@RISK

advanced risk analysis for spreadsheets

PALISADE

The World's Most Popular Risk Analysis Tool

@RISK is the Risk Analysis and Simulation add-in for Microsoft Excel®. As an add-in, @RISK becomes seamlessly integrated – via a new toolbar and functions - with your spreadsheet, adding Risk Analysis to your existing models. If you can use a spreadsheet, you can use @RISK!

@RISK uses a technique known as Monte Carlo simulation to allow you to take all possible outcomes into account. Simply replace uncertain values in your spreadsheet model with @RISK functions to represent a range of possible values. Select bottom-line cells, like Total Profits, as outputs, and start a simulation. @RISK recalculates your spreadsheet hundreds or even thousands of times, each time selecting random numbers from the @RISK functions you entered. The result: distributions of possible outcomes and the probabilities of getting those results! This not only tells you what could happen in a given situation, but how likely it is that it will happen. With @RISK, you can answer questions like "What are the chances of getting a negative result?" or "What is the probability of earning profits over $500,000?"

@RISK 4.5 for Excel comes in three editions – **Standard, Professional,** and **Industrial** – to allow you to select the feature set which best meets your needs.

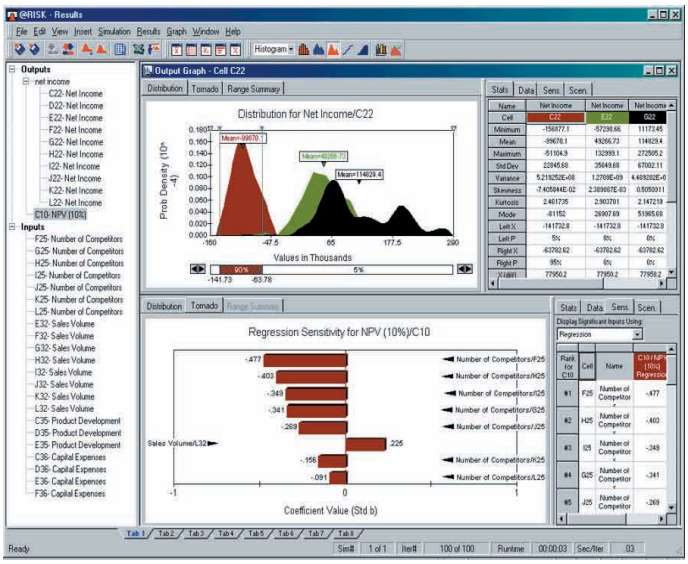
Risk Analysis

Risk Analysis, in a broad sense, is any method — qualitative and/or quantitative — for assessing the impacts of risk on decisions. Myriad Risk Analysis methods are used that blend both qualitative and quantitative techniques. The goal of any of these methods is to help the decision-maker choose a course of action, given a better understanding of the possible outcomes that could occur. You might wonder if what you do would be suitable for Risk Analysis. If you use data to solve problems, make forecasts, develop strategies, or make decisions, then you definitely should consider performing Risk Analysis.

Risk Analysis with @RISK

Risk Analysis in @RISK is a quantitative method that seeks to determine the outcomes of a decision as a probability distribution. In general, Risk Analysis with @RISK encompasses four steps:

1. Develop a Model First, define your problem or situation in an Excel worksheet format.
2. Identify Uncertainty Next, determine which inputs in your model are uncertain, and represent those using ranges of values with @RISK probability distribution functions. Identify which result or output of your model you want to analyse.
3. Analyse the Model with Simulation Run your simulation to determine the range and probabilities of all possible outcomes for the outputs you've identified.
4. Make a Decision Armed with complete information from your analysis, and your personal preferences, make your decision.



@RISK lets you see all possible outcomes!

Step 1: Develop a Model

The first step is constructing a model in your spreadsheet that represents your situation. Because you are working in a spreadsheet, you are virtually unlimited in what you can model. You might be launching a new product and want to see the potential profits, or you might want to see the potential pollution effects a new factory might have on a river. Perhaps you work in pharmaceuticals and need to analyse the effectiveness of a new drug therapy on an illness, or you are an oil executive looking to determine whether or not to drill at a new site. Whatever your situation, @RISK can help!

