

ABOUT MONTE CARLO SIMULATION



Applications of Monte Carlo Simulation

Retirement planning · Currency valuation · Real options analysis
Discounted Cash Flow analysis · Value-at-risk · Portfolio optimization
Insurance loss reserves estimation · Insurance premium pricing
Six Sigma and quality analysis · Exploration and production · Oil reserves estimation · Capital project estimation · Product Pricing
Regulation compliance · New product analysis · Production siting
Plant shutdown · Product life cycle analysis · R&D estimation · Drug effectiveness · Endangered species preservation · Pollution cleanup and projections · Resource allocation · Military war games · Welfare and budgetary projections · Cost estimating · Highway planning and optimization · Supply chain distribution

Risk is part of every decision we make. We are constantly faced with uncertainty, ambiguity, and variability. And even though we have unprecedented access to information, we can't accurately predict the future. Monte Carlo simulation lets you see all the possible outcomes of your decisions and assess the impact of risk.

What is Monte Carlo simulation?

Monte Carlo simulation is a computerized mathematical technique that allows people to account for risk in quantitative analysis and decision making. The technique is used by professionals in such widely disparate fields as finance, project management, energy, manufacturing, engineering, research and development, insurance, oil & gas, transportation, and the environment.

Monte Carlo simulation furnishes the decision-maker with a range of possible outcomes and the probabilities they will occur for any choice of action. It shows the extreme possibilities—the outcomes of going for broke and for the most conservative decision—along with all possible consequences for middle-of-the-road decisions.

How Monte Carlo simulation works

Monte Carlo simulation builds models of possible results by substituting a range of values—a probability distribution function—for any factor that has inherent uncertainty. It then calculates results over and over, each time using a different set of random values from the probability functions. Depending upon the number of uncertainties and the ranges specified for them, a Monte Carlo simulation could involve thousands or tens of thousands of recalculations before it is complete. Monte Carlo simulation produces distributions of possible outcome values.

The technique was first used by scientists working on the atom bomb; it was named for Monte Carlo, the Monaco resort town renowned for its casinos. Since its introduction in World War II, Monte Carlo simulation has been used to model a variety of physical and conceptual systems. An enhancement to Monte Carlo simulation is the use of Latin Hypercube sampling, which samples more accurately from the entire range of distribution functions.

Palisade Monte Carlo simulation products

The advent of spreadsheet applications for personal computers provided an opportunity for professionals to use Monte Carlo simulation in everyday analysis work. Microsoft Excel is the dominant spreadsheet analysis tool and Palisade's @RISK is the leading Monte Carlo simulation add-in for Excel. First introduced for Lotus 1-2-3 for DOS in 1987, @RISK has a long-established reputation for computational accuracy, modeling flexibility, and ease of use. The introduction of Microsoft Project led to another logical application of Monte Carlo simulation—analyzing the uncertainties and risks inherent to the management of large projects. @RISK for Project is Palisade's Monte Carlo simulation add-in for Microsoft Project.