—when you select a cell and use the **Risk Simulator Copy** function, it copies everything into Windows clipboard, including the cell's value, equation, function, color, font, and size, as well as **Risk Simulator** assumptions, forecasts, or decision variables. Then, as you apply the **Risk Simulator Paste** function, you have two options. The first option is to apply the **Risk Simulator Paste** directly, and all cell

values, color, font, equation, functions and parameters will be pasted into the new cell. The second option is to first click *Escape* on the keyboard, and then apply the **Risk Simulator Paste**. *Escape* tells **Risk Simulator** that you wish to paste only the **Risk Simulator** assumption, forecast, or decision variable, and not the cell's values, color, equation, function, font, and so forth. Hitting *Escape* before pasting allows you to maintain the target cell's values and computations, and pastes only the **Risk Simulator** parameters.

- Copy and Paste on Multiple Cells—select multiple cells for copy and paste (with contiguous and noncontiguous assumptions).

#### **TIPS: Correlations**

- Set Assumption—set pairwise correlations using the set input assumption dialog (ideal for entering only several correlations).
- Edit Correlations—set up a correlation matrix by manually entering or pasting from Windows clipboard (ideal for large correlation matrices and multiple correlations).
- Multiple Distributional Fitting—automatically computes and enters pairwise correlations (ideal when performing multiple variable fitting to automatically compute the correlations for deciding what constitutes a statistically significant correlation).

#### **TIPS: Data Diagnostics and Statistical Analysis**

- Stochastic Parameter Estimation—in the *Statistical Analysis and Data Diagnostic* reports, there is a tab on stochastic parameter estimations that estimates the volatility, drift, mean-reversion rate, and jump-diffusion rates based on historical data. Be aware that these parameter results are based solely on historical data used, and the parameters may change over time and depending on the amount of fitted historical data. Further, the analysis results show all parameters and do not imply which stochastic process model (e.g., Brownian Motion, Mean-Reversion, Jump-Diffusion, or mixed process) is the best fit. It is up to the user to make this determination depending on the time-series variable to be forecasted. The analysis cannot determine which process is best; only the user can do this (e.g., Brownian Motion process is best for modeling stock prices, but the analysis cannot determine that the historical data analyzed is from a stock or some other variable, and only the user will know this). Finally, a good hint is that if a certain parameter is out of the normal range, the process requiring this input parameter is most probably not the correct process (e.g., if the mean-reversion rate is 110%, chances are, mean-reversion is not the correct process).

#### **TIPS: Distributional Analysis, Charts and Probability Tables**

- Distributional Analysis—used to quickly compute the PDF, CDF, and ICDF of the 42 probability distributions available in **Risk Simulator**, and to return a *table* of these values.
- Distributional Charts and Tables—used to compare *different parameters of the same distribution* (e.g., takes the shapes and PDF, CDF, ICDF values of a Weibull distribution

with Alpha and Beta of [2, 2], [3, 5], and [3.5, 8] and overlays them on top of one another).

- Overlay Charts—used to compare *different distributions* (theoretical input assumptions and empirically simulated output forecasts) and overlay them on top of one another for a visual comparison.

#### **TIPS: Efficient Frontier**

- Efficient Frontier Variables—to access the frontier variables, first set the model's Constraints before setting efficient frontier variables.

#### **TIPS: Forecast Cells**

- Forecast Cells with No Equations—you can set output forecasts on cells without any equations or values (simply ignore the warning message) but be aware that the resulting forecast chart will be empty. Output forecasts are typically set on empty cells when there are macros that are being computed and the cell will be continually updated.

#### **TIPS: Forecast Charts**

- *TAB* versus *Spacebar*—hit *TAB* on the keyboard to update the forecast chart and to obtain the percentile and confidence values after you enter some inputs, and hit the *Spacebar* to rotate among the various tabs in the forecast chart.
- Normal versus Global View—click on these views to rotate between a tabbed interface and a global interface where all elements of the forecast charts are visible at once.
- Copy—copies the forecast chart or the entire global view depending on whether you are in the normal or global view.

#### **TIPS: Forecasting**

- Cell Link Address—if you first select the data in the spreadsheet and then run a forecasting tool, the cell address of the selected data will be automatically entered into the user interface. Otherwise, you will have to manually enter in the cell address or use the link icon to link to the relevant data location.
- Forecast RMSE—use as the universal error measure on multiple forecast models for direct comparisons of the accuracy of each model.

#### **TIPS: Forecasting: ARIMA**

- Forecast Periods—the number of exogenous data rows has to exceed the time-series data rows by at least the desired forecast periods (e.g., if you wish to forecast 5 periods into the future and have 100 time-series data points, you will need to have at least 105 or more data points on the exogenous variable). Otherwise, just run ARIMA without the exogenous variable to forecast as many periods as you wish without any limitations.

