

## ROV MODELING TOOLKIT 2011 Boîte à Outils de Modélisation 2011

Real Options Valuation, Inc. est fier de présenter sa dernière innovation, la boîte à outils de modélisation (édition PLATINUM). Cette boîte à outils comprend plus de 800 modèles, fonctions et outils analytiques, et environ 300 modèles et exemples Excel/SLS de modèles analytiques couvrant les domaines de l'analyse des risques, de la simulation, des prévisions, de l'analyse des risques Bâle II, des risques de crédit et de défaut, des modèles statistiques et bien davantage ! Cette boîte à outils est composée de modèles mathématiques sophistiqués écrits en C++ et reliés à des feuilles de calcul Excel. Elle comprend plus de 1 100 modèles et fonctions avec des feuilles de calcul et des modèles SLS et les domaines analytiques couverts incluent:

- Analytics
- Banking Models
- Credit Analysis
- Debt Analysis
- Decision Analysis
- Exotic Options
- Forecasting
- Industry Applications
- Optimization
- Options Analysis
- Probability of Default
- Project Management
- Real Options SLS
- Risk Analysis
- Risk Hedging
- Sensitivity
- Simulation
- Six Sigma
- Valuation
- Value at Risk
- Volatility

**ROV** Real Options  
Valuation  
L.P.C.

R R I S S K

## ROV MODELING TOOLKIT: (Boîte à outils de modélisation)

Real Options Valuation, Inc. est fier de présenter sa dernière innovation, la boîte à outils de modélisation (édition PLATINUM). Cette boîte à outils comprend plus de 800 modèles, fonctions et outils analytiques, et environ 300 modèles et exemples Excel/SLS de modèles analytiques couvrant les domaines de l'analyse des risques, de la simulation, des prévisions, de l'analyse des risques Bâle II, des risques de crédit et de défaut, des modèles statistiques et bien davantage ! Cette boîte à outils est composée de modèles mathématiques sophistiqués écrits en C++ et reliés à des feuilles de calcul Excel. Elle comprend plus de 1 100 modèles et fonctions avec des feuilles de calcul et des modèles SLS et les domaines analytiques couverts incluent:

**Analytics:** Central Limit Theorem, Central Limit Theorem (Lottery Analysis), Flaw of Averages, Mathematical Integration, Parametric and Nonparametric Hypothesis Tests Dataset, Projectile Motion, Regression Diagnostics, Ships in the Night, Statistical Analysis, Weighting of Ratios

**Banking Models:** Audit of Construction Lending, Banker's Construction Budget, Classified Breakeven Loan Inventory, Classified Loan Borrowing Base, Classified Loan Cash Budget and Overdraft Facilities, Federal Reserve Camels Rating System, Firm in Financial Distress, Project Finance Risk Rating Model, Queuing Models, Reconciling Enron's Cash Flow, Risk Rating Model, Sample Cash Flows, Sensitivity Projections, Stochastic Loan Pricing Model, Valuation and Appraisal

**Credit Analysis:** Credit Default Swaps and Credit Spread Options, Credit Default Swaps (with Counterparty Defaults and Correlations), Credit Premium, Credit Risk and Effects on Prices, External Debt Rating and Spreads, Internal Credit Risk Rating Model, Profit Cost Analysis of New Credit, Debt Analysis, Asset Equity Parity Model, Cox Model on Price and Yield of Risky Debt with Mean Reverting Rates, Debt Repayment and Amortization, Debt Sensitivity Models, Merton Price of Risky Debt with Stochastic Asset and Interest, Vasicek Debt Option Valuation, Vasicek Price and Yield of Risky Debt

**Decision Analysis:** Decision Tree Basics, Decision Tree with EVPI, Minimax and Bayes Theorem, Economic Order Quantity and Inventory Reorder Point, Economic Order Quantity and Optimal Manufacturing, Expected Utility Analysis, Inventory Control, Queuing Models