Step 2: Define the Uncertainty Using the @RISK Model and Define Distribution Windows

Next you need to represent uncertainty in your spreadsheet model. You probably base most decisions on whatever data you have on hand – historical costs, competitors' prices, vendor estimates, etc. But how often do you have full, complete information? Prices change, demand fluctuates, costs rise. By using probability

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distribution functions to represent a range of possible values, @RISK lets you take that uncertainty into account. Simply select a cell whose value you are unsure of and replace its value with one of the 37 @RISK probability distributions below:

Beta	General	Pareto
Beta General	Geometric	Pareto 2
Beta-Subjective	Histogram	Pearson V
Binomial	Hypergeometric	Pearson VI
Chi-Square	Int Uniform	PERT
Cumulative	Inverse Gaussian/Wald	Poisson
Discrete	Logistic	Rayleigh
Discrete Uniform	Log-Logistic	Student's t
Error Function	Lognormal	Triangular
Erlang	Lognormal2	Triangular General
Exponential	Negative Binomial	Uniform
Extreme Value/Gumbel	Normal	Weibull
Gamma		

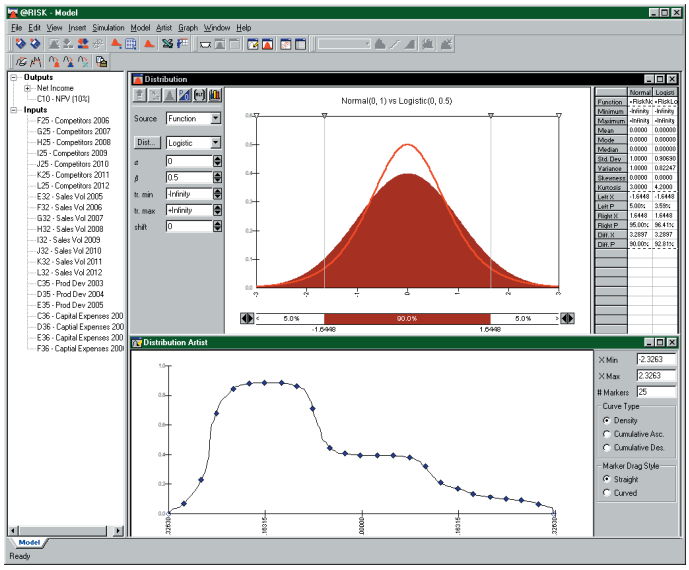
For example, if you have a cost estimate with a most likely value of $10,000, but you know it can't go below $7,000 or higher than $15,000, you can represent that uncertainty with a Triangular distribution using the function **RiskTriang**(7000, 10000, 15000). All @RISK functions become true Excel functions that may be used in other function arguments or support cell references. This gives you maximum flexibility in defining your models.

@RISK 4.5 for Excel makes entering your probability functions easy. Simply type them in like you would any Excel function, use the Excel Paste Function tool, or use the @RISK **Define Distribution Window** to enter your probability distributions graphically (see below for details). @RISK 4.5 also features a Function Wizard that tells you exactly what arguments each @RISK function requires. Once you've entered your distribution functions, select the bottom-line cell or cells whose values you are interested in (such as Total Profit) and click the Add Output button in the @RISK toolbar. This adds a **RiskOutput** function to the chosen cell, allowing you to name, move, and manage your outputs easily.

Open the **@RISK Model Window** to see a clear, Explorer-style list of your inputs and outputs at a glance. You can also perform distribution fitting, correlate inputs, and open a Define Distribution Window from the @RISK Model Window.

Visualise Your Uncertainty with RISKview™

@RISK 4.5 allows complete graphical selection of your probability distribution functions using **RISKview,** Palisade's distribution previewing companion. Now entering your distributions is easier than ever because you can see them, edit them, and apply them with a few clicks of the mouse. RISKview comes fully integrated with every copy of @RISK 4.5 for Excel, and appears as a convenient pop-up Define Distribution Window right over your spreadsheet. You can view graphs, parameters, and statistics of any @RISK distribution. All graphs include adjustable delimiters and probability bars for viewing calculated probabilities and other statistics directly on graphs. Simply slide the delimiter on a graph to see calculated probabilities both on the graph and in the linked statistical report. RISKview even lets you overlay graphs of different distributions for comparison, change parameters, and draw your own curves! When you draw your own curves using RISKview's Distribution Artist, RISKview can find the standard probability distribution which best fits that curve. RISKview can also directly link to any distribution in your spreadsheet model for instant updating. Defining your uncertainty couldn't be more intuitive!



