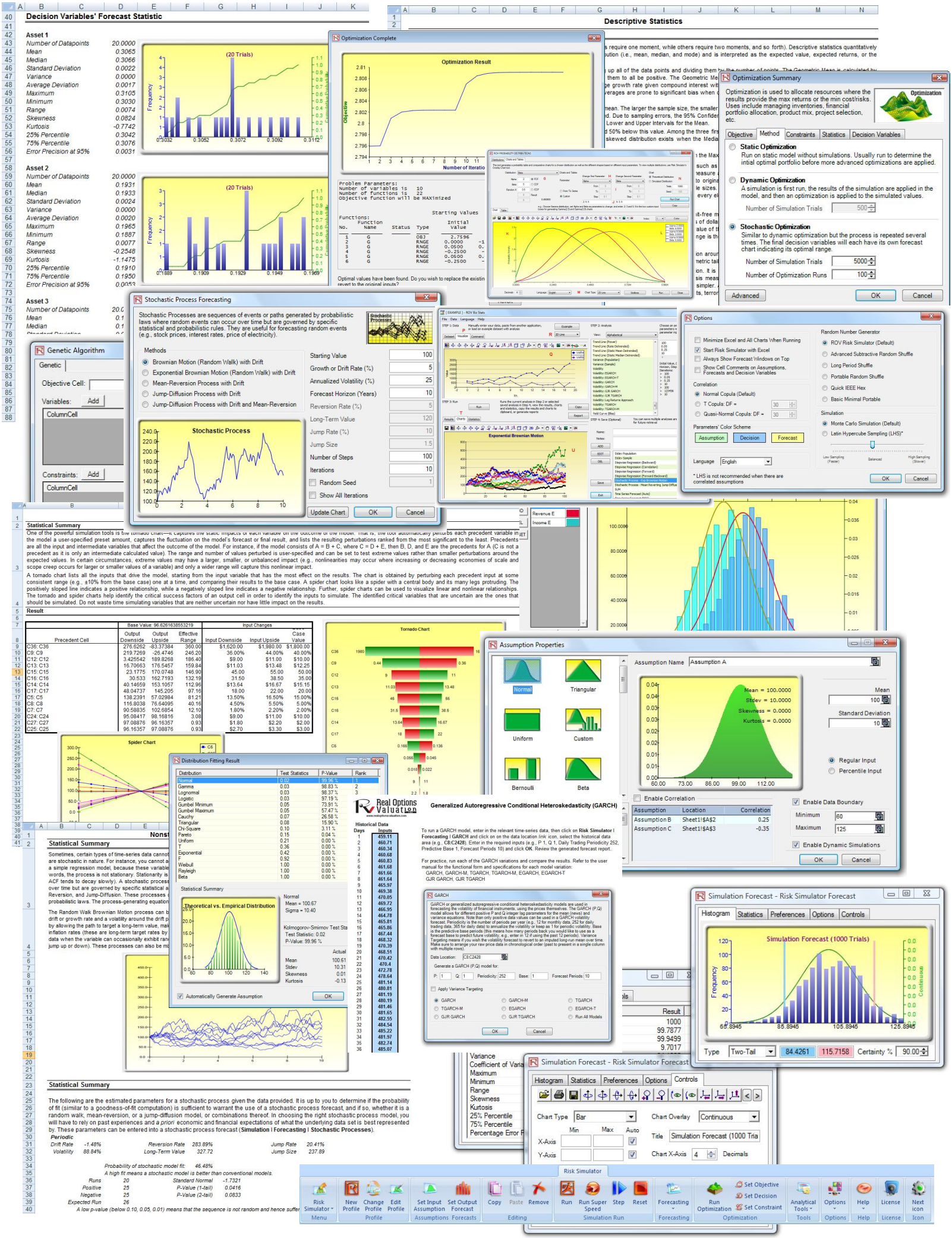
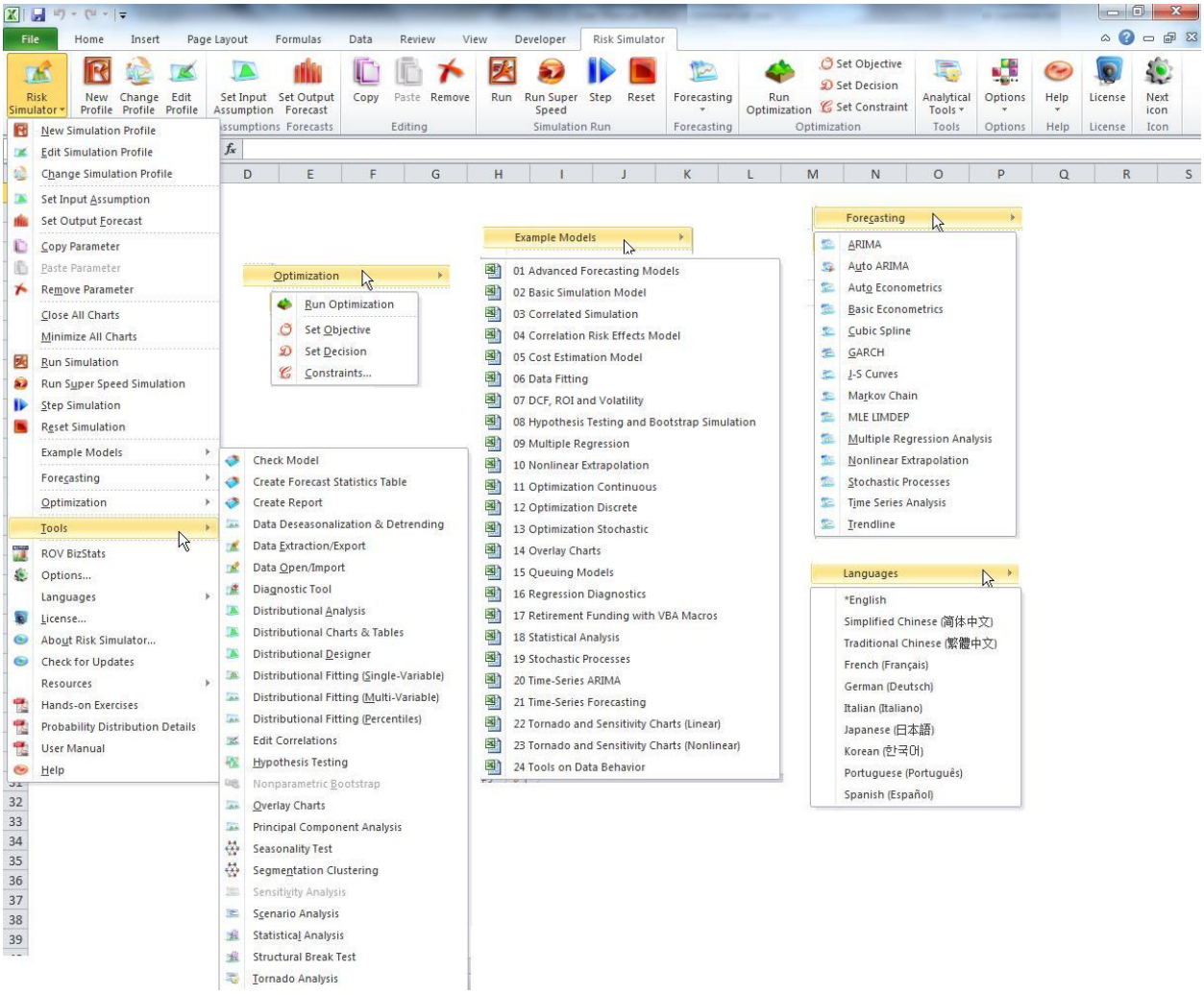
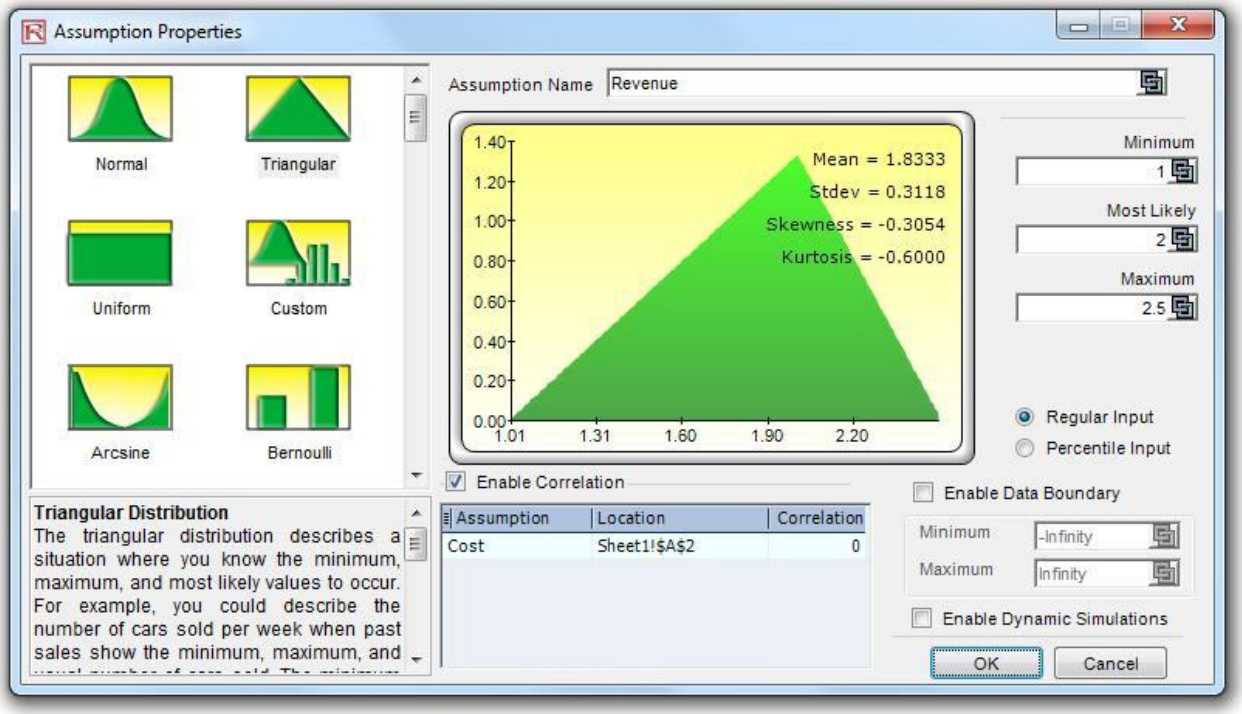
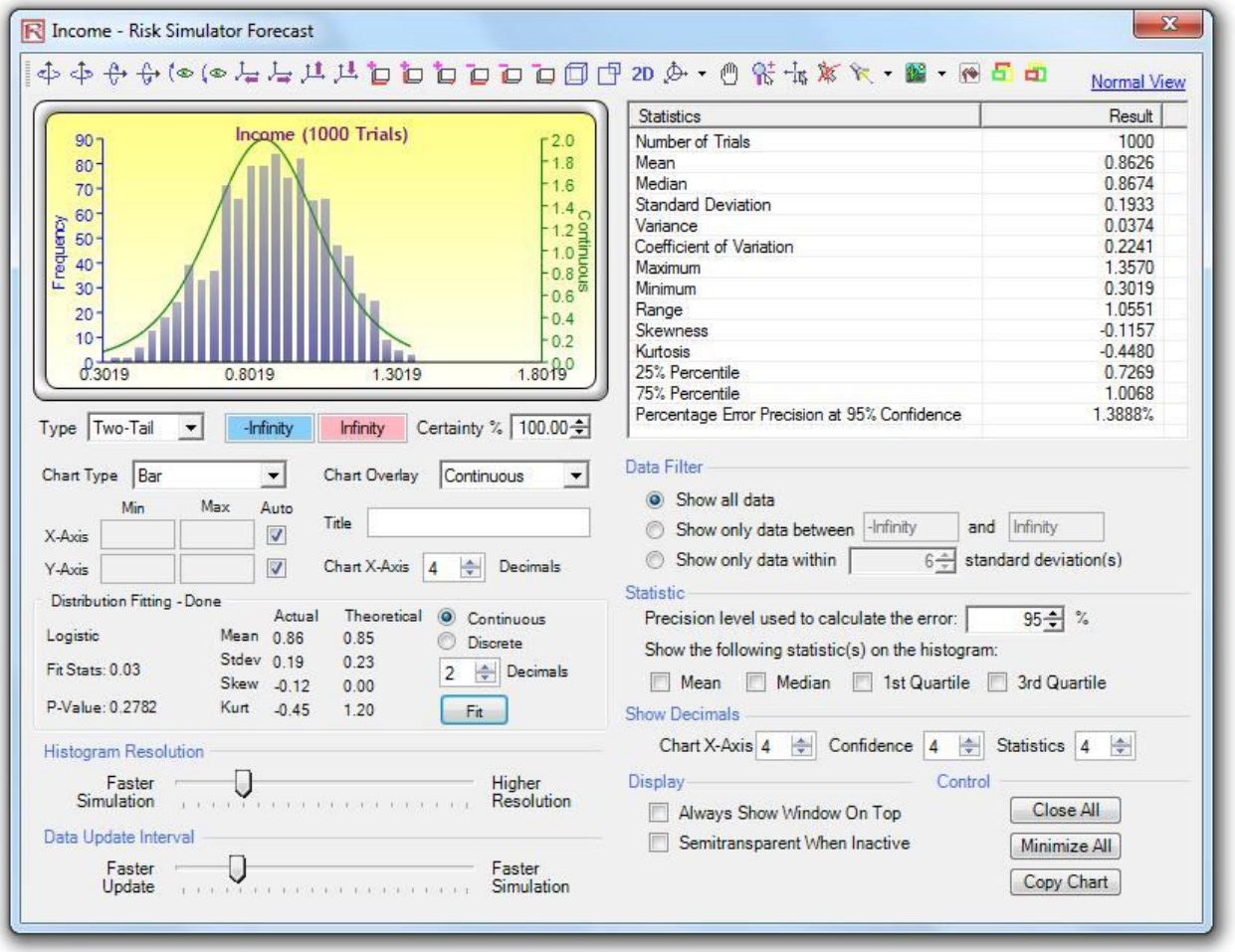
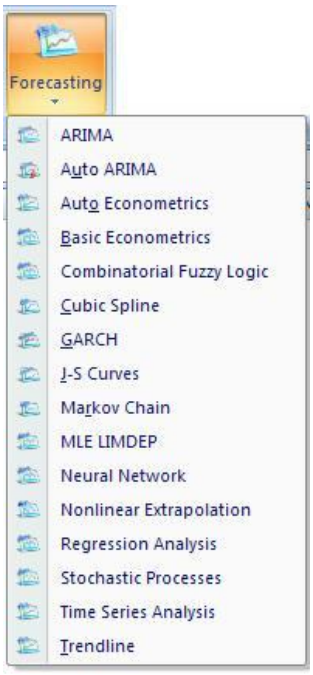
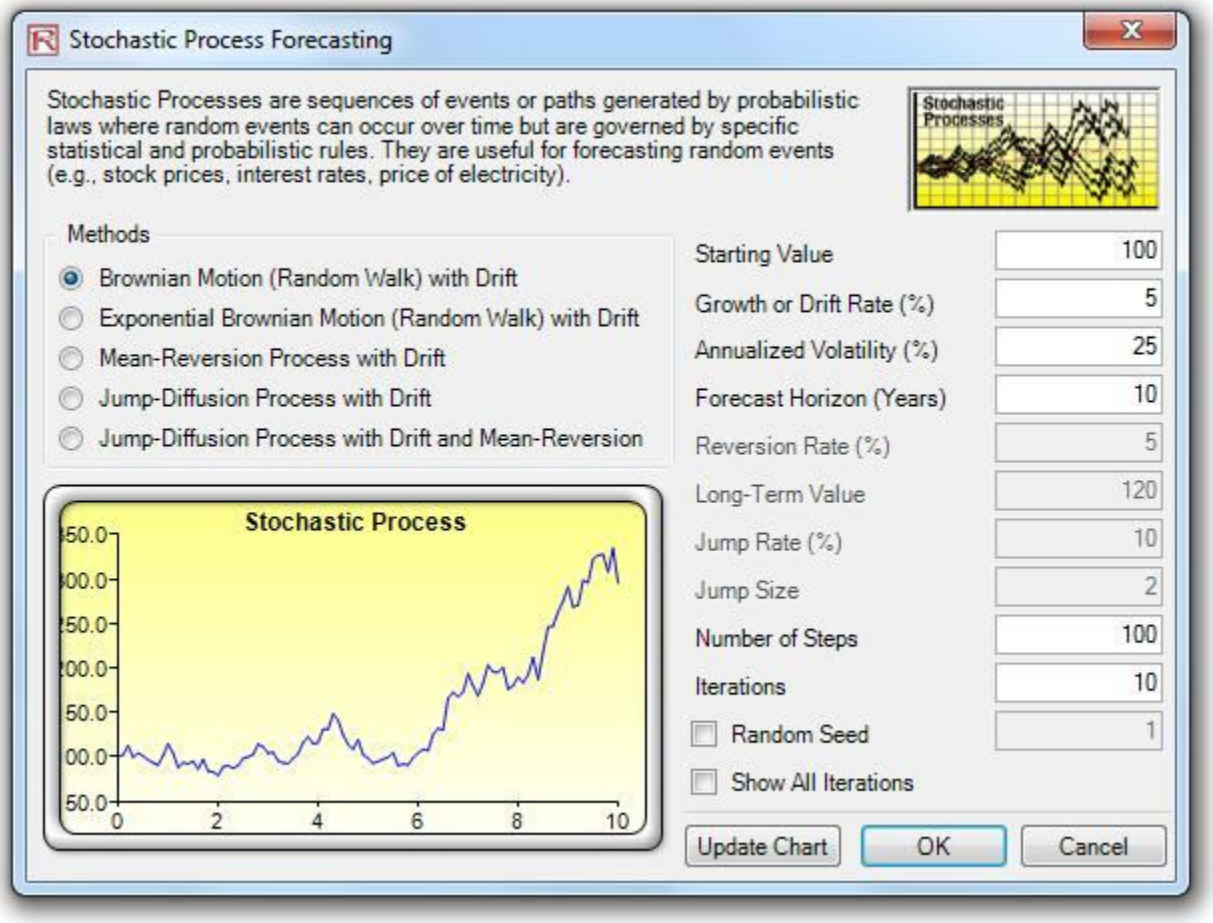