**Exotic Options:** American, Bermudan and European Options, Asian Arithmetic, Asian Geometric, Asset or Nothing, Barrier Options, Binary Digital Options, Cash or Nothing, Commodity Options, Complex Chooser, Credit Spread Options, Currency Options, Double Barriers, Exchange Assets, Extreme Spread, Foreign Equity Linked Forex, Foreign Equity Domestic Currency, Foreign Equity Fixed Forex, Foreign Takeover Options, Forward Start, Futures and Forward Options, Gap Options, Graduated Barriers, Index Options, Inverse Gamma Out-of-the-money Options, Jump Diffusion, Leptokurtic and Skewed Options, Lookback Fixed Strike Partial Time, Lookback Fixed Strike, Lookback Floating Strike Partial Time, Lookback Floating Strike, Min and Max of Two Assets, Option Collar, Options on Options, Perpetual Options, Simple Chooser, Spread on Futures, Supershares, Time Switch, Trading Day Corrections, Two Assets Barrier, Two Assets Cash, Two Assets Correlated, Uneven Dividends, Writer Extendible

**Forecasting:** Brownian Motion Stochastic Process, Data Diagnostics, Econometric, Correlations and Multiple Regression Modeling, Exponential J-Growth Curves, Forecasting Manual Computations, Jump-Diffusion Stochastic Process, Linear Interpolation, Logistic S-Growth Curves, Markov Chains and Market Share, Mean-Reverting Stochastic Process, Multiple Regression, Nonlinear Extrapolation, Stochastic Processes and Yield Curves, Stock Distribution at Horizon, Time-Series Analysis, Time-Series ARIMA

**Industry Applications:** Asset Liability Management ALM, Biotech: Manufacturing Strategy, Biotech-In-licensing and Deal Structuring, Biotech: Investment Valuation, Electric Utility: Efficient Frontier Generation, Electric Utility: Electricity Contract Risk, Information Technology: Forecasting Use, Information Technology: Decision Analysis, Pensions: Closed Group Portfolio Matching, Pensions: Accounting Modeling and Optimization, Real Estate: Commercial ROI

**Optimization:** Capital Investments (Part A), Capital Investments (Part B), Continuous Portfolio Allocation, Discrete Project Selection, Inventory Optimization, Investment Portfolio Allocation, Military Portfolio and Efficient Frontier, Optimal Pricing with Elasticity, Optimization of a Harvest Model, Optimizing Ordinary Least Squares, Stochastic Portfolio Allocation

**Options Analysis:** Binary Digital Instruments, Inverse Floater Bond Lattice Maker, Options Adjusted Spreads on Debt, Options on Debt, Options Trading Strategies

**Probability of Default:** Empirical (Individuals), External Options Model (Public Company), Merton Internal Model (Private Company), Merton Market Options Model (Industry Comparable), Yields and Spreads (Market Comparable)

**Project Management:** Cost Estimation Model, Critical Path Analysis (CPM PERT GANTT), Project Timing

**Real Options SLS:** Employee Stock Options: Simple American Call, Employee Stock Options: Simple Bermudan Call with Vesting, Employee Stock Options: Simple European Call, Employee Stock Options: Suboptimal Exercise, Employee Stock Options: Vesting and Suboptimal Exercise, Employee Stock Options: Vesting, Blackout, Suboptimal, Forfeiture

**Exotic Options:** American Call Option with Dividends, Exotic Options: Accruals on Basket of Assets, Exotic Options: American Call Option on Foreign Exchange, Exotic Options: American Call Option on Index Futures, Exotic Options: Barrier Option: Down and In Lower Barrier, Exotic Options: Barrier Option: Down and Out Lower Barrier, Exotic Options: Barrier Option: Up and In Upper Barrier Call, Exotic Options: Barrier Option: Up and In, Down and In Double Barrier Call, Exotic Options: Barrier Option: Up and Out Upper Barrier Call, Exotic Options: Barrier Option: Up and Out, Down and Out Double Barrier Call, Exotic Options: Basic American, European, versus Bermudan Call Options, Exotic Options: Chooser Option, Exotic Options: Equity Linked Notes, Exotic Options: European Call Option with Dividends, Exotic Options: Range Accruals