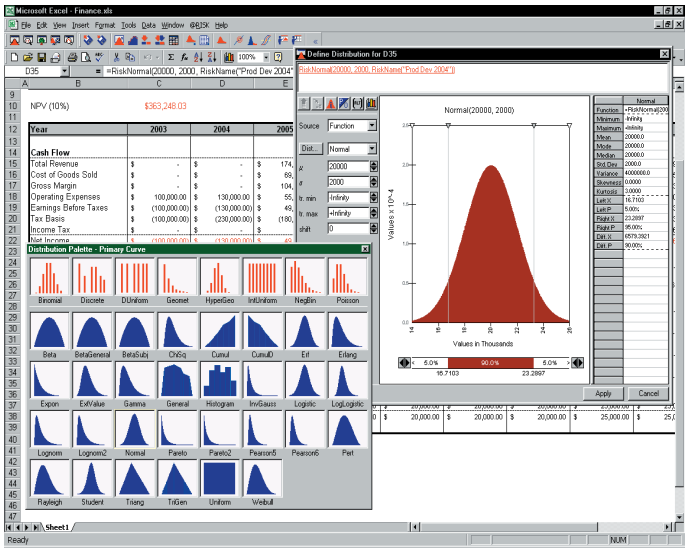
The @RISK Model Window lets you define your model graphically.

To further speed up the process of defining uncertainty, RISKview features a Distribution Palette of thumbnail sketches of all available distribution types. Just click the thumbnail of the distribution you want. And, you are not restricted to using standard parameters when defining your distribution functions. @RISK lets you enter in percentile parameters. For example, if you know oil field reserves are typically represented by a lognormal curve, and you know the 10th and 90th percentile values the reserves could take, you can use that information to set up your @RISK model.

Fit Distributions to Data with BestFit®

There may be times when you have historical data on a particular input in your model. For example, you may have price data on the material costs of a product you are going to produce. You would like to use this data to represent uncertainty in your model, but how? With **BestFit,** Palisade's distribution fitting tool, it's easy! BestFit is fully integrated with the Professional and Industrial versions of @RISK 4.5 for Excel. Just read your data into the @RISK Model Window, and click the Fit button. BestFit will find the distribution which best describes your data. A handy right-click command writes the newfound distribution to your spreadsheet cell. You can also link your fit to the resulting @RISK functions. If the underlying data changes, the fit automatically re-runs and updates the distribution in your model!

BestFit ranks dozens of distribution functions against your data, and provides comprehensive results. Four types of graphs are available to assess accuracy of the fit, and there are complete statistical reports and goodness-of-fit data. Choose from Comparison, Difference, Probability-Probability,



RISKview pops up right over your spreadsheet model!

or Quantile-Quantile graphs. Like RISKview, BestFit includes sliding delimiters and probability bars on all graphs. Graph types can be easily formatted be using toolbar icons or right-click menus, and may be exported to Excel in native Excel format for further modification.

But it doesn't stop there. BestFit has a host of advanced features for the power user. BestFit uses three advanced fitting algorithms to optimise its fits – Chi Square, Anderson-Darling, and Komolgorov-Smirnov. You can read in data sets with up to 100,000 points, in sample, density, or cumulative format. You can fit multiple data sets in a single project, and specify which predefined distributions to fit to. BestFit allows full control over Chi-squared calculations, including equal interval binning, equal probability binning, and full custom binning. It will also perform the RMS (root mean square error) test for cumulative and density data.

Step 3: Simulate and View All Possible Outcomes!

Once your model is set up, click the Simulation Settings button if you want to customise the parameters of your simulation. You can specify the number of iterations (times @RISK recalculates the spreadsheet model), update the spreadsheet in real-time numerically or graphically as @RISK is simulating, control the convergence criteria, and choose Monte Carlo or Latin Hypercube sampling. This gives you complete control over your simulations. Or, use the default settings and @RISK will automate everything for you. Then click the Simulate button and watch!

@RISK recalculates your spreadsheet hundreds or thousands of times! Each time, @RISK selects random numbers from the @RISK functions you entered and records the resulting output. Each recalculation shows a possible combination of uncertain values or a "scenario" that could occur. At the end of the simulation, you have a whole range of possible outcomes, and the probabilities of them occurring! Your spreadsheet has gone from representing one possible scenario to representing all possible scenarios! Try doing that with Excel alone.