Decision Variables' Forecast Statistic
Asset 1
Number of Datapoints 20.0000
Mean 0.3065
Median 0.3066
Standard Deviation 0.0022
Variance 0.0000
Average Deviation 0.0017
Maximum 0.3105
Minimum 0.3030
Range 0.0074
Skewness 0.0824
Kurtosis -0.7742
25% Percentile 0.3042
75% Percentile 0.3076
Error Precision at 95% 0.0031
(20 Trials)
Frequency
Asset 2
Number of Datapoints 20.0000
Mean 0.1931
Median 0.1933
Standard Deviation 0.0024
Variance 0.0000
Average Deviation 0.0020
Maximum 0.1965
Minimum 0.1887
Range 0.0077
Skewness -0.2548
Kurtosis -1.1475
25% Percentile 0.1910
75% Percentile 0.1950
Error Precision at 95% 0.0033
(20 Trials)
Frequency
Asset 3
Number of Datapoints 20.0
Mean 0.1
Median 0.1
Optimization Complete
Optimization Result
Objective
Number of Iteratio
Problem Parameters:
Number of variables is 10
Number of functions is 22
Objective function will be MAXimized
Starting Values
Functions:
Function No. Name Status Type Initial Value
1 G OBJ 2.7596
2 G RNGE 0.0000 -1
3 G RNGE 0.0500 0.
4 G RNGE -0.2500 -
5 G RNGE 0.0500 0.
6 G RNGE -0.2500 -
Optimal values have been found. Do you wish to replace the existin
revert to the original inputs?
Optimization Summary
Optimization is used to allocate resources where the results provide the max returns or the min cost/risks. Uses include managing inventories, financial portfolio allocation, product mix, project selection, etc.
Optimization
Objective
Method
Constraints
Statistics
Decision Variables
Static Optimization
Run on static model without simulations. Usually run to determine the intial optimal portfolio before more advanced optimizations are applied.
Dynamic Optimization
A simulation is first run, the results of the simulation are applied in the model, and then an optimization is applied to the simulated values.
Number of Simulation Trials 500
Stochastic Optimization
Similar to dynamic optimization but the process is repeated several times. The final decision variables will each have its own forecast chart indicating its optimal range.
Number of Simulation Trials 5000
Number of Optimization Runs 100
Advanced
OK
Cancel
Descriptive Statistics
Genetic Algorithm
Genetic
Objective Cell:
Variables:
Add
ColumnCell
Constraints:
Add
ColumnCell
Stochastic Process Forecasting
Stochastic Processes are sequences of events or paths generated by probabilistic laws where random events can occur over time but are governed by specific statistical and probabilistic rules. They are useful for forecasting random events (e.g., stock prices, interest rates, price of electricity).
Methods
Brownian Motion (Random Walk) with Drift
Exponential Brownian Motion (Random Walk) with Drift
Mean-Reversion Process with Drift
Jump-Diffusion Process with Drift
Jump-Diffusion Process with Drift and Mean-Reversion
Starting Value 100
Growth or Drift Rate (%) 5
Annualized Volatility (%) 25
Forecast Horizon (Years) 10
Reversion Rate (%) 5
Long-Term Value 120
Jump Rate (%) 10
Jump Size 1.5
Number of Steps 100
Iterations 10
Random Seed 1
Show All Iterations
Stochastic Process
Update Chart
OK
Cancel
Exponential Brownian Motion
Options
Minimize Excel and All Charts When Running
Start Risk Simulator with Excel
Always Show Forecast Windows on Top
Show Cell Comments on Assumptions, Forecasts and Decision Variables
Correlation
Normal Copula (Default)
T Copula: DF =
Quasi-Normal Copula: DF =
Parameters' Color Scheme
Assumption
Decision
Forecast
Language English
* LHS is not recommended when there are correlated assumptions
Random Number Generator
ROV Risk Simulator (Default)
Advanced Subtractive Random Shuffle
Long Period Shuffle
Portable Random Shuffle
Quick IEEE Hex
Basic Minimal Portable
Simulation
Monte Carlo Simulation (Default)
Latin Hypercube Sampling (LHS)*
Low Sampling (Faster)
Balanced
High Sampling (Slower)
OK
Cancel
Statistical Summary
One of the powerful simulation tools is the tornado chart—it captures the static impacts of each variable on the outcome of the model. That is, the tool automatically perturbs each precedent variable in the model a user-specified preset amount, captures the fluctuation on the model's forecast or final result, and lists the resulting perturbations ranked from the most significant to the least. Precedents are all the input and intermediate variables that affect the outcome of the model. For instance, if the model consists of A = B + C, where C = D + E, then B, D, and E are the precedents for A (C is not a precedent as it is only an intermediate calculated value). The range and number of values perturbed is user-specified and can be set to test extreme values rather than smaller perturbations around the expected values. In certain circumstances, extreme values may have a larger, smaller, or unbalanced impact (e.g., nonlinearities may occur where increasing or decreasing economies of scale and scope creep occurs for larger or smaller values of a variable) and only a wider range will capture this nonlinear impact.
A tornado chart lists all the inputs that drive the model, starting from the input variable that has the most effect on the results. The chart is obtained by perturbing each precedent input at some consistent range (e.g., ±10% from the base case) one at a time, and comparing their results to the base case. A spider chart looks like a spider with a central body and its many legs protruding. The positively sloped line indicates a positive relationship, while a negatively sloped line indicates a negative relationship. Further, spider charts can be used to visualize linear and nonlinear relationships. The tornado and spider charts help identify the critical success factors of an output cell in order to identify the inputs to simulate. The identified critical variables that are uncertain are the ones that should be simulated. Do not waste time simulating variables that are neither uncertain nor have little impact on the results.
Result
Base Value: 96.6261638553219
Input Changes
Precedent Cell
Output Downside
Output Upside
Effective Range
Input Downside
Input Upside
Case Value
C36: C36 276.6262 -83.37384 360.00 $1,620.00 $1,980.00 $1,800.00
C9: C9 219.7269 -26.4746 246.20 36.00% 44.00% 40.00%
C12: C12 3.425542 189.8268 186.40 $9.00 $11.00 $10.00
C13: C13 16.70663 176.5457 159.84 $11.03 $13.48 $12.25
C15: C15 23.1775 170.0748 146.90 45.00 55.00 50.00
C16: C16 30.533 162.7193 132.19 31.50 38.50 35.00
C14: C14 40.14659 153.1057 112.96 $13.64 $16.67 $15.15
C17: C17 48.04737 145.205 97.16 18.00 22.00 20.00
C5: C5 138.2391 57.02984 81.21 13.50% 16.50% 15.00%
C8: C8 116.8038 76.64095 40.16 4.50% 5.50% 5.00%
C7: C7 90.58835 102.6854 12.10 1.80% 2.20% 2.00%
C24: C24 95.08417 98.16816 3.08 $9.00 $11.00 $10.00
C27: C27 97.08876 96.16357 0.93 $1.80 $2.20 $2.00
C26: C25 96.16357 97.08876 0.93 $2.70 $3.30 $3.00
Tornado Chart
Spider Chart
Distribution Fitting Result
Distribution Test Statistics P-Value Rank
Normal 0.02 99.5 %
Gamma 0.03 98.83 % 2
Lognormal 0.03 98.37 % 3
Logistic 0.03 97.19 %
Gumbel Minimum 0.05 73.91 %
Gumbel Maximum 0.05 57.47 %
Cauchy 0.07 26.58 %
Triangular 0.08 15.90 %
Chi-Square 0.10 3.11 %
Pareto 0.15 0.04 %
Uniform 0.21 0.00 %
T 0.36 0.00 %
Exponential 0.42 0.00 %
F 0.92 0.00 %
Weibull 1.00 0.00 %
Rayleigh 1.00 0.00 %
Beta 1.00 0.00 %
Statistical Summary
Theoretical vs. Empirical Distribution
Normal
Mean = 100.67
Sigma = 10.40
Kolmogorov-Smirnov Test Sta
Test Statistic: 0.02
P-Value: 99.96 %
Actual
Mean 100.61
Stdev 10.31
Skewness 0.01
Kurtosis -0.13
Automatically Generate Assumption
OK
Assumption Properties
Normal
Triangular
Uniform
Custom
Bernoulli
Beta
Assumption Name Assumption A
Mean = 100.0000
Stdev = 10.0000
Skewness = 0.0000
Kurtosis = 0.0000
Mean 100
Standard Deviation 10
Regular Input
Percentile Input
Enable Correlation
Assumption Location Correlation
Assumption B Sheet1!$A$2 0.25
Assumption C Sheet1!$A$3 -0.35
Enable Data Boundary
Minimum 60
Maximum 125
Enable Dynamic Simulations
OK
Cancel
Real Options Valuation
Generalized Autoregressive Conditional Heteroskedasticity (GARCH)
Historical Data
Days Inputs
To run a GARCH model, enter in the relevant time-series data, then click on Risk Simulator | Forecasting | GARCH and click on on the data location link icon, select the historical data area (e.g., C8:C2428). Enter in the required inputs (e.g., P 1, Q 1, Daily Trading Periodicity 252, Predictive Base 1, Forecast Periods 10) and click OK. Review the generated forecast report.
For practice, run each of the GARCH variations and compare the results. Refer to the user manual for the functional form and specifications for each model variation:
GARCH, GARCH-M, TGARCH, TGARCH-M, EGARCH, EGARCH-T
GJR GARCH, GJR TGARCH
GARCH
GARCH or generalized autoregressive conditional heteroskedasticity models are used in forecasting the volatility of financial instruments, using the prices themselves. The GARCH (P,Q) model allows for different positive P and Q integer lag parameters for the mean (news) and variance equations. Note than only positive data values can be used in a GARCH volatility forecast. Periodicity is the number of periods per year (e.g., 12 for monthly data, 252 for daily trading data, 365 for daily data) to annualize the volatility or keep as 1 for periodic volatility. Base is the predictive base periods (this means how many periods back you would like to use as a forecast base to predict future volatility, e.g., enter in 12 if using the past 12 periods). Variance Targeting means if you wish the volatility forecast to revert to an imputed long-run mean over time. Make sure to arrange your raw price data in chronological order (past to present in a single column with multiple rows).
Data Location: C8:C2428
Generate a GARCH (P,Q) model for:
P: 1 Q: 1 Periodicity: 252 Base: 1 Forecast Periods: 10
Apply Variance Targeting
GARCH
GARCH-M
TGARCH
TGARCH-M
EGARCH
EGARCH-T
GJR GARCH
GJR TGARCH
Run All Models
OK
Cancel
Simulation Forecast - Risk Simulator Forecast
Histogram
Statistics
Preferences
Options
Controls
Simulation Forecast (1000 Trials)
Frequency
Continuous
Type Two-Tail 84.4261 115.7158 Certainty % 90.00
Result
1000
99.7877
99.9499
9.7017
Variance
Coefficient of Variation
Maximum
Minimum
Range
Skewness
Kurtosis
25% Percentile
75% Percentile
Percentage Error
Simulation Forecast - Risk Simulator Forecast
Histogram
Statistics
Preferences
Options
Controls
Chart Type Bar
Chart Overlay Continuous
Min Max Auto
X-Axis
Y-Axis
Title Simulation Forecast (1000 Tria
Chart X-Axis 4 Decimals
Risk Simulator
Risk Simulator
New Profile
Change Profile
Edit Profile
Set Input Assumption
Set Output Forecast
Copy
Paste
Remove
Run
Run Super Speed
Step
Reset
Forecasting
Run Optimization
Set Objective
Set Decision
Set Constraint
Analytical Tools
Options
Help
License
Next Icon
Menu
Profile
Assumptions
Forecasts
Editing
Simulation Run
Forecasting
Optimization
Tools
Options
Help
License
Icon
Statistical Summary
The following are the estimated parameters for a stochastic process given the data provided. It is up to you to determine if the probability of fit (similar to a goodness-of-fit computation) is sufficient to warrant the use of a stochastic process forecast, and if so, whether it is a random walk, mean-reversion, or a jump-diffusion model, or combinations thereof. In choosing the right stochastic process model, you will have to rely on past experiences and *a priori* economic and financial expectations of what the underlying data set is best represented by. These parameters can be entered into a stochastic process forecast (**Simulation | Forecasting | Stochastic Processes**).
Periodic
Drift Rate -1.48% Reversion Rate 283.89% Jump Rate 20.41%
Volatility 88.84% Long-Term Value 327.72 Jump Size 237.89
Probability of stochastic model fit: 46.48%
A high fit means a stochastic model is better than conventional models.
Runs 20 Standard Normal -1.7321
Positive 25 P-Value (1-tail) 0.0416
Negative 25 P-Value (2-tail) 0.0833
Expected Run 26
A low p-value (below 0.10, 0.05, 0.01) means that the sequence is not random and hence suffer


