

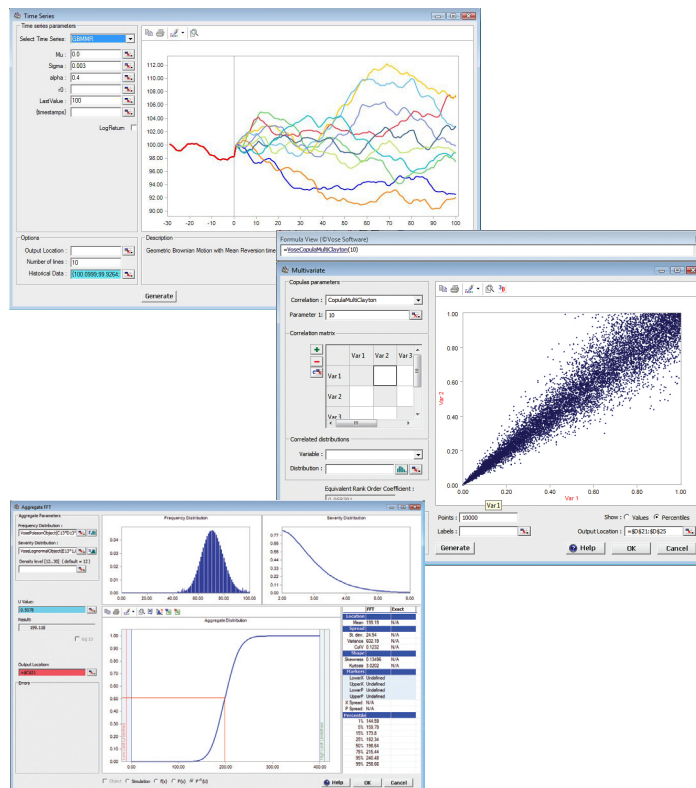
MODEL RISK FOR INSURANCE AND FINANCE

OVERVIEW

Vose Software is a leading international firm specializing in quantitative risk analysis software tools. Our primary goal is to provide software tools for clients from the private and public sectors to help them save time and money through better, more informed decisions under conditions of uncertainty.

**ModelRisk for Insurance and Finance** is a risk analysis tool specifically designed for the insurance and finance industries that allows the user to incorporate advanced risk analysis techniques in actuarial and financial risk analysis models. In combination with Excel, ModelRisk gives access to the most up-to-date, advanced quantitative techniques available without having to resort to complex programming. ModelRisk allows you to build accurate, state-of-the-art models in a fraction of the time previously required. For developers building custom applications, ModelRisk routines can also be called via VBA or C++.

**ModelRisk** was developed from our perspective as risk analysis practitioners when we asked ourselves: *"In a perfect world, what would other risk analysts working in insurance or finance want to have in a software tool?"* ModelRisk is the result.



*"I installed ModelRisk and simply "WOW"!!!!!!"*  
 – David T. Galligan, Professor, University of Pennsylvania

SOLUTIONS

◆ Finance

- » Modeling of discounted cashflows.
- » Simulating interest and exchange rates, commodity prices, derivatives, etc. using stochastic financial time series models like mean-reversion, EGARCH and jump diffusion (also fitting to historical data available).
- » Inclusion of distributions used in finance (e.g. Slash, g-and-h, generalized error, non-central chi-squared).
- » Advanced finance specific correlation tools (copulas).
- » Portfolio optimization.
- » Wilkie models.
- » Special distributions for modeling and combining expert opinions.
- » Markov Chain modeling.

◆ Insurance

- » Modeling exposure to individual and aggregate claims using simulation and numerical techniques.
- » Incorporates standard recursive (e.g. De Pril, Panjer) and FFT methods for single and multiple policies.
- » Advanced insurance specific correlation tools (copulas).
- » Direct calculation of premiums.
- » Runoff modeling.
- » Huge range of tools for direct probability calculations.
- » Easy inclusion of deductibles and limits in policies.
- » Inclusion of distributions used in insurance (e.g. Delaporte, Pólya, Burr, LogGamma, spliced distributions).
- » Organization of distributions according to their use in insurance.
- » Special algorithms for extreme value modeling.
- » Ruin and depletion models.
- » Efficient, highly accurate numerical integration.

◆ General Risk Analysis

- » Fitting of distributions, copulas and time series including parameter uncertainty.
- » Tools to simplify modeling of common risk problems (e.g. sums of random variables, stop sum simulation, extreme value modeling, stochastic sum product).
- » Intuitive, simple and efficient modeling through use of objects.
- » Stochastic dominance tools for selecting between options.
- » Automated, hot-linked statistical analysis of data.
- » Interpolation tool.
- » Visual interface available at click of button for most tools.
- » All commonly useful multivariate distributions.
- » Huge help file explaining tools and risk analysis techniques.
- » Calculation tools for returning moments of all stochastic objects (distributions, aggregate costs, etc.).