Analyse Your Results in the @RISK Results Window

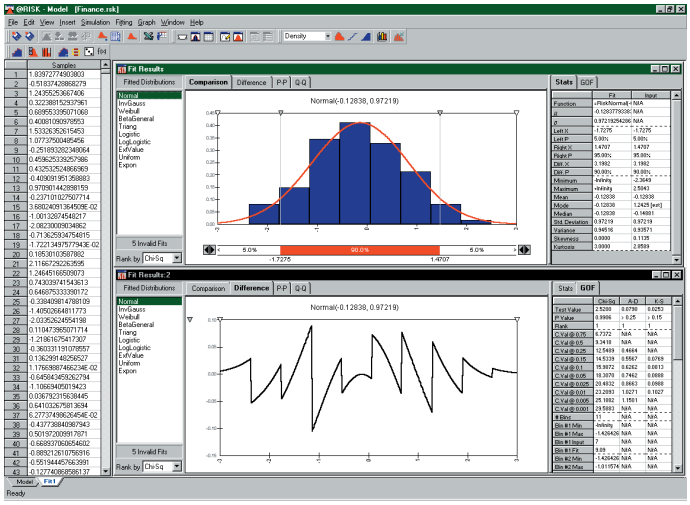
When your simulation is complete, all the results appear instantly in the **@RISK Results Window.** The Results Window, like the Model Window, features an Explorer-style list of inputs and tabbed reports. Extensive graphing options, comprehensive statistics, full data, and advanced analyses like Sensitivity and Scenario analyses are available with the click of a button.

Dazzling Graphs

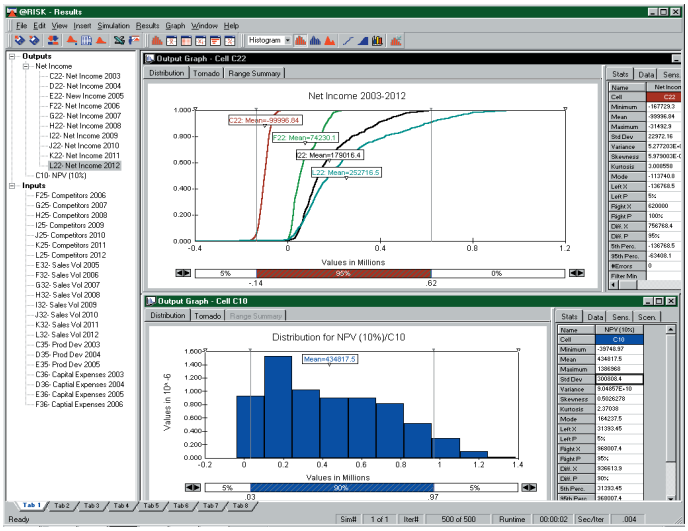
One of the strengths of Monte Carlo simulation is that it produces enough data to create accurate graphs. Histograms, cumulative curves, area and line graphs, and more are available in @RISK 4.5. As in the Model Window, graphs are created with simple toolbar clicks or right-click menus. Select the type of graph, then customise it by selecting colours, changing scaling, creating new titles and axis labels, and more! Do you have a range of outputs you'd like to graph? Simply highlight the range in the Explorer list and select Summary Graph to see your risk over time. You can even overlay multiple variables on the same graph for comparison. All graphs may also be displayed in Excel format for further enhancement. These Excel format graphs recreate any @RISK graph in native Excel chart format, giving you access to all of Excel's charting capabilities. @RISK's various graphing options allow you to quickly and easily present possible outcomes for any situation to others!

All graphs include summary statistics in the same window for easy reference. They also include probability bars and sliding delimiters, so you can answer questions like "What are the chances of losing money on this venture?" simply by sliding a bar to the $0 mark on your cumulative curve and reading the probability result below.

@RISK can also create a summary report of results using the **Quick Report** command. With a single click @RISK will generate a one-page, preformatted report in Excel containing a histogram, cumulative curve, Tornado graph, and summary statistics – all set up and ready to print! This saves valuable time by doing the formatting for you.



BestFit 4.5 gives you multiple graphing options and full statistics for your fits.



The @RISK Results Window gives you countless graphing and reporting options!

Want to see how your graph changes as the simulation runs? @RISK 4.5 will display and update any graph in real-time while your simulation is running. You can start, stop, and control the frequency of updates.