File
Home
Insert
Page Layout
Formulas
Data
Review
View
Developer
Risk Simulator
Risk Simulator
New Profile
Change Profile
Edit Profile
Set Input Assumption
Set Output Forecast
Copy
Paste
Remove
Run
Run Super Speed
Step
Reset
Forecasting
Run Optimization
Set Objective
Set Decision
Set Constraint
Analytical Tools
Options
Help
License
Next icon
Editing
Simulation Run
Optimization
Tools
Options
Help
License
Icon
New Simulation Profile
Edit Simulation Profile
Change Simulation Profile
Set Input Assumption
Set Output Forecast
Copy Parameter
Paste Parameter
Remove Parameter
Close All Charts
Minimize All Charts
Run Simulation
Run Super Speed Simulation
Step Simulation
Reset Simulation
Example Models
Forecasting
Optimization
Tools
ROV BizStats
Options...
Languages
License...
About Risk Simulator...
Check for Updates
Resources
Hands-on Exercises
Probability Distribution Details
User Manual
Help
Optimization
Run Optimization
Set Objective
Set Decision
Constraints...
Example Models
01 Advanced Forecasting Models
02 Basic Simulation Model
03 Correlated Simulation
04 Correlation Risk Effects Model
05 Cost Estimation Model
06 Data Fitting
07 DCF, ROI and Volatility
08 Hypothesis Testing and Bootstrap Simulation
09 Multiple Regression
10 Nonlinear Extrapolation
11 Optimization Continuous
12 Optimization Discrete
13 Optimization Stochastic
14 Overlay Charts
15 Queuing Models
16 Regression Diagnostics
17 Retirement Funding with VBA Macros
18 Statistical Analysis
19 Stochastic Processes
20 Time-Series ARIMA
21 Time-Series Forecasting
22 Tornado and Sensitivity Charts (Linear)
23 Tornado and Sensitivity Charts (Nonlinear)
24 Tools on Data Behavior
Forecasting
ARIMA
Auto ARIMA
Auto Econometrics
Basic Econometrics
Cubic Spline
GARCH
J-S Curves
Markov Chain
MLE LIMDEP
Multiple Regression Analysis
Nonlinear Extrapolation
Stochastic Processes
Time Series Analysis
Trendline
Languages
*English
Simplified Chinese (簡体中文)
Traditional Chinese (繁體中文)
French (Français)
German (Deutsch)
Italian (Italiano)
Japanese (日本語)
Korean (한국어)
Portuguese (Português)
Spanish (Español)
Check Model
Create Forecast Statistics Table
Create Report
Data Deseasonalization & Detrending
Data Extraction/Export
Data Open/Import
Diagnostic Tool
Distributional Analysis
Distributional Charts & Tables
Distributional Designer
Distributional Fitting (Single-Variable)
Distributional Fitting (Multi-Variable)
Distributional Fitting (Percentiles)
Edit Correlations
Hypothesis Testing
Nonparametric Bootstrap
Overlay Charts
Principal Component Analysis
Seasonality Test
Segmentation Clustering
Sensitivity Analysis
Scenario Analysis
Statistical Analysis
Structural Break Test
Tornado Analysis


