

In This Issue

1. Gain an understanding of the basics of genetic algorithm for optimization
2. Learn about goal seek and single variable optimization

“What is Genetic Algorithm and how does it work?”

Genetic Algorithm Optimization

Genetic Algorithms belong to the larger class of evolutionary algorithms that generate solutions to optimization and search problems using techniques inspired by natural evolution, such as inheritance, mutation, selection, and crossover.

The genetic algorithm is available in *Risk Simulator* | *Tools* | *Genetic Algorithm* (Figure 1). Care should be taken in calibrating the model’s inputs as the results will be fairly sensitive to the inputs (the default inputs are provided as a general guide to the most common input levels), and it is recommended that the *Gradient Search Test* option be chosen for a more robust set of results (you can deselect this option to get started and then select this choice, rerun the analysis, and compare the results).

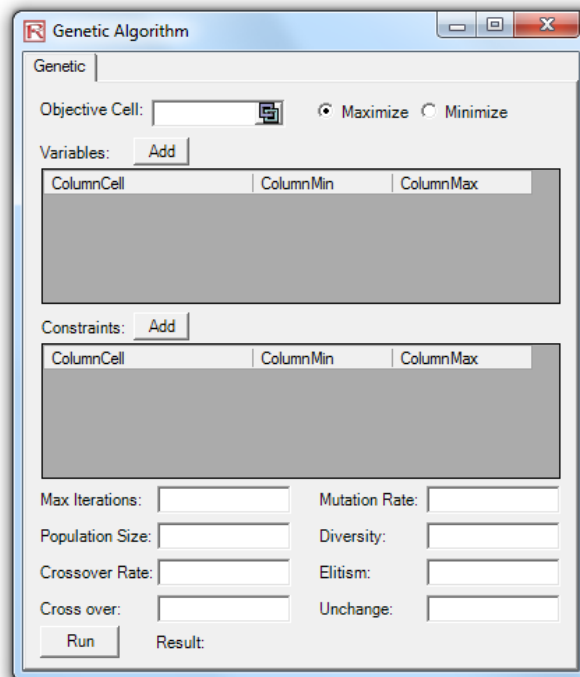


Figure 1. Genetic Algorithm

Notes

In many problems, genetic algorithms may have a tendency to converge towards local optima or even arbitrary points rather than the global optimum of the problem. This means that it does not know how to sacrifice short-term fitness to gain longer-term fitness. For specific optimization problems and problem instances, other optimization algorithms may find better solutions than genetic algorithms (given the same amount of computation time). Therefore, it is recommended that you first run the *Genetic Algorithm* and then rerun it by selecting the *Apply Gradient Search Test* option (Figure 1) to check the robustness of the model. This gradient search test will attempt to run combinations of traditional optimization techniques with Genetic Algorithm methods and return the best possible solution. Finally, unless there is a specific theoretical need to use *Genetic Algorithm*, we recommend using *Risk Simulator’s Optimization* module, which allows you to run more advanced risk-based dynamic and stochastic optimization routines for more robust results.

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Goal Seek and Single Variable Optimizer

The *Goal Seek* tool is a search algorithm applied to find the solution of a single variable within a model. If you know the result that you want from a formula or a model, but are not sure what input value the formula needs to get that result, use the *Risk Simulator* | *Tools* | *Goal Seek* feature. Note that *Goal Seek* works only with one variable input value. If you want to accept more than one input value, use *Risk Simulator's* advanced Optimization routines. Figure 2 shows how *Goal Seek* is applied to a simple model.

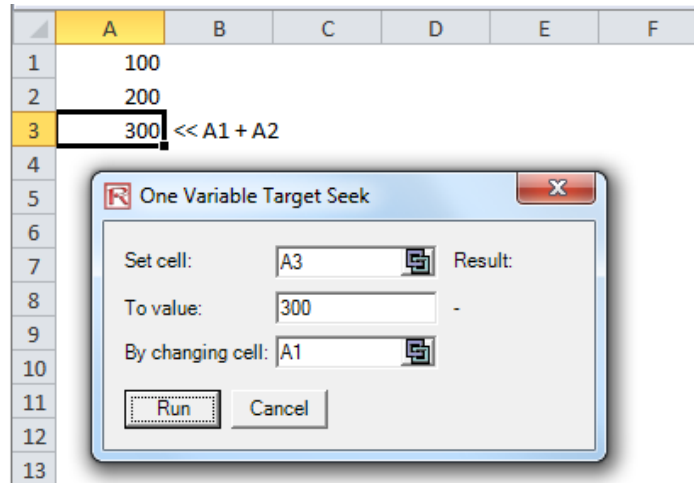


Figure 2. Goal Seek

The *Single Variable Optimizer* tool is a search algorithm used to find the solution of a single variable within a model, just like the goal seek routine discussed previously. If you want the maximum or minimum possible result from a model but are not sure what input value the formula needs to get that result, use the *Risk Simulator* | *Tools* | *Single Variable Optimizer* feature (Figure 3). Note that this tool runs very quickly but is only applicable to finding one variable input. If you want to accept more than one input value, use *Risk Simulator's* advanced Optimization routines. Note that this tool is included in *Risk Simulator* because if you require a quick optimization computation for a single decision variable, this tool provides that capability without having to set up an optimization model with profiles, simulation assumptions, decision variables, objectives, and constraints.

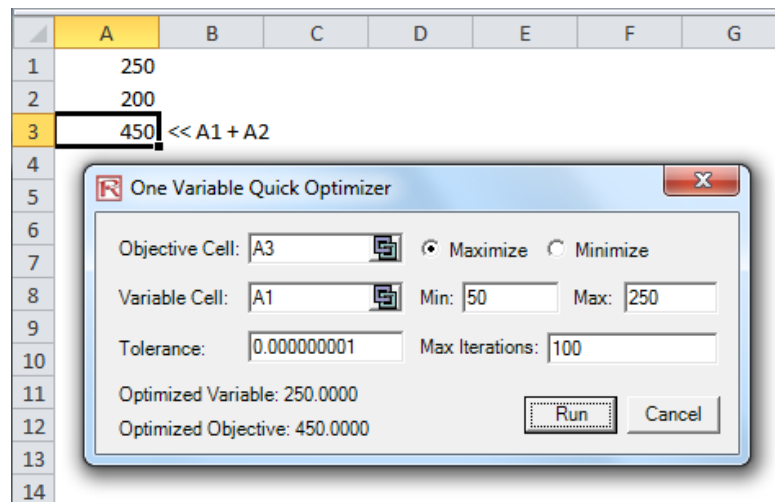


Figure 3. Single Variable Optimizer