**Options Analysis:** Plain Vanilla Call Option I, Options Analysis: Plain Vanilla Call Option II, Options Analysis: Plain Vanilla Call Option III, Options Analysis: Plain Vanilla Call Option IV, Options Analysis: Plain Vanilla Put Option

**Real Options:** Abandonment American Option, Real Options: Abandonment Bermudan Option, Real Options: Abandonment Customized Option, Real Options: Abandonment European Option, Real Options: Contraction American and European Option, Real Options: Contraction Bermudan Option, Real Options: Contraction Customized Option, Real Options: Dual-Asset Rainbow Option Pentanomial Lattice, Real Options: Excel-based Options Models, Real Options: Exotic Complex Floating American Chooser, Real Options: Exotic Complex Floating European Chooser, Real Options: Expand Contract Abandon American and European Option, Real Options: Expand Contract Abandon Bermudan Option, Real Options: Expand Contract Abandon Customized Option I, Real Options: Expand Contract Abandon Customized Option II, Real Options: Expansion American and European Option, Real Options: Expansion Bermudan Option, Real Options: Expansion Customized Option, Real Options: Jump Diffusion Calls and Puts using Quadrnomial Lattices, Real Options: Mean Reverting Calls and Puts using Trinomial Lattices, Real Options: Multiple Asset Competing Options (3D Binomial), Real Options: Multiple Phased Complex Sequential Compound Option, Real Options: Multiple Phased Sequential Compound Option, Real Options: Multiple Phased Simultaneous Compound Option, Real Options: Simple Calls and Puts using Trinomial Lattices, Real Options: Simple Two Phased Sequential Compound Option, Real Options: Simple Two Phased Simultaneous Compound Option, Real Options: Strategic Cases: High: Tech Manufacturing Strategy A, Real Options: Strategic Cases: High-Tech Manufacturing Strategy B, Real Options: Strategic Cases: High-Tech Manufacturing Strategy C, Real Options: Strategic Cases: Oil and Gas: Strategy A, Real Options: Strategic Cases: Oil and Gas: Strategy B, Real Options: Strategic Cases: R&D Stage-Gate Process A, Real Options: Strategic Cases: R&D Stage-Gate Process B, Real Options: Strategic Cases: Switching Option's Strategy A, Real Options: Strategic Cases: Switching Option's Strategy B

**Trinomial Lattices:** American Call Option, Trinomial Lattices: American Put Option, Trinomial Lattices: European Call Option, Trinomial Lattices: European Put Option, Trinomial Lattices: Mean Reverting American Call Option, Trinomial Lattices: Mean Reverting American Put Option, Trinomial Lattices: Mean Reverting European Call Option, Trinomial Lattices: Mean Reverting European Put Option, Trinomial Lattices: Mean Reverting American Abandonment Option, Trinomial Lattices: Mean Reverting American Contraction Option, Trinomial Lattices: Mean Reverting American Expansion Option, Trinomial Lattices: Mean Reverting American Abandonment, Contraction, Expansion, Trinomial Lattices: Mean Reverting Bermudan Abandonment, Contraction, Expansion, Trinomial Lattices: Mean Reverting Abandonment, Contraction, Expansion, Trinomial Lattices: Mean Reverting European Abandonment, Contraction, Expansion

**Quadrnomial Lattices:** Jump Diffusion American Call Option, Quadrnomial Lattices: Jump Diffusion American Put Option, Quadrnomial Lattices: Jump Diffusion European Call Option, Quadrnomial Lattices: Jump Diffusion European Put Option