Assumption Properties
Normal
Triangular
Uniform
Custom
Arcsine
Bernoulli
Assumption Name
Revenue
Mean = 1.8333
Stdev = 0.3118
Skewness = -0.3054
Kurtosis = -0.6000
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1.01
1.31
1.60
1.90
2.20
Minimum
1
Most Likely
2
Maximum
2.5
Regular Input
Percentile Input
Triangular Distribution
The triangular distribution describes a situation where you know the minimum, maximum, and most likely values to occur. For example, you could describe the number of cars sold per week when past sales show the minimum, maximum, and
Enable Correlation
Assumption
Location
Correlation
Cost
Sheet1!$A$2
0
Enable Data Boundary
Minimum
-Infinity
Maximum
Infinity
Enable Dynamic Simulations
OK
Cancel


Income - Risk Simulator Forecast
2D
Normal View
Income (1000 Trials)
Frequency
Continuous
90
80
70
60
50
40
30
20
10
0
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.3019
0.8019
1.3019
1.8019
Statistics
Result
Number of Trials 1000
Mean 0.8626
Median 0.8674
Standard Deviation 0.1933
Variance 0.0374
Coefficient of Variation 0.2241
Maximum 1.3570
Minimum 0.3019
Range 1.0551
Skewness -0.1157
Kurtosis -0.4480
25% Percentile 0.7269
75% Percentile 1.0068
Percentage Error Precision at 95% Confidence 1.3888%
Type
Two-Tail
-Infinity
Infinity
Certainty %
100.00
Chart Type
Bar
Chart Overlay
Continuous
Min
Max
Auto
X-Axis
Y-Axis
Title
Chart X-Axis
4
Decimals
Distribution Fitting - Done
Logistic
Fit Stats: 0.03
P-Value: 0.2782
Actual
Theoretical
Mean 0.86 0.85
Stdev 0.19 0.23
Skew -0.12 0.00
Kurt -0.45 1.20
Continuous
Discrete
2
Decimals
Fit
Data Filter
Show all data
Show only data between
-Infinity
and
Infinity
Show only data within
6
standard deviation(s)
Statistic
Precision level used to calculate the error:
95
%
Show the following statistic(s) on the histogram:
Mean
Median
1st Quartile
3rd Quartile
Show Decimals
Chart X-Axis
4
Confidence
4
Statistics
4
Histogram Resolution
Faster Simulation
Higher Resolution
Data Update Interval
Faster Update
Faster Simulation
Display
Always Show Window On Top
Semitransparent When Inactive
Control
Close All
Minimize All
Copy Chart

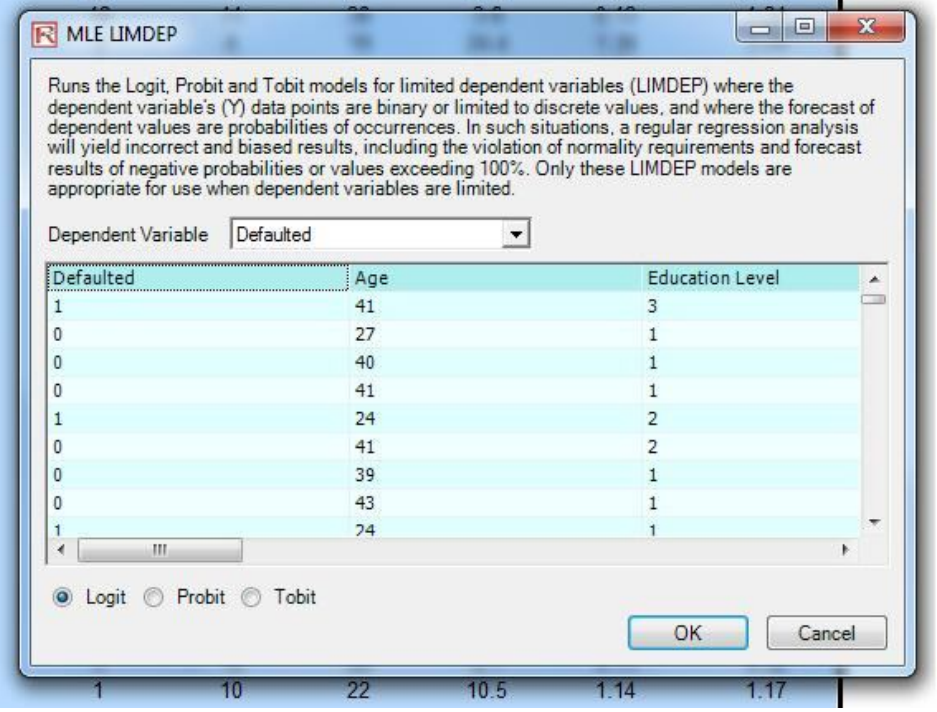

Forecasting
ARIMA
Auto ARIMA
Auto Econometrics
Basic Econometrics
Combinatorial Fuzzy Logic
Cubic Spline
GARCH
J-S Curves
Markov Chain
MLE LIMDEP
Neural Network
Nonlinear Extrapolation
Regression Analysis
Stochastic Processes
Time Series Analysis
Trendline


Stochastic Process Forecasting
Stochastic Processes are sequences of events or paths generated by probabilistic laws where random events can occur over time but are governed by specific statistical and probabilistic rules. They are useful for forecasting random events (e.g., stock prices, interest rates, price of electricity).
Stochastic Processes
Methods
Brownian Motion (Random Walk) with Drift
Exponential Brownian Motion (Random Walk) with Drift
Mean-Reversion Process with Drift
Jump-Diffusion Process with Drift
Jump-Diffusion Process with Drift and Mean-Reversion
Stochastic Process
50.0
00.0
50.0
00.0
00.0
50.0
0
2
4
6
8
10
Starting Value 100
Growth or Drift Rate (%) 5
Annualized Volatility (%) 25
Forecast Horizon (Years) 10
Reversion Rate (%) 5
Long-Term Value 120
Jump Rate (%) 10
Jump Size 2
Number of Steps 100
Iterations 10
Random Seed 1
Show All Iterations
Update Chart
OK
Cancel

Binary Logistic Maximum Likelihood Forecast: Logit, Probit, Tobit

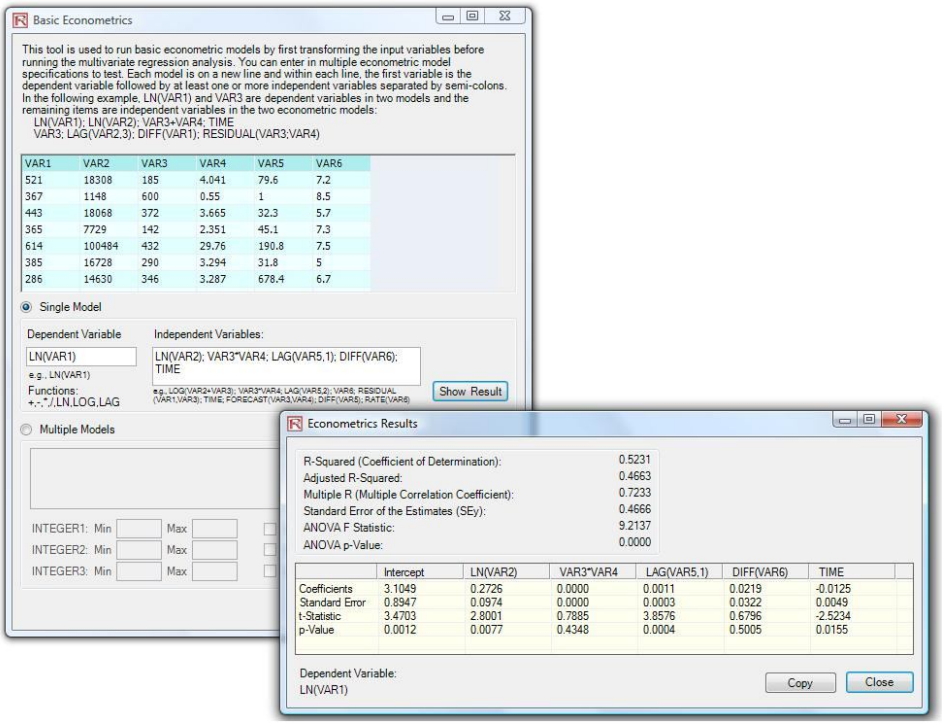
LOGIT & PROBIT SAMPLE DATA

Defaulted	Age	Education Level	Years with Current Employer	Years at Current Address	Household Income (Thousands $)	Debt to Income Ratio (%)	Credit Card Debt (Thousands $)	Other Debt (Thousands $)
1	41	3	17	12	176	9.3	11.36	5.01
0	27	1	10	6	31	17.3	1.36	4
0	40	1	15	14	55	5.5	0.86	2.17
0	41	1	15	14	120	2.9	2.66	0.82
1	24	2	2	0	28	17.3	1.79	3.06
0	41	2	5	5	25	10.2	0.39	2.16
0	39	1	20	9	67	30.6	3.83	16.67
0	43	1						
1	24	1						
0	36	1						
0	27	1						
0	25	1						
0	52	1						
0	37	1						
0	48	1						
1	36	2						
1	36	2						
0	43	1						
0	39	1						
0	41	3						
0	39	1						
0	47	1						
0	28	1						
0	29	1						
1	21	2						
0	25	4						
0	45	2						
0	43	1						
0	33	2						
0	26	3						
0	45	1						
0	30	1	1	10	22	10.5	1.14	1.17



Basic Econometrics Data Set

Y	X1	X2	X3	X4	X5
521	18308	185	4.041	79.6	7.2
367	1148	600	0.55	1	8.5
443	18068	372	3.665	32.3	5.7
365	7729	142	2.351	45.1	7.3
614	100484	432	29.76	190.8	7.5
385	16728	290	3.294	31.8	5
286	14630	346	3.287	678.4	6.7
397	4008	328	0.666	340.8	6.2
764	38927	354	12.938	239.6	7.3
427	22322	266	6.478	111.9	5
153	3711	320	1.108	172.5	2.8
231	3136	197	1.007	12.2	6.1
524	50508	266	11.431	205.6	7.1
328	28886	173	5.544	154.6	5.9
240	16996	190	2.777	49.7	4.6
286	13035	239	2.478	30.3	4.4
285	12973	190	3.685	92.8	7.4
569	16309	241	4.22	96.9	7.1
96	5227	189	1.228	39.8	7.5
498	19235	358	4.781	489.2	5.9
481	44487	315	6.016	767.6	9
468	44213	303	9.295	163.6	9.2
177	23619	228	4.375	55	5.1
198	9106	134	2.573	54.9	8.6
458	24917	189	5.117	74.3	6.6
108	3872	196	0.799	5.5	6.9
246	8945	183	1.578	20.5	2.7
291	2373	417	1.202	10.9	5.5
68	7128	233	1.109	123.7	7.2
311	23624	349	7.73	1042	6.6
606	5242	284	1.515	12.5	6.9
512	92629	499	17.99	381	7.2
426	28795	231	6.629	136.1	5.8
47	4487	143	0.639	9.3	4.1
265	48799	249	10.847	264.9	6.4
370	14067	195	3.146	45.8	6.7
312	12693	288	2.842	29.6	6
222	62184	229	11.882	265.1	6.9
280	9153	287	1.003	960.3	8.5