Start generating accurate and easy-to-build models while saving time and money now! Please contact us for more information or download a trial version of ModelRisk from our website at [www.vosesoftware.com](http://www.vosesoftware.com).

## KEY BENEFITS

- ◆ Save enormous amounts of time and money on model development.
- ◆ Access to industry specific up-to-date and advanced quantitative techniques without expensive custom programming.
- ◆ Vastly improved simulation speeds for large models.
- ◆ Models easy to audit and explain.
- ◆ Context-specific help file written by risk analysts.
- ◆ Software support provided by risk analysts, not a help desk.
- ◆ Training given by risk analysts, not software trainers, that can be customized to your needs.

## FEATURES

**ModelRisk** runs seamlessly in Excel with any Monte Carlo spreadsheet simulation package. This means that you can combine ModelRisk with Monte Carlo simulation to make full use of sophisticated financial tools together with the simulation package's intuitive interface to run simulations, perform statistical analyses on results and produce high quality reporting graphics, as well as making full use of features like sensitivity analysis and optimization. Developed for speed and accuracy, ModelRisk for Insurance and Finance offers a wealth of high-end financial modeling capabilities, including:

- ◆ Over 500 risk analysis functions accessible through Excel.
- ◆ Unique approach to defining and manipulating random variables as objects allowing unprecedented flexibility in modeling insurance and finance issues.
- ◆ Time series models including Geometric Brownian Motion, mean-reversion, Markov Chain, ARCH, GARCH, Wilkie models and jump diffusion.
- ◆ Various elliptical and Archimedean copulas and a unique empirical copula.
- ◆ Intuitive and highly flexible tools for fitting time series, distributions and copulas to data.
- ◆ Distributions, time series and copulas fit to data with options for hot-linked to data and inclusion of parameter uncertainty (i.e. second-order fitting).
- ◆ Density, cumulative probability and generation functions for all univariate distributions and moment calculations so you can quickly and accurately perform complex probability calculations, define custom MLE functions, etc.
- ◆ Over 70 different distributions, both univariate and multivariate, used in the insurance and finance fields, with shifting and bounding.
- ◆ Ruin and depletion models.
- ◆ Models allowing you to evaluate the effect of risk events.
- ◆ Powerful, unique approach to extreme value modeling allowing you, for example, to directly calculate the probability that the largest of a million claims following a certain distribution will not exceed some value X with 95% confidence.
- ◆ Splicing of distributions to model, for example, the bulk of a claim distribution with a Lognormal and splice a Pareto to extend the high-end tail.
- ◆ One-click statistical analysis of data, including bootstrapping.
- ◆ Stochastic dominance analysis.
- ◆ Direct aggregate distribution modeling with recursive and FFT methods.
- ◆ Direct determination of moments of aggregate distributions and fitting various distributions to those moments.
- ◆ All functions are optimized for both speed and accuracy.

## SOME IMPORTANT FUNCTIONALITY

- ◆ **Distributions** – Over 70 univariate and multivariate distributions covering categories such as discrete and continuous, bounded and unbounded, parametric and non-parametric, and first and second order. ModelRisk also has powerful functionality for fitting first and second order parametric and non-parametric distributions to empirical data allowing the user to run simulations based directly on their historical data.
- ◆ **Aggregate Distributions** – Insurance and finance risk analysis frequently requires the determination of the sum of random variables. For example, the aggregate claim distribution of a portfolio of policies over a certain period or the total exposure from a set of investments. Modeling methods included in ModelRisk are Monte Carlo, Panjer, De Pril, and Fast Fourier Transform.
- ◆ **Copulas** – Quantifying dependence has become a major topic in finance and insurance risk analysis. Copulas, used to combine marginal distributions into multivariate distributions, are a good method to capture non-linear dependency. ModelRisk provides comprehensive facilities for implementing copulas. Copulas available include Archimedean (Clayton, Gumbel, Frank), Elliptical (Normal, T) and the unique capability of fitting copulas to empirical data.
- ◆ **Time Series** – Choose between 18 different time series forecasting models including ARCH, GARCH, Geometric Brownian Motion, jump diffusion, and mean reversion. The user can generate time series based on model parameters or by fitting any of the time series models to their empirical data.

**ModelRisk** is not only very **user-friendly**, but also **teaches and helps** the user employ the methods and techniques available by:

- ◆ A specialized version of ModelAssist for ModelRisk (an advanced 'help file') shows how to use ModelRisk with explanation of any relevant theory, linked problems and example model solutions, videos, a search engine and much more!
- ◆ Sophisticated graphical interfaces to visualize, explain and insert model components in an intuitive manner.
- ◆ All features within ModelRisk return meaningful error messages to guide the user when there has been an input error.
- ◆ Models can be passed between those using different language versions of Microsoft Excel.

## OUR LOCATION, AND HOW TO CONTACT US

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