**Pentanomial Lattices:** American Rainbow Call Option, Pentanomial Lattices: American Rainbow Put Option, Pentanomial Lattices: Dual Reverse Strike American Call (3D Binomial), Pentanomial Lattices: Dual Reverse Strike American Put (3D Binomial), Pentanomial Lattices: Dual Strike American Call (3D Binomial), Pentanomial Lattices: Dual Strike American Put (3D Binomial), Pentanomial Lattices: European Rainbow Call Option, Pentanomial Lattices: European Rainbow Put Option, Pentanomial Lattices: Exchange of Two Assets American Put (3D Binomial), Pentanomial Lattices: Maximum of Two Assets American Call (3D Binomial), Pentanomial Lattices: Maximum of Two Assets American Put (3D Binomial), Pentanomial Lattices: Minimum of Two Assets American Call (3D Binomial), Pentanomial Lattices: Minimum of Two Assets American Put (3D Binomial), Pentanomial Lattices: Portfolio American Call (3D Binomial), Pentanomial Lattices: Portfolio American Put (3D Binomial), Pentanomial Lattices: Spread of Two Assets American Call (3D Binomial), Pentanomial Lattices: Spread of Two Assets American Put (3D Binomial)

**Risk Analysis:** Integrated Risk Analysis, Interest Rate Risk, Portfolio Risk and Return Profile

**Risk Hedging:** Delta Gamma Hedge, Delta Hedge, Effects of Fixed versus Floating Rates, Foreign Exchange Cash Flow Model, Foreign Exchange Exposure Hedging

**Sensitivity:** Greeks, Tornado and Sensitivity Charts Linear, Tornado and Sensitivity Nonlinear

**Simulation:** Basic Simulation Model, Best Surgical Team, Correlated Simulation, Correlation Effects Model, Data Fitting, DCF, ROI and Volatility, Debt Repayment and Amortization, Demand Curve and Elasticity Estimation, Infectious Diseases, Recruitment Budget (Negative Binomial and Multidimensional Simulation), Retirement Funding with VBA Macros, Roulette Wheel, Time Value of Money

**Six Sigma:** Confidence Intervals with Hypothesis Testing, Control Charts (c, n, p, u, X, XmR, R), Delta Precision, Design of Experiments and Combinatorics, Hypothesis Testing and Bootstrap Simulation, Sample Size Correlation, Sample Size DPU, Sample Size Mean, Sample Size Proportion, Sample Size Sigma, Statistical Analysis (CDF, PDF, ICDF) with Hypothesis Testing, Statistical Capability Measures, Unit Capability Measures

**Valuation:** APT, BETA and CAPM, Buy versus Lease, Caps and Floors, Convertible Bonds, Financial Ratios Analysis, Financial Statements Analysis, Valuation Model, Valuation: Warrant Combined Value, Valuation: Warrant Put Only, Valuation: Warrant Only

**Value at Risk:** Optimized and Simulated Portfolio VaR, Options Delta Portfolio, Portfolio Operational and Capital Adequacy, Right Tail Capital Requirements, Static Covariance Method

**Volatility:** EWMA Volatility Models, GARCH Volatility Models, Implied Volatility, Log Asset Returns Approach, Log Cash Flow Returns Approach Probability to Volatility

**Yield Curve:** CIR Model, Curve Interpolation BIM, Curve Interpolation NS, Forward Rates from Spot Rates, Spline Interpolation and Extrapolation, Term Structure of Volatility, US Treasury Risk Free Rate, Vasicek Model



# MODELING TOOLKIT

Real Options Valuation, Inc. is proud to present its latest innovation, the **Modeling Toolkit (Premium Edition)**. This toolkit comprises over 800 analytical models, functions and tools, and about 300 analytical model Excel/SLS templates and example spreadsheets covering the areas of risk analysis, simulation, forecasting, Basel II risk analysis, credit and default risk, statistical models, and much more! This toolkit is a set of mathematically sophisticated models written in C++ and linked into Excel spreadsheets. There are over 1100 models, functions, with spreadsheet and SLS templates in this toolkit and the analytical areas covered include:

## **Analytics**

1. **Central Limit Theorem**
2. **Central Limit Theorem (Lottery Analysis)**
3. **Flaw of Averages**
4. **Mathematical Integration**
5. **Parametric and Nonparametric Hypothesis Tests Dataset**
6. **Projectile Motion**
7. **Regression Diagnostics**
8. **Ships in the Night**
9. **Statistical Analysis**
10. **Weighting of Ratios**

## **Banking Models**

11. **Audit of Construction Lending**
12. **Banker's Construction Budget**
13. **Classified Breakeven Loan Inventory**
14. **Classified Loan Borrowing Base**
15. **Classified Loan Cash Budget and Overdraft Facilities**
16. **Federal Reserve Camels Rating System**
17. **Firm in Financial Distress**
18. **Project Finance Risk Rating Model**
19. **Queuing Models**
20. **Reconciling Enron's Cash Flow**
21. **Risk Rating Model**
22. **Sample Cash Flows**
23. **Sensitivity Projections**
24. **Stochastic Loan Pricing Model**
25. **Valuation and Appraisal**

### **Credit Analysis**

26. Credit Default Swaps and Credit Spread Options
27. Credit Default Swaps (with Counterparty Defaults and Correlations)
28. Credit Premium
29. Credit Risk and Effects on Prices
30. External Debt Rating and Spreads
31. Internal Credit Risk Rating Model
32. Profit Cost Analysis of New Credit

### **Debt Analysis**

33. Asset Equity Parity Model
34. Cox Model on Price and Yield of Risky Debt with Mean Reverting Rates
35. Debt Repayment and Amortization
36. Debt Sensitivity Models
37. Merton Price of Risky Debt with Stochastic Asset and Interest
38. Vasicek Debt Option Valuation
39. Vasicek Price and Yield of Risky Debt

### **Decision Analysis**

40. Decision Tree Basics
41. Decision Tree with EVPI, Minimax and Bayes Theorem
42. Economic Order Quantity and Inventory Reorder Point
43. Economic Order Quantity and Optimal Manufacturing
44. Expected Utility Analysis
45. Inventory Control
46. Queuing Models

### **Exotic Options**

47. American, Bermudan and European Options
48. Asian Arithmetic
49. Asian Geometric
50. Asset or Nothing
51. Barrier Options
52. Binary Digital Options
53. Cash or Nothing
54. Commodity Options
55. Complex Chooser
56. Credit Spread Options

57. Currency Options
58. Double Barriers
59. Exchange Assets
60. Extreme Spread
61. Foreign Equity Linked Forex
62. Foreign Equity Domestic Currency
63. Foreign Equity Fixed Forex
64. Foreign Takeover Options
65. Forward Start
66. Futures and Forward Options
67. Gap Options
68. Graduated Barriers
69. Index Options
70. Inverse Gamma Out-of-the-money Options
71. Jump Diffusion
72. Leptokurtic and Skewed Options
73. Lookback Fixed Strike Partial Time
74. Lookback Fixed Strike
75. Lookback Floating Strike Partial Time
76. Lookback Floating Strike
77. Min and Max of Two Assets
78. Option Collar
79. Options on Options
80. Perpetual Options
81. Simple Chooser
82. Spread on Futures
83. Supershares
84. Time Switch
85. Trading Day Corrections
86. Two Assets Barrier
87. Two Assets Cash
88. Two Assets Correlated
89. Uneven Dividends
90. Writer Extendible

#### Forecasting

91. Brownian Motion Stochastic Process
92. Data Diagnostics
93. Econometric, Correlations and Multiple Regression Modeling
94. Exponential J-Growth Curves
95. Forecasting Manual Computations