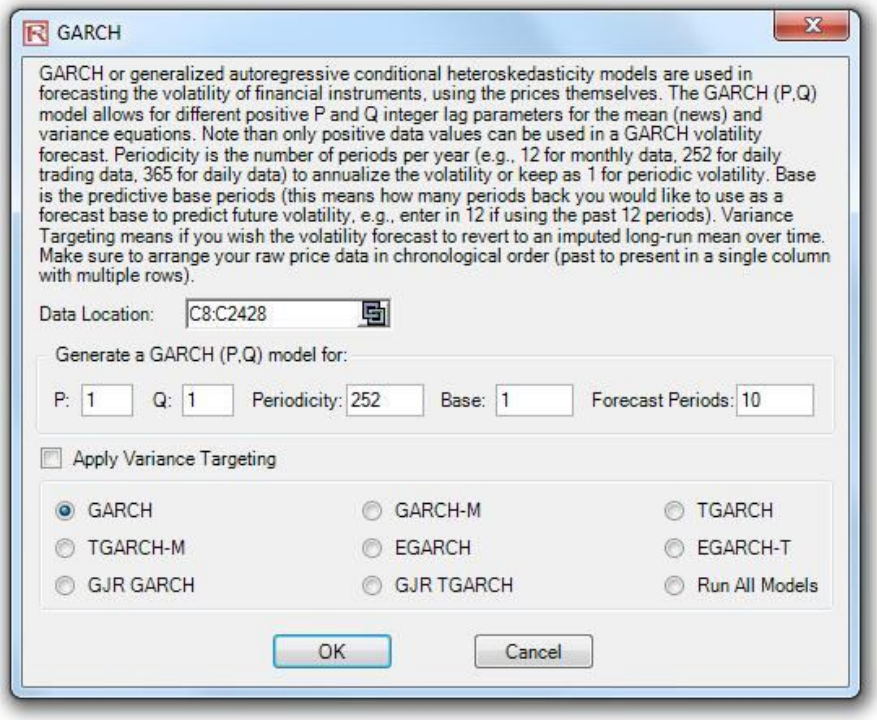
Real Options Valuation
www.realoptionsvaluation.com

Generalized Autoregressive Conditional Heteroskedasticity (GARCH)

Historical Data	
Days	Inputs
1	459.11
2	460.71
3	460.34
4	460.68
5	460.83
6	461.68
7	461.66
8	461.64
9	465.97
10	469.38
11	470.05
12	469.72
13	466.95
14	464.78
15	465.81
16	465.86
17	467.44
18	468.32
19	470.39
20	468.51
21	470.42
22	470.4
23	472.78
24	478.64
25	481.14
26	480.81
27	481.19
28	480.19
29	481.46
30	481.65
31	482.55
32	484.54
33	485.22
34	481.97
35	482.74
36	485.07

To run a GARCH model, enter in the relevant time-series data, then click on **Risk Simulator** | **Forecasting** | **GARCH** and click on on the data location *link* icon, select the historical data area (e.g., **C8:C2428**). Enter in the required inputs (e.g., P 1, Q 1, Daily Trading Periodicity 252, Predictive Base 1, Forecast Periods 10) and click **OK**. Review the generated forecast report.

For practice, run each of the GARCH variations and compare the results. Refer to the user manual for the functional form and specifications for each model variation:
GARCH, GARCH-M, TGARCH, TGARCH-M, EGARCH, EGARCH-T
GJR GARCH, GJR TGARCH



Efficient Frontier

Problem Parameters:

Number of variables	12
Number of functions	3
Objective function will be	Maximized

STEP1, D17 <= 5000, J17 <= 4

Functions

Starting Values

No.	Function Name	Status	Type	Initial Value	Lower Bound	Upper Bound
1	G		OBJ	2.45726		
2	G	****	RNGE	3197.43710	-1E+10	0
3	G	****	RNGE	8.00000	-1E+10	0

Final Results

No.	Function Name	Initial Value	Final Value
1	G	2.45726	3.46137
2	G	3197.43710	-1472.56292
3	G	8.00000	0.00000

Variables

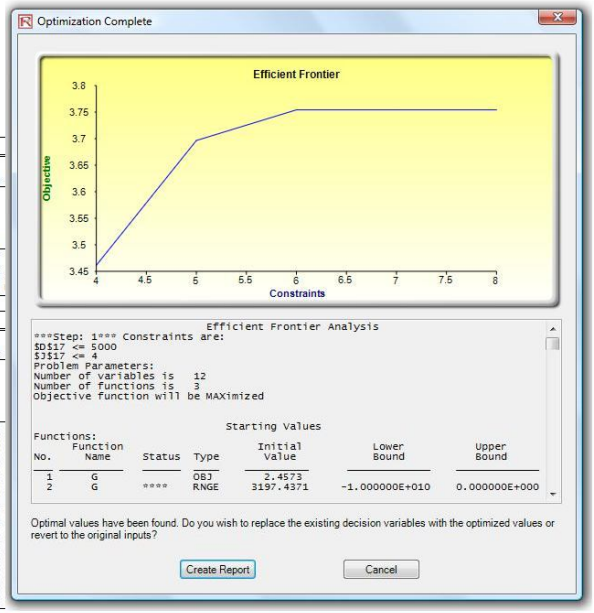
Starting Values

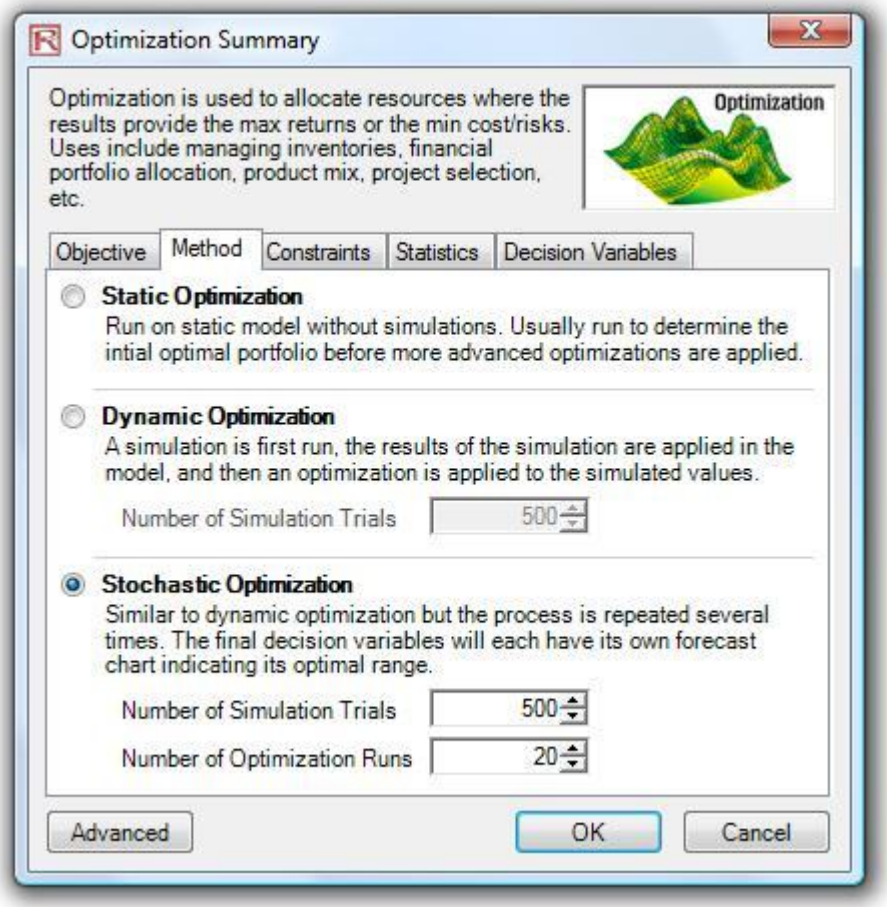
No.	Variable Name	Status	Initial Value	Lower Bound	Upper Bound
1	X	UL	1.00000	0	1
2	X	UL	1.00000	0	1
3	X	UL	1.00000	0	1
4	X	UL	1.00000	0	1
5	X	UL	1.00000	0	1
6	X	UL	1.00000	0	1
7	X	UL	1.00000	0	1
8	X	UL	1.00000	0	1
9	X	UL	1.00000	0	1
10	X	UL	1.00000	0	1
11	X	UL	1.00000	0	1
12	X	UL	1.00000	0	1

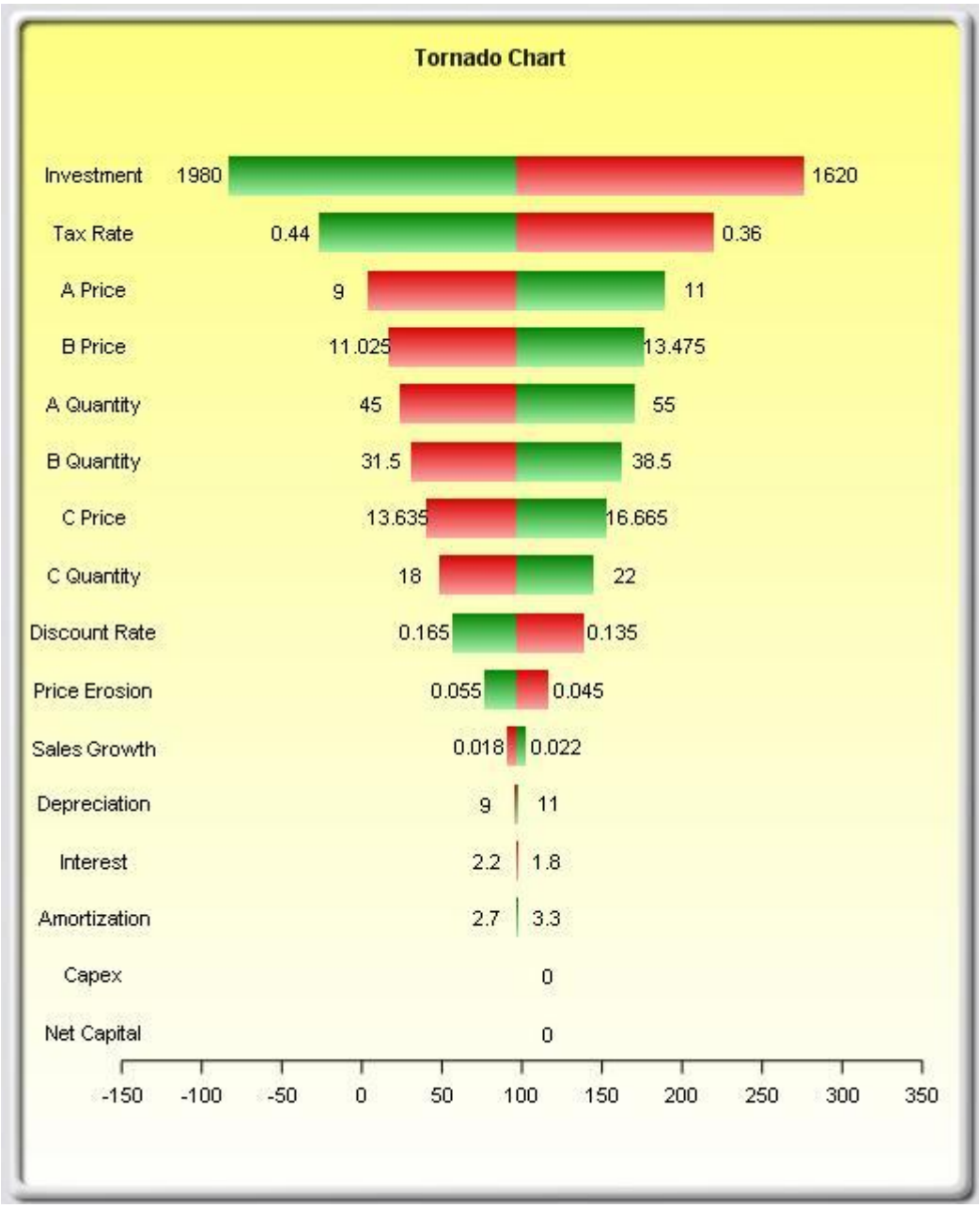
Final Results

No.	Variable Name	Initial Value	Final Value
1	X	1.00000	1.00000
2	X	1.00000	0.00000
3	X	1.00000	0.00000
4	X	1.00000	1.00000
5	X	1.00000	0.00000
6	X	1.00000	0.00000
7	X	1.00000	0.00000
8	X	1.00000	0.00000
9	X	1.00000	0.00000
10	X	1.00000	0.00000
11	X	1.00000	1.00000
12	X	1.00000	1.00000