Identify Critical factors with Sensitivity and Scenario Analyses

@RISK performs two additional analyses that identify your risk factors: Sensitivity Analysis and Scenario Analysis, both accessible by clicking their tabs in the Results Window. Sensitivity Analysis determines which input distributions have the biggest impact on the outputs. The results can be displayed as an easy-to-interpret Tornado chart, with longer bars at the top representing the most significant input variables. You can choose from Rank-Order Correlation or Multi-variate Stepwise Regression to perform Sensitivity Analysis. Sensitivity Analysis allows you to zero in on the factors in your model which contribute the most to your risk!

Scenario Analysis identifies combinations of inputs – or scenarios – which lead to output target values. This lets you make such crucial observations as "When profit is high, operating cost is low, sales price is high, and cost of market entry is low."

Accurate Statistics and Data

Click the Detailed Statistics button to see statistics for all outputs displayed in a spreadsheet-like format for easy viewing. All the complete statistics you would expect are here. You can also enter target values and find the likelihood of achieving them, similar to using the sliding delimiters on the graphs. Another click and you can see all data for inputs and outputs for every iteration of the simulation. You can cut and paste data and statistics to other applications, or have @RISK generate a full statistical or data report in your spreadsheet for further analysis. @RISK allows full access to the information of your simulation!

Customisable Reports

The best analysis always has to be presented to others. To help with this, @RISK provides extensive capabilities for reporting on both your model and simulation results. To start, any @RISK graph or report can be pasted into Excel or other applications. In addition, @RISK 4.5 comes with a report generator that will quickly create a report with graphs and statistics on your simulation. Lastly, @RISK 4.5's report template feature allows you to build custom reports in Excel that contain just the statistics and graphs you want, plus any custom formatting, logos, and more. Your template will be used to create a polished report from each simulation you run.

Step 4: Make a Decision

Using @RISK's comprehensive results and your own personal thresholds for risk, you are now ready to make a well-informed decision. By accounting for all possible outcomes, @RISK gives you the tools to make the best possible decision in any situation!

Advanced Features Make @RISK a True Powerhouse

@RISK comes with a number of advanced features that make it the only choice for top decision-makers world wide.

Multiple Simulations

@RISK features the **RiskSimTable** function, which allows multiple simulations to be run back-to-back. This lets you change only select inputs in your model from simulation to simulation, so you can compare the effect of a variable or variables on your outcome. For example, you may with to see what impact charging different prices has on your profits. You can even graph the results from multiple simulations on one chart!

Correlate Your Inputs for More Accurate Models

In real life, inputs are seldom independent. When interest rates are high, mortgages are low, for example. If you don't take these relationships into account when building your model, you risk dangerously inaccurate results. The @RISK Model Window provides an easy way to correlate inputs in your model using a simple matrix format. Click a button to get a blank matrix, then drag inputs onto it from the Explorer list. Enter in correlation coefficients, click Apply, and the correlations are automatically written to your spreadsheet model.

Statistics and Graphing Functions

@RISK 4.5 for Excel adds a set of statistics functions that return a desired statistic on simulation results anywhere in your spreadsheet. These functions include all standard statistics plus percentiles and target probabilities, and can be used just like any other Excel or @RISK function. You can watch the statistics update real-time as the simulation runs, as well!

The statistics described by these functions are

Kurtosis	Mode	Standard Deviation
Max	Percentile	Target Value
Mean	Range	Variance
Min	Skewness	

@RISK 4.5 also includes a powerful graph placement function that places any graph of simulation results directly in your spreadsheet. Place this new **RiskResultsGraph** function anywhere in your spreadsheet and automatically, after a simulation, the desired graph will be appear directly in Excel. As with all @RISK graphs, you can choose to generate a graph in metafile or standard Excel chart format.

Enhanced VBA Support for Custom Applications

@RISK 4.5 lets you write your own custom applications in Excel that can perform virtually any @RISK function. Harness the power of @RISK's Monte Carlo simulation engine for your company's specific needs. Utilise @RISK's extensive reporting options, Sensitivity analysis, Scenario analysis, distribution fitting, and more, all in your own custom Excel program! Example files are included demonstrating how to use these commands. Plus, you can run macros before, during, or after a simulation run.

@RISK Professional

@RISK 4.5 is available in three editions to meet your risk analysis needs: **Standard, Professional,** and **Industrial.** @RISK Professional adds a host of analytical power features to your arsenal.

Integrated BestFit

Fit distributions to your data. See above.