96. **Jump-Diffusion Stochastic Process**
97. **Linear Interpolation**
98. **Logistic S-Growth Curves**
99. **Markov Chains and Market Share**
100. **Mean-Reverting Stochastic Process**
101. **Multiple Regression**
102. **Nonlinear Extrapolation**
103. **Stochastic Processes and Yield Curves**
104. **Stock Distribution at Horizon**
105. **Time-Series Analysis**
106. **Time-Series ARIMA**

#### **Industry Applications**

107. **Asset Liability Management ALM**
108. **Biotech – Manufacturing Strategy**
109. **Biotech – In-licensing and Deal Structuring**
110. **Biotech – Investment Valuation**
111. **Electric Utility – Efficient Frontier Generation**
112. **Electric Utility – Electricity Contract Risk**
113. **Information Technology – Forecasting Use**
114. **Information Technology – Decision Analysis**
115. **Pensions – Closed Group Portfolio Matching**
116. **Pensions – Accounting Modeling and Optimization**
117. **Real Estate – Commercial ROI**

#### **Optimization**

118. **Capital Investments (Part A)**
119. **Capital Investments (Part B)**
120. **Continuous Portfolio Allocation**
121. **Discrete Project Selection**
122. **Inventory Optimization**
123. **Investment Portfolio Allocation**
124. **Military Portfolio and Efficient Frontier**
125. **Optimal Pricing with Elasticity**
126. **Optimization of a Harvest Model**
127. **Optimizing Ordinary Least Squares**
128. **Stochastic Portfolio Allocation**

## **Options Analysis**

- 129. **Binary Digital Instruments**
- 130. **Inverse Floater Bond Lattice Maker**
- 131. **Options Adjusted Spreads on Debt**
- 132. **Options on Debt**
- 133. **Options Trading Strategies**

## **Probability of Default**

- 134. **Empirical (Individuals)**
- 135. **External Options Model (Public Company)**
- 136. **Merton Internal Model (Private Company)**
- 137. **Merton Market Options Model (Industry Comparable)**
- 138. **Yields and Spreads (Market Comparable)**

## **Project Management**

- 139. **Cost Estimation Model**
- 140. **Critical Path Analysis (CPM PERT GANTT)**
- 141. **Project Timing**

## **Real Options SLS**

- 142. **Employee Stock Options - Simple American Call**
- 143. **Employee Stock Options - Simple Bermudan Call with Vesting**
- 144. **Employee Stock Options - Simple European Call**
- 145. **Employee Stock Options - Suboptimal Exercise**
- 146. **Employee Stock Options - Vesting and Suboptimal Exercise**
- 147. **Employee Stock Options - Vesting, Blackout, Suboptimal, Forfeiture**
- 148. **Exotic Options - American Call Option with Dividends**
- 149. **Exotic Options - Accruals on Basket of Assets**
- 150. **Exotic Options - American Call Option on Foreign Exchange**
- 151. **Exotic Options - American Call Option on Index Futures**
- 152. **Exotic Options - Barrier Option - Down and In Lower Barrier**
- 153. **Exotic Options - Barrier Option - Down and Out Lower Barrier**
- 154. **Exotic Options - Barrier Option - Up and In Upper Barrier Call**
- 155. **Exotic Options - Barrier Option - Up and In, Down and In Double Barrier Call**
- 156. **Exotic Options - Barrier Option - Up and Out Upper Barrier Call**
- 157. **Exotic Options - Barrier Option - Up and Out, Down and Out Double Barrier Call**
- 158. **Exotic Options - Basic American, European, versus Bermudan Call Options**
- 159. **Exotic Options - Chooser Option**
- 160. **Exotic Options - Equity Linked Notes**
- 161. **Exotic Options - European Call Option with Dividends**
- 162. **Exotic Options - Range Accruals**

163. Options Analysis - Plain Vanilla Call Option I
164. Options Analysis - Plain Vanilla Call Option II
165. Options Analysis - Plain Vanilla Call Option III
166. Options Analysis - Plain Vanilla Call Option