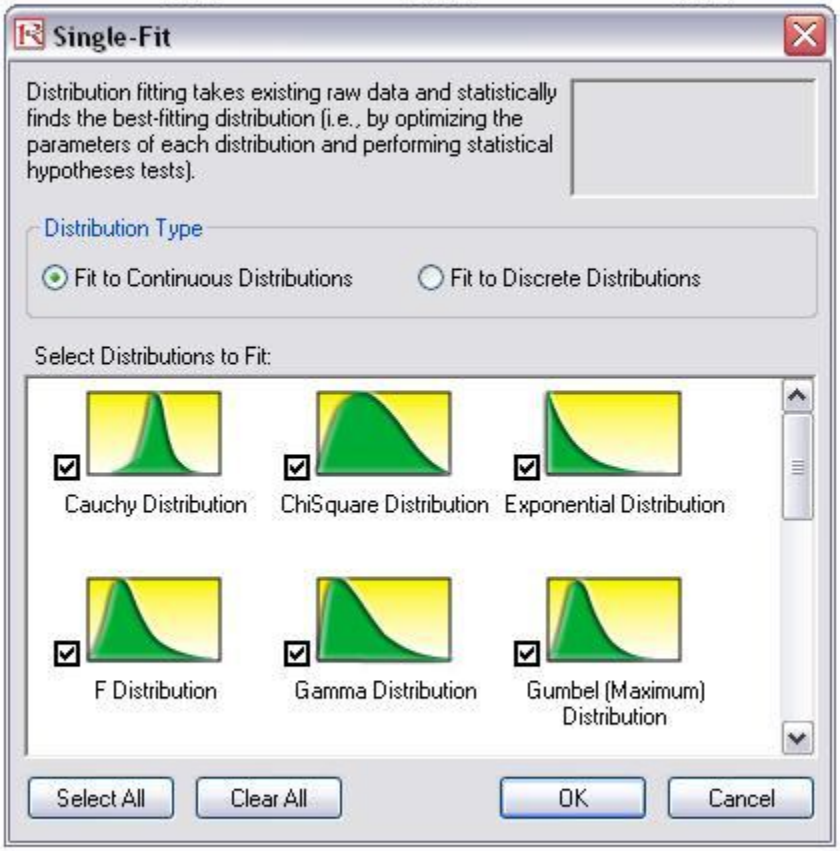
No.	Objective Function	Binding Constrs	Super Basics	Infeas Constr	Norm of Red. Grad	Hessian Cond.No.	Step Size	Degen Step
1	3205.43710	0	12	2	0.57590	1	0	
2	3.55285	0	11	1	0.28146	1	1	
3	2.88211	0	10	1	0.34697	1	0.061	

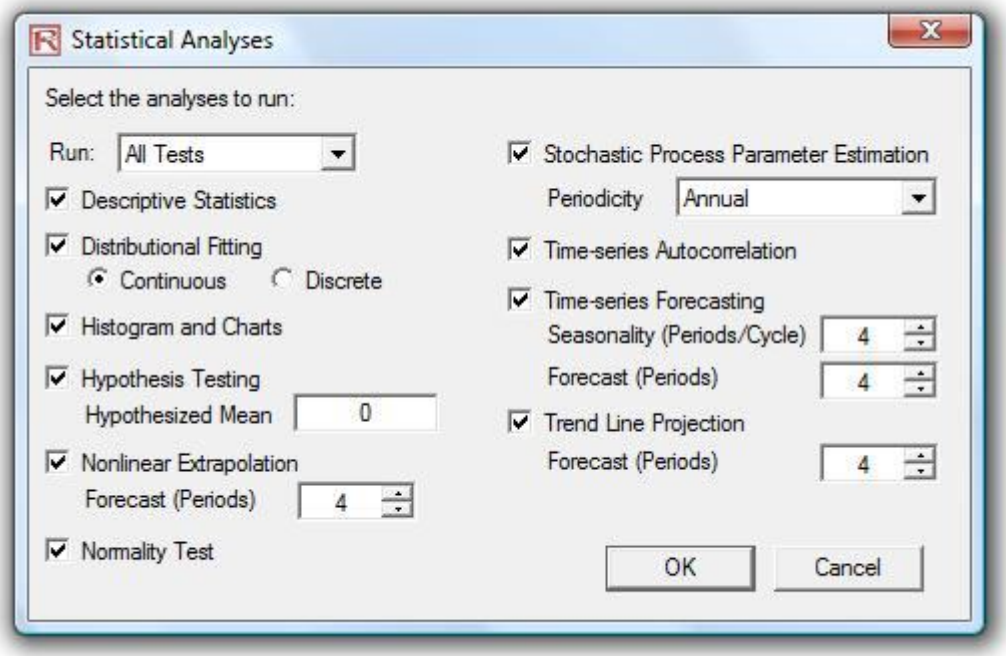





Tornado Chart
Investment
1980
1620
Tax Rate
0.44
0.36
A Price
9
11
B Price
11.025
13.475
A Quantity
45
55
B Quantity
31.5
38.5
C Price
13.635
16.665
C Quantity
18
22
Discount Rate
0.165
0.135
Price Erosion
0.055
0.045
Sales Growth
0.018
0.022
Depreciation
9
11
Interest
2.2
1.8
Amortization
2.7
3.3
Capex
0
Net Capital
0
-150
-100
-50
0
50
100
150
200
250
300
350

Normal (Single Fit)	Student's T	Triangular	Uniform
93.75	47.56	185.86	53.30
99.66	49.71	204.77	53.09
86.95	50.24	145.61	52.09
111.86	50.36	219.85	45.81
99.55			
95.55			
97.32			
87.25			
90.68			
85.86			
98.74			
88.76			
97.70			
99.75			
90.05			
106.63			
103.21			
66.48			
104.38			
123.26			
103.65			
92.85			
84.18			
109.85			
86.04			
102.26			
105.36			
97.64			
109.15			
110.98	52.25	128.85	49.08
108.09	49.01	166.19	52.81
95.38	50.51	197.52	50.74
93.21	49.72	279.06	47.98




Statistical Analyses
Select the analyses to run:
Run:
All Tests
Descriptive Statistics
Distributional Fitting
Continuous
Discrete
Histogram and Charts
Hypothesis Testing
Hypothesized Mean
0
Nonlinear Extrapolation
Forecast (Periods)
4
Normality Test
Stochastic Process Parameter Estimation
Periodicity
Annual
Time-series Autocorrelation
Time-series Forecasting
Seasonality (Periods/Cycle)
4
Forecast (Periods)
4
Trend Line Projection
Forecast (Periods)
4
OK
Cancel

Distribution Analysis

This tool generates the probability density function (PDF), cumulative distribution function (CDF) and the Inverse CDF (ICDF) of all the distributions in Risk Simulator, including theoretical moments and probability chart.