@RISK Goal Seek

@RISK Goal Seek lets you find the value of an input that leads to a desired simulation result. You set the target value or the goal – say, a simulated mean of $1000 – and then tell Goal Seek which input to adjust in order to achieve your goal. Goal Seek will then use multiple simulations – not deterministic spreadsheet recalculations like Excel's Goal Seek – to find the input value that achieves the goal. This lets you take all possible outcomes into account when determining input values that achieve your goals!

Stress Analysis

@RISK lets you control the range that is sampled within an input distribution; that is, you can stress the distributions. By specifying extreme ranges of a given input, you can see how different situations would affect your bottom line. Instantly test various scenarios without changing your model! Results include Box-Whisker plots, comparison graphs, cumulative charts and histograms.

Advanced Sensitivity Analysis

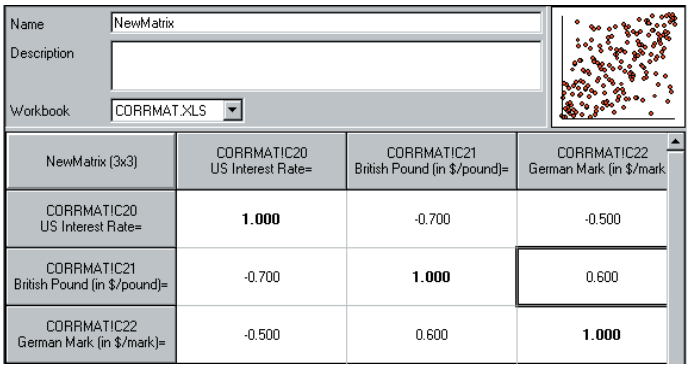
@RISK 4.5 lets you see how changes in input values affect your simulated results. With Advanced Sensitivity Analysis, inputs can be any value or distribution in your model. Using a wide variety of options, you can control how these inputs are varied. @RISK then runs any number of simulations (hundreds or thousands if necessary!) – one at each possible input value – and tracks how your output statistics change. Results graphs include Box-Whisker plots, Spider graphs, cumulative curves, line graphs and Tornado charts to show you the critical factors in your model.

@RISK Industrial

@RISK 4.5 Industrial is well-suited to the power risk analyst. @RISK Industrial builds upon @RISK Professional by adding:

RISKOptimizer to Optimise Your Simulation Results

@RISK 4.5 Industrial for Excel comes with **RISKOptimizer,** the simulation optimisation add-in for Excel. RISKOptimizer is an innovative tool which allows you to optimise the results of an @RISK simulation, finding the best combination of inputs to maximise or minimise your bottom line.



NewMatrix (3x3)	CORRMATIC20 US Interest Rate=	CORRMATIC21 British Pound (in $/pound)=	CORRMATIC22 German Mark (in $/mark
CORRMATIC20 US Interest Rate=	**1.000**	-0.700	-0.500
CORRMATIC21 British Pound (in $/pound)=	-0.700	**1.000**	0.600
CORRMATIC22 German Mark (in $/mark)=	-0.500	0.600	**1.000**

Correlate your inputs in the @RISK Model Window.

@RISK alone uses Monte Carlo simulation to account for uncertainty in models and view the probabilities of various outcomes occurring. But Monte Carlo simulation cannot deal with input or decision variables whose values you can control. It views all possible outcomes at a single state of those controllable variables.

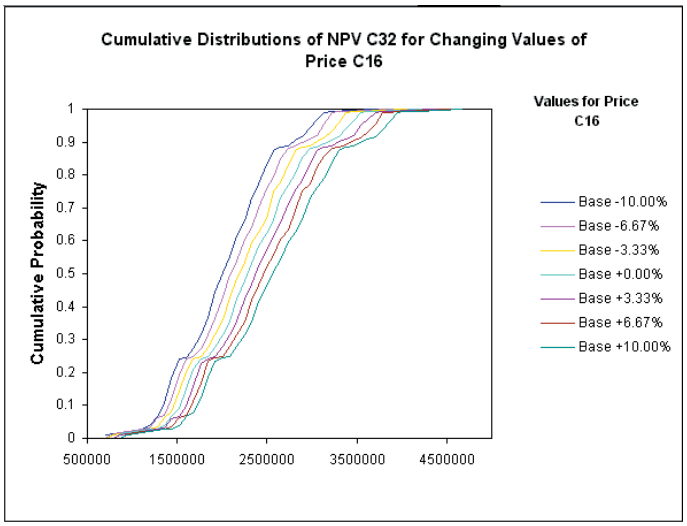
RISKOptimizer changes all that. With RISKOptimizer, many different combinations of controllable inputs (called adjustable cells) are tried in order to maximise or minimise your output. This process of trying different inputs is called optimisation. But unlike other optimisers, RISKOptimizer performs Monte Carlo simulation while it is optimising, allowing uncertainty to be taken into account. For each different combination of inputs – or trial solution – RISKOptimizer runs a Monte Carlo simulation. In this way, RISKOptimizer looks at all possible outcomes in many different states. This is an extremely powerful technique that can solve problems not previously solvable by traditional linear or nonlinear optimisation packages.

