

Crystal Ball Software and Risk Analysis Tips

Using the Scenario Analysis Tool to Generate Potential Outcomes For Identical Assumptions

In certain models, you may have several variables that are described by the same distribution. For example, you might be trying to describe the rate of return from a given investment over multiple years or you might be attempting to model the amount of recoverable oil from a set of wells with identical characteristics.

In large models, you will soon find that creating so many identical distributions will overcomplicate your model and slow down your simulations. One solution you can use to create more manageable models is to define your assumptions and correlations for only one of the identical variables (e.g., for one year or for one well, as described above), and then use the Scenario Analysis Tool to generate potential outcomes. With a little Excel modeling savvy, you can generate the same effect as if you created the larger number of separate assumptions.

Let's say that you are forecasting the value of your portfolio over ten years and that the fraction you invest in each of four assets remains constant. The classic Crystal Ball method for modeling these uncertain returns is to create a separate assumption for each asset (including any necessary correlations) and then to use the Crystal Ball Copy and Paste commands to apply these assumptions to all of the ten years. Your result is 40 assumptions, with each asset represented by the same assumption for each of the ten years.

An alternative technique to this method is as follows:

1. Define the assumptions that correctly describe your variables. Include any correlations.
2. Define a forecast in your model.
3. From the Menu choose CBTools > Scenario Analysis.
4. In the first Scenario Analysis dialog, select the appropriate target forecast. Because we are only using Scenario Analysis to generate assumption values, it does not matter which forecast you choose.
5. In the second Scenario Analysis dialog, select to show percentiles 0-100 and 10,000 trials. (You do not have to run this many trials. However, as you increase the number of trials, you will increase the quality of your results.)
6. Select Start.
7. The Scenario Analysis Tool generates 10,000 rows of assumption scenarios. For each trial in your simulation, you want to select only one of these sets. Start by copying the columns from the Scenario Analysis results into your workbook.
8. Replace the percentile values in the far left column of the Scenario Analysis results with the integers 0 - 9999.

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9. Insert two columns in your workbook. In the first column, type the formula =RAND() and copy this down for each year your are forecasting. This function will generate a random number at least zero and less than one.
10. In the second column, type the formula = 10,000*ROUND(x,4) where x is a cell reference to the formula you created in Step 9.
11. Select the first cell where you would have used the assumption. Type the formula =VLOOKUP(Y,A1:Z10000,2,TRUE). The first argument refers to the value generated in Step 10. The second argument is the array of values including the integers assigned to each set of assumptions and the values for the assumptions. The third argument represents the column number (counting from the left) from which the function will choose a value in the appropriate row. In our case, this value would range from 2-5 depending on the investment assumption we were replacing.
12. Copy this formula into all of the cells where you would have used CB assumptions, taking care to adjust the arguments appropriately.
13. Run the simulation. In each trial, the random values selected by the Excel RAND function will change, and a new set of assumptions will be chosen for each year during each trial.

For more information or to contact us, browse to <http://helpdesk.crystalball.com>

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