Distribution: Binomial

Trials: 20

Probability: 0.5

Type: PDF

Formatting: 0.000000

Single Value

Value X

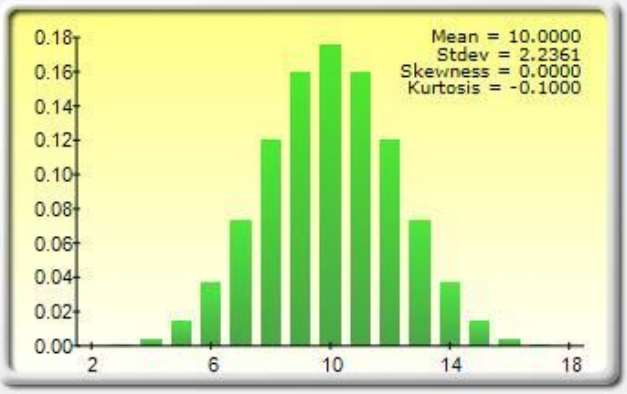
Range of Values

Lower Bound: 0

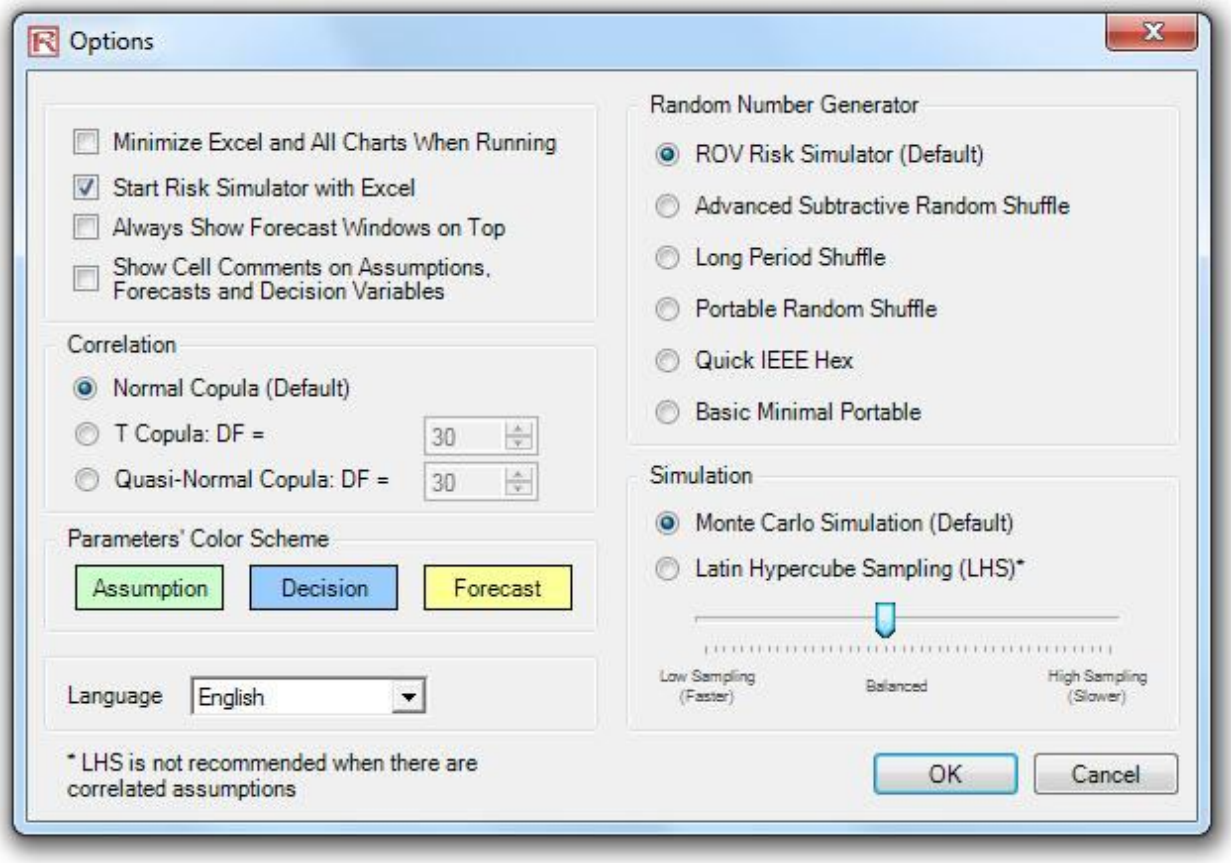
Upper Bound: 20

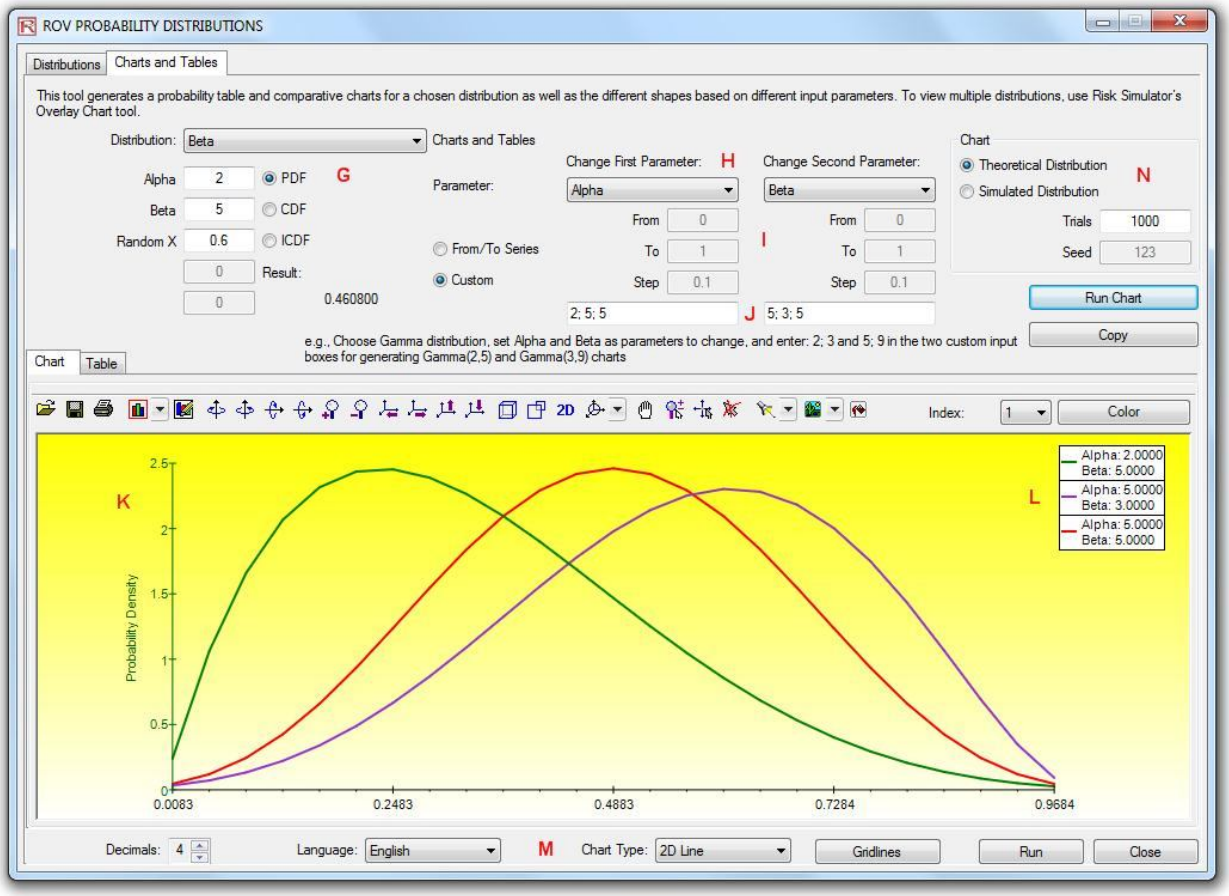
Step Size: 1

Run

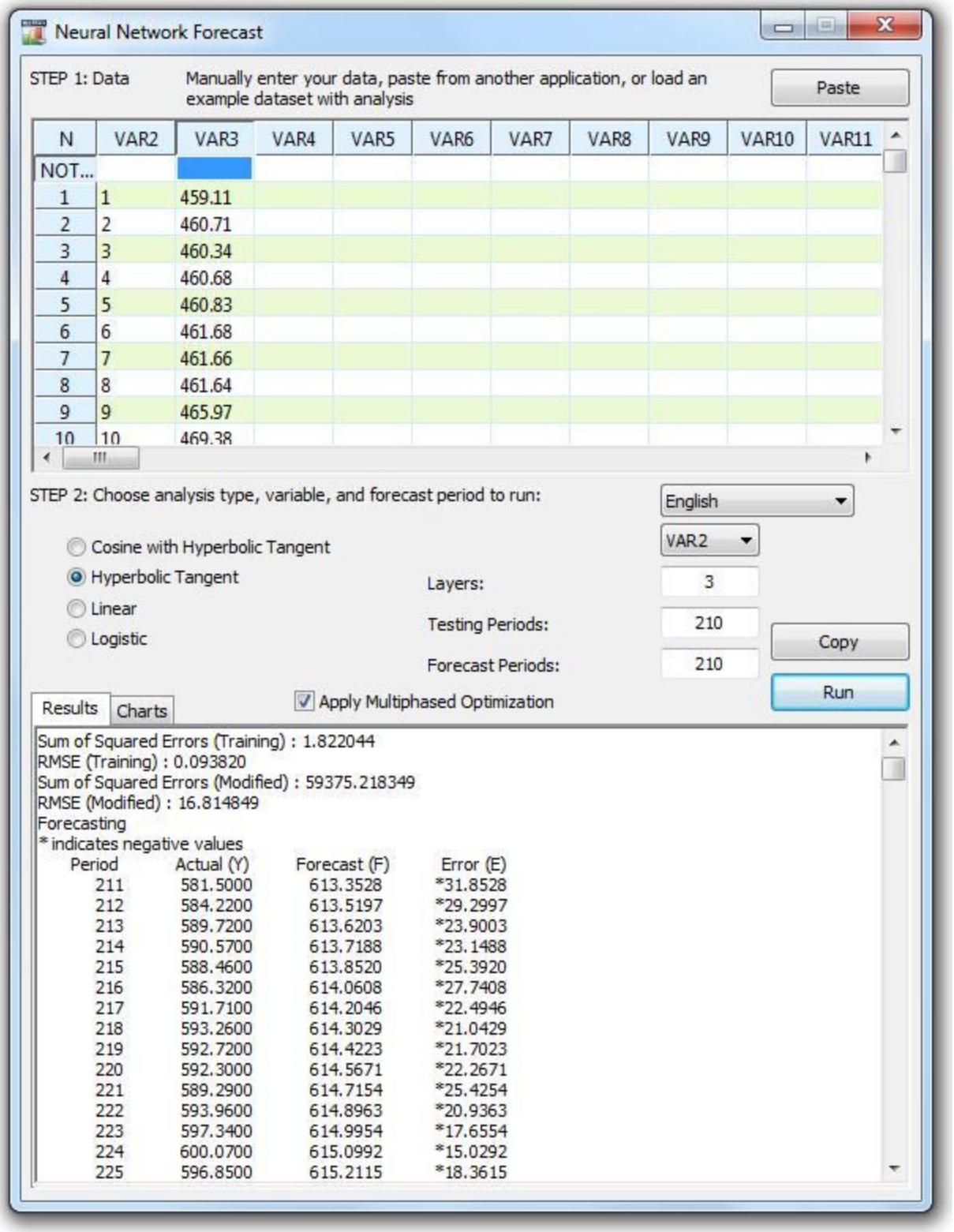


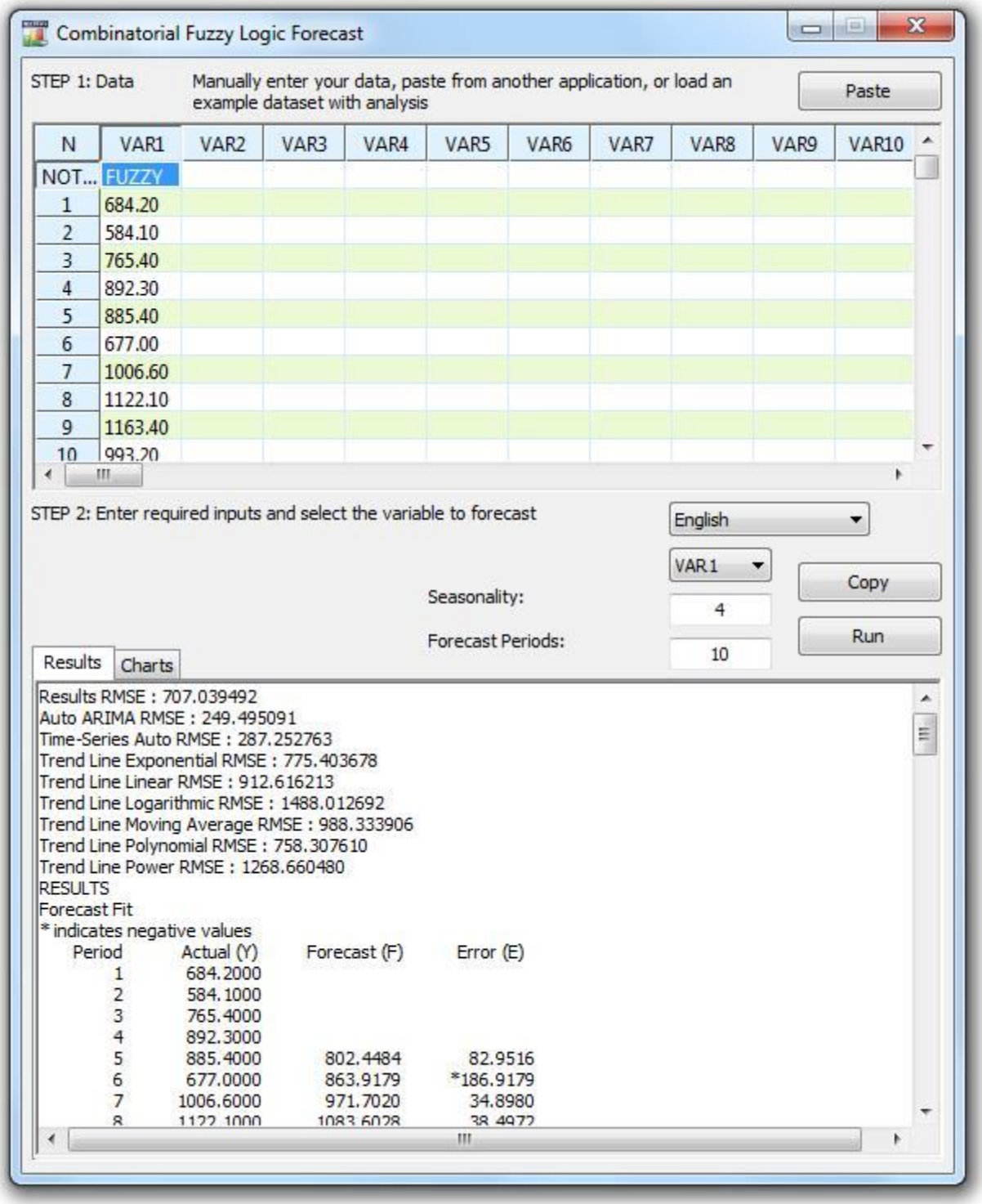
X	PDF
0.000000	0.000001
1.000000	0.000019
2.000000	0.000181
3.000000	0.001087
4.000000	0.004621
5.000000	0.014786
6.000000	0.036964
7.000000	0.073929
8.000000	0.120134
9.000000	0.160179
10.000000	0.176197
11.000000	0.160179
12.000000	0.120134
13.000000	0.073929
14.000000	0.036964
15.000000	0.014786
16.000000	0.004621
17.000000	0.001087
18.000000	0.000181
19.000000	0.000019
20.000000	0.000001