For example, say you run an @RISK simulation on a potential product launch to see the range of possible outcomes for profit. But your model is based on using specific vendors to supply the raw materials for your product. There may be other vendors who can offer cheaper materials, quicker turnaround, or more attractive shipping. With @RISK alone, you could run multiple simulations for different vendors, but did you try every possible combination of inputs? RISKOptimizer will try many different combinations until it maximises the simulation results for profit.

RISKOptimizer uses the same genetic-algorithm based optimisation engine as Evolver. With genetic algorithms, favorable trial solutions are combined to produce more and more effective "offspring" solutions. "Mutations," or randomly generated new trial solutions, occur to make sure that all possible solutions are explored. In this way, RISKOptimizer achieves true "global," or overall, solutions and avoids settling on a less effective "local" solution as many traditional hill-climbing optimisers do.

@RISKAccelerator for Your Largest Simulations

Speed up large simulations by using all CPUs in a multi-CPU machine. If your PC has two processors, your simulations will run nearly twice as fast! With integrated **@RISKAccelerator,** @RISK Industrial lets you take full advantage of the additional processing



Save the effects of multiple inputs with Advanced Sensitivity Analysis.

speed available with increasingly popular multi-processor machines. Using innovative parallel-processing technology, @RISKAccelerator "splits up" a simulation for available CPUs to work on simultaneously.

@RISKAccelerator is invaluable for users with large, complex models or users who run simulations frequently. For example, in the securities industry, the risk and return of portfolios comprised of thousands of stocks – each with a different possible future price path – are often calculated using Monte Carlo simulation. This is a lengthy simulation that is constantly re-run as market conditions, current prices, and portfolio components change.

Also available separately, @RISKAccelerator can be configured to utilise available CPUs over a network.

Choose the @RISK 4.5 Edition to Suit Your Needs!

	Standard	Pro	Industrial
Advanced simulation engine	✓	✓	✓
37 distribution functions	✓	✓	✓
Correlation of inputs	✓	✓	✓
Variety of graphs	✓	✓	✓
Sensitivity & Scenario Analysis	✓	✓	✓
Integrated RISKview	✓	✓	✓
Integrated BestFit		✓	✓
@RISK Goal Seek		✓	✓
Stress Analysis		✓	✓
Advanced Sensitivity Analysis		✓	✓
Integrated @RISKAccelerator			✓
RISKOptimizer			✓

@RISK Applications

- Capital Budgeting
- Chemical Process Engineering
- Corporate Planning
- Cost Analysis
- Engineering Reliability
- Environmental Impacts & Policy
- Financial Risk Analysis
- Foreign Exchange Modelling
- Health Risk Assessment
- Insurance
- Mergers & Acquisitions
- Mortgage Pricing
- Operations Research Analysis
- Petroleum and Mining Resource Evaluations
- Retirement Planning
- R&D Assessment
- Toxicological Analysis
- And More!

International Versions Available!

@RISK is also available in French, German, Spanish and Japanese. Menus, dialogues, help files, examples, and user manuals have all been translated. All the great features of @RISK are more accessible than ever with these native-language versions!

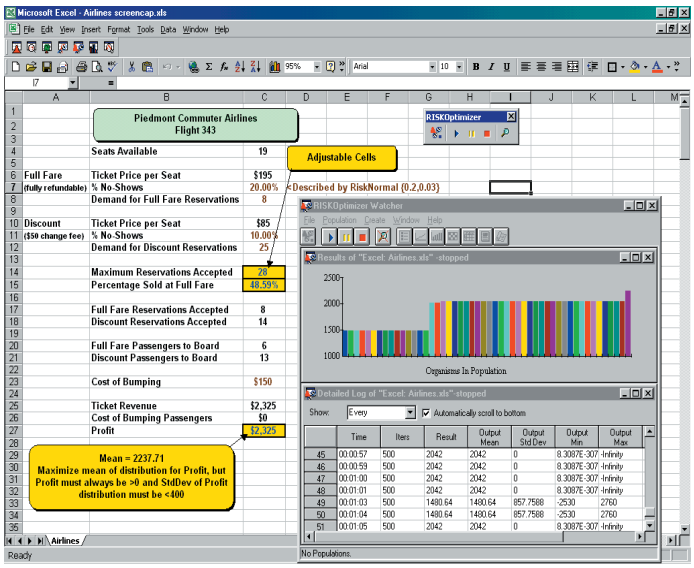
RELATED PRODUCTS

Enhance and expand the power of @RISK with these tools from Palisade:

@RISK Developer's Kit
Apply simulation to applications outside Excel.

@RISK for Project
Monte Carlo simulation for Microsoft Project.

DecisionTools Suite
Complete risk and decision analysis tool kit.



RISKOptimizer combines simulation with optimisation to solve the most complex problems.

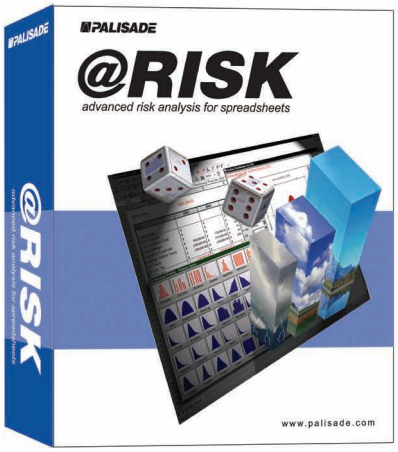
@RISK 4.5 Features

- True Spreadsheet Add-In
- Toolbars for Most Commands
- Office-style Interface
- @RISK Model Window
- 37 Distribution Functions
- Fully Integrated RISKview
- Fully Integrated BestFit (Professional and Industrial versions only)
- Distribution Palette
- Alternate (Percentile) Distribution Parameters
- Correlation of Inputs
- Customisable Simulation Settings
- Convergence Monitoring
- Full Statistics Report
- Full Data Report
- Reporting in Excel
- Target Values
- Histogram, Area, Line, and Cumulative Graphs
- Fully Customisable Graphs
- Summary Graphs
- Multiple Summary and Overlay Graphs
- Sliding Delimiters on all Graphs
- Real-time Updating of Graphs
- Graph in Excel
- One-step Quick Reports
- Multiple Simulations
- Sensitivity Analysis - Multivariate Stepwise Regression and Rank Order Correlation
- Tornado Graphs
- Scenario Analysis
- Statistics Functions
- Macros - Execute During Simulation
- Macros – Customise with VBA
- @RISK Goal Seek (Pro and Industrial only)
- Stress Analysis (Pro and Industrial only)
- Advanced Sensitivity Analysis (Pro and Industrial)
- Comprehensive Help File and Tutorial
- Integrated RISKOptimizer (Industrial only)
- Integrated @RISKAccelerator (Industrial only)
- Fully Integrated With DecisionTools Suite: @RISK, BestFit, TopRank, PrecisionTree, and RISKview

Become an @RISK Wizard with Palisade Training!

Customised on-site training is available to help you get the most from your software investment. Save time and money by having an expert Palisade instructor travel to your company site and deliver a risk assessment training course tailored to your group's needs. Palisade also offers risk assessment training seminars in major cities around the globe and over the web. These seminars provide hands-on training on how to use @RISK, and teach valuable model-building techniques. Call or visit our web site at **www.palisade.com.au** for more details and the latest schedule.

Order @RISK 4.5 Now!



@RISK Version	Desktop Price Including 12 Months Maintenance
@RISK 4.5 Standard	$1,395
@RISK 4.5 Professional	$1,695
@RISK 4.5 Industrial	$3,095

Customised Corporate Licences and On-Site training are available to meet the risk analysis needs of your organisation. Call for details.

Technical Information

Minimum Platform: Microsoft Windows 98 or higher and Excel 97 or higher

Technical Support and Upgrades: Included for 12 months with Maintenance

Other Versions Available: @RISK Developer's Kit, @RISKAccelerator, @RISK for Microsoft Project

Demo: Download your free trial version online at www.palisade.com.au/trials.asp or call for a free CD.