#### **TIPS: Forecasting: Basic Econometrics**

- Variable Separation with Semicolons—separate independent variables using a semicolon.

### **TIPS: Forecasting: Logit, Probit, and Tobit**

- Data Requirements—the dependent variables for running logit and probit models must be binary only (0 and 1), whereas the tobit model can take binary and other numerical decimal values. The independent variables for all three models can take any numerical value.

### **TIPS: Forecasting: Stochastic Processes**

- Default Sample Inputs—when in doubt, use the default inputs as a starting point to develop your own model.
- Statistical Analysis Tool for Parameter Estimation—use this tool to calibrate the input parameters into the stochastic process models by estimating them from your raw data.
- Stochastic Process Model—sometimes if the stochastic process user interface hangs for a long time, chances are your inputs are incorrect and the model is not correctly specified (e.g., if the mean-reversion rate is 110%, mean-reversion is probably not the correct process). Try with different inputs or use a different model.

### **TIPS: Forecasting: Trendlines**

- Forecast Results—scroll to the bottom of the report to see the forecasted values.

### **TIPS: Function Calls**

- RS Functions—there are functions that you can use inside your Excel spreadsheet to set input assumption and get forecast statistics. To use these functions, you need to first install *RS Functions* (which include *Start, Programs, Real Options Valuation, Risk Simulator, Tools, and Install Functions*) and then run a simulation before setting the RS functions inside Excel. Refer to the example model 24 for examples on how to use these functions.

### **TIPS: Getting Started Exercises and Getting Started Videos**

- Getting Started Exercises—there are multiple step-by-step hands-on examples and results interpretation exercises available in the *Start, Programs, Real Options Valuation, Risk Simulator* shortcut location. These exercises are meant to quickly get you up to speed with the use of the software.
- Getting Started Videos—these are all available for free on our website: [www.realoptionsvaluation.com/download.html](http://www.realoptionsvaluation.com/download.html) or [www.rovdownloads.com/download.html](http://www.rovdownloads.com/download.html).

### **TIPS: Hardware ID**

- Right-Click HWID Copy—in the *Install License* user interface, select or double-click on the *HWID* to select its value, right-click to copy or click on the E-mail HWID link to generate an e-mail with the HWID.
- Troubleshooter—run the Troubleshooter from the *Start, Programs, Real Options Valuation, Risk Simulator* folder, and run the *Get HWID* tool to obtain your computer's HWID.

### **TIPS: Latin Hypercube Sampling (LHS) vs. Monte Carlo Simulation (MCS)**

- Correlations—when setting pairwise correlations among input assumptions, we recommend using the Monte Carlo setting in the **Risk Simulator Options** menu. Latin Hypercube Sampling is not compatible with the correlated copula method for simulation.
- LHS Bins—a larger number of bins will slow down the simulation while providing a more uniform set of simulation results.
- Randomness—all of the random simulation techniques in the **Options** menu have been tested and are all good simulators and approach the same levels of randomness when larger number of trials are run.

### **TIPS: Online Resources**

- Books, Getting Started Videos, Models, White Papers—resources available on our website:  
[www.realoptionsvaluation.com/download.html](http://www.realoptionsvaluation.com/download.html) or  
[www.rovdownloads.com/download.html](http://www.rovdownloads.com/download.html).

### **TIPS: Optimization**

- Infeasible Results—if the optimization run returns infeasible results, you can change the constraints from an Equal (=) to an Inequality ( $\geq$  or  $\leq$ ) and try again. This also applies when you are running an efficient frontier analysis.

### **TIPS: Profiles**

- Multiple Profiles—create and switch among multiple profiles in a single model. This allows you to run scenarios on simulation by being able to change input parameters or distribution types in your model to see the effects on the results.
- Profile Required—Assumptions, Forecasts, or Decision Variables cannot be created if there is no active profile. However, once you have a profile, you no longer have to keep creating new profiles each time. In fact, if you wish to run a simulation model by adding additional assumptions or forecasts, you should keep the same profile.
- Active Profile—the last profile used when you save Excel will be automatically opened the next time the Excel file is opened.
- Multiple Excel Files—when switching between several opened Excel models, the active profile will be from the current and active Excel model.
- Cross Workbook Profiles—be careful when you have multiple Excel files open because if only one of the Excel files has an active profile and you accidentally switch to another Excel file and set assumptions and forecasts on this file, the assumptions and forecast will not run and will be invalid.
- Deleting Profiles—you can clone existing profiles and delete existing profiles, but note that at least one profile must exist in the Excel file if you delete profiles.
- Profile Location—the profiles you create (containing the assumptions, forecasts, decision variables, objectives, constraints, etc.) are saved as an encrypted hidden

worksheet. This is why the profile is automatically saved when you save the Excel workbook file.

#### **TIPS: Right-Click Shortcut and Other Shortcut Keys**

- Right-Click—you can open the **Risk Simulator** shortcut menu by right-clicking on a cell anywhere in Excel.

#### **TIPS: Save**

- Saving the Excel File—saves the profile settings, assumptions, forecasts, decision variables, and your Excel model (including any **Risk Simulator** reports, charts, and data extracted).
- Saving the Chart Settings—saves the forecast chart settings such that the same settings can be recovered and applied to future forecast charts (use the save and open icons in the forecast charts).
- Saving and Extracting Simulated Data in Excel—extracts a simulated run's assumptions and forecasts; the Excel file itself will still have to be saved in order to save the data for retrieval later.
- Saving Simulated Data and Charts in **Risk Simulator**—using the **Risk Simulator Data Extract** and saving to a \*.RiskSim file will allow you to reopen the dynamic and live forecast chart with the same data in the future without having to rerun the simulation.
- Saving and Generating Reports—simulation reports and other analytical reports are extracted as separate worksheets in your workbook, and the entire Excel file will have to be saved in order to save the data for future retrieval later.

#### **TIPS: Sampling and Simulation Techniques**

- Random Number Generator—there are six supported random number generators (see the user manual for details) and, in general, the ROV **Risk Simulator** default method and the **Advanced Subtractive Random Shuffle** method are the two recommended approaches to use. Do not apply the other methods unless your model or analytics specifically calls for their uses, and, even then, we recommended testing the results against these two recommended approaches.

#### **TIPS: Software Development Kit (SDK) and DLL Libraries**

- SDK, DLL, and OEM—all of the analytics in **Risk Simulator** can be called outside of this software and integrated in any user proprietary software. Contact admin@realoptionsvaluation.com for details on using our Software Development Kit to access the **Dynamic Link Library** (DLL) analytics files.

#### **TIPS: Starting Risk Simulator with Excel**

- ROV Troubleshooter—run this troubleshooter to obtain your computer's HWID for licensing purposes, to view your computer settings and prerequisites, and to reenble **Risk Simulator** if it has been accidentally disabled.
- Start **Risk Simulator** when Excel Starts—you can let **Risk Simulator** start automatically

when Excel starts each time or start it manually from the Start, Programs, Real Options Valuation, **Risk Simulator** shortcut location. This preference can be set in the **Risk Simulator, Options** menu.

#### **TIPS: Super Speed Simulation**

- Model Development—if you wish to run super speed in your model, test run a few super speed simulations while the model is being constructed to make sure that the final product will run the super speed simulation. Do not wait until the final model is complete before testing super speed to avoid having to backtrack to identify where any broken links or incompatible functions exist.
- Regular Speed—when in doubt, regular speed simulation always works.

#### **TIPS: Tornado Analysis**

- Tornado Analysis—the tornado analysis should never be run just once. It is meant as a model diagnostic tool, which means that it should ideally be run several times on the same model. For instance, in a large model, **Tornado** can be run the first time using all of the default settings and all precedents should be shown (select **Show All Variables**). This single analysis may result in a large report and long (and potentially unsightly) Tornado charts. Nonetheless, it provides a great starting point to determine how many of the precedents are considered critical success factors. For example, the Tornado chart may show that the first 5 variables have high impact on the output, while the remaining 200 variables have little to no impact, in which case, a second tornado analysis is run showing fewer variables. For the second run, select **Show Top 10 Variables** if the first 5 are critical, thereby creating a nice report and a Tornado chart that shows a contrast between the key factors and less critical factors. (You should never show a Tornado chart with only the key variables without showing some less critical variables as a contrast to their effects on the output.)
- Default Values—the default testing points can be increased from the  $\pm 10\%$  value to some larger value to test for nonlinearities (the Spider chart will show nonlinear lines and Tornado charts will be skewed to one side if the precedent effects are nonlinear).
- Zero Values and Integers—inputs with zero or integer values only should be deselected in the Tornado analysis before it is run. Otherwise, the percentage perturbation may invalidate your model (e.g., if your model uses a lookup table where Jan = 1, Feb = 2, Mar = 3, etc., perturbing the value 1 at a  $\pm 10\%$  value yields 0.9 and 1.1, which makes no sense to the model).
- Chart Options—try various chart options to find the best options to turn on or off for your model.

#### **TIPS: Troubleshooter**

- ROV Troubleshooter—run to obtain the computer's HWID, to view your computer settings and prerequisites, and to re-enable **Risk Simulator** if it has been disabled.