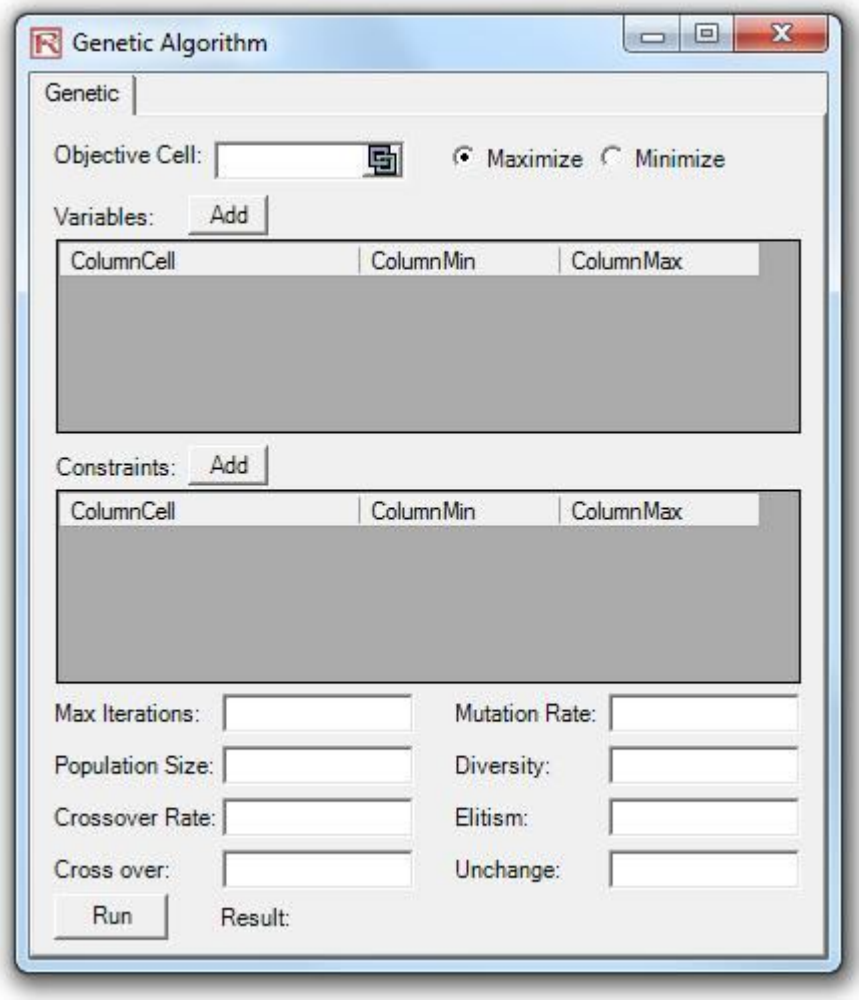

Options
Minimize Excel and All Charts When Running
Start Risk Simulator with Excel
Always Show Forecast Windows on Top
Show Cell Comments on Assumptions, Forecasts and Decision Variables
Correlation
Normal Copula (Default)
T Copula: DF =
30
Quasi-Normal Copula: DF =
30
Parameters' Color Scheme
Assumption
Decision
Forecast
Language
English
* LHS is not recommended when there are correlated assumptions
Random Number Generator
ROV Risk Simulator (Default)
Advanced Subtractive Random Shuffle
Long Period Shuffle
Portable Random Shuffle
Quick IEEE Hex
Basic Minimal Portable
Simulation
Monte Carlo Simulation (Default)
Latin Hypercube Sampling (LHS)*
Low Sampling (Faster)
Balanced
High Sampling (Slower)
OK
Cancel


ROV PROBABILITY DISTRIBUTIONS
Distributions
Charts and Tables
This tool generates a probability table and comparative charts for a chosen distribution as well as the different shapes based on different input parameters. To view multiple distributions, use Risk Simulator's Overlay Chart tool.
Distribution: Beta
Charts and Tables
Alpha 2
Beta 5
Random X 0.6
PDF
CDF
ICDF
Result:
0.460800
G
Parameter:
From/To Series
Custom
Change First Parameter:
H
Alpha
From 0
To 1
Step 0.1
2; 5; 5
Change Second Parameter:
Beta
From 0
To 1
Step 0.1
5; 3; 5
I
J
Chart
Theoretical Distribution
Simulated Distribution
N
Trials 1000
Seed 123
Run Chart
Copy
e.g., Choose Gamma distribution, set Alpha and Beta as parameters to change, and enter: 2; 3 and 5; 9 in the two custom input boxes for generating Gamma(2,5) and Gamma(3,9) charts
Chart
Table
2D
Index: 1
Color
K
L
Probability Density
2.5
2
1.5
1
0.5
0
0.0083
0.2483
0.4883
0.7284
0.9684
Alpha: 2.0000
Beta: 5.0000
Alpha: 5.0000
Beta: 3.0000
Alpha: 5.0000
Beta: 5.0000
Decimals: 4
Language: English
M
Chart Type: 2D Line
Gridlines
Run
Close


[EXAMPLE] - ROV Biz Stats
File Data Language Help
STEP 1: Data
Manually enter your data, paste from another application, or load an example dataset with analysis
Example
P
R
2D Line
Dataset Visualize Command
Q
VAR4
VAR5
Value
Itn.
STEP 2: Analysis
View: Alphabetical
Choose an analysis and enter the parameters required (see example parameter inputs below)
Trend Line (Power)
Trend Line (Rate Detrended)
Trend Line (Static Mean Detrended)
Trend Line (Static Median Detrended)
Variance (Population)
Variance (Sample)
Volatility
Volatility: EGARCH
Volatility: EGARCH-T
Volatility: GARCH
Volatility: GARCH-M
Volatility: GJR GARCH
Volatility: GJR TGARCH
Volatility: Log Returns Approach
Volatility: TGARCH
Volatility: TGARCH-M
Yield Curve (Bliss)
100
0.05
0.25
10
Initial Value, Drift Rate, Volatility, Horizon, Steps, Random Seed, Iterations:
> 100
> 0.05
> 0.25
> 10
> 100
> 123456
> 10
STEP 3: Run
Run
Runs the current analysis in Step 2 or selected saved analysis in Step 4, view the results, charts and statistics, copy the results and charts to clipboard, or generate reports
Copy
Report
T
Results Charts Statistics
Exponential Brownian Motion
U
STEP 4: Save (Optional)
You can save multiple analyses and notes in the profile for future retrieval
Name:
Notes:
ADD
EDIT
DEL
Save
Exit
Stdev Population
Stdev Sample
Stepwise Regression (Backward)
Stepwise Regression (Correlation)
Stepwise Regression (Forward)
Stepwise Regression (Forward-Backward)
S
Stochastic Process - Exp Brownian Motion
Stochastic Process - Mean Reverting Jump Diffusion
SUM
Time Series Forecast (Auto)


Neural Network Forecast
STEP 1: Data
Manually enter your data, paste from another application, or load an example dataset with analysis
Paste
N VAR2 VAR3 VAR4 VAR5 VAR6 VAR7 VAR8 VAR9 VAR10 VAR11
NOT...
1 1 459.11
2 2 460.71
3 3 460.34
4 4 460.68
5 5 460.83
6 6 461.68
7 7 461.66
8 8 461.64
9 9 465.97
10 10 469.38
STEP 2: Choose analysis type, variable, and forecast period to run:
English
VAR2
Cosine with Hyperbolic Tangent
Hyperbolic Tangent
Linear
Logistic
Layers: 3
Testing Periods: 210
Forecast Periods: 210
Copy
Run
Apply Multiphased Optimization
Results
Charts
Sum of Squared Errors (Training) : 1.822044
RMSE (Training) : 0.093820
Sum of Squared Errors (Modified) : 59375.218349
RMSE (Modified) : 16.814849
Forecasting
* indicates negative values
Period Actual (Y) Forecast (F) Error (E)
211 581.5000 613.3528 *31.8528
212 584.2200 613.5197 *29.2997
213 589.7200 613.6203 *23.9003
214 590.5700 613.7188 *23.1488
215 588.4600 613.8520 *25.3920
216 586.3200 614.0608 *27.7408
217 591.7100 614.2046 *22.4946
218 593.2600 614.3029 *21.0429
219 592.7200 614.4223 *21.7023
220 592.3000 614.5671 *22.2671
221 589.2900 614.7154 *25.4254
222 593.9600 614.8963 *20.9363
223 597.3400 614.9954 *17.6554
224 600.0700 615.0992 *15.0292
225 596.8500 615.2115 *18.3615


Combinatorial Fuzzy Logic Forecast
STEP 1: Data
Manually enter your data, paste from another application, or load an example dataset with analysis
Paste
N VAR1 VAR2 VAR3 VAR4 VAR5 VAR6 VAR7 VAR8 VAR9 VAR10
NOT... FUZZY
1 684.20
2 584.10
3 765.40
4 892.30
5 885.40
6 677.00
7 1006.60
8 1122.10
9 1163.40
10 993.20
STEP 2: Enter required inputs and select the variable to forecast
English
VAR1
Copy
Seasonality:
4
Forecast Periods:
10
Run
Results
Charts
Results RMSE : 707.039492
Auto ARIMA RMSE : 249.495091
Time-Series Auto RMSE : 287.252763
Trend Line Exponential RMSE : 775.403678
Trend Line Linear RMSE : 912.616213
Trend Line Logarithmic RMSE : 1488.012692
Trend Line Moving Average RMSE : 988.333906
Trend Line Polynomial RMSE : 758.307610
Trend Line Power RMSE : 1268.660480
RESULTS
Forecast Fit
* indicates negative values
Period Actual (Y) Forecast (F) Error (E)
1 684.2000
2 584.1000
3 765.4000
4 892.3000
5 885.4000 802.4484 82.9516
6 677.0000 863.9179 *186.9179
7 1006.6000 971.7020 34.8980
8 1122.1000 1083.6028 38.4972


Genetic Algorithm
Genetic
Objective Cell:
Maximize
Minimize
Variables:
Add
ColumnCell
ColumnMin
ColumnMax
Constraints:
Add
ColumnCell
ColumnMin
ColumnMax
Max Iterations:
Mutation Rate:
Population Size:
Diversity:
Crossover Rate:
Elitism:
Cross over:
Unchange:
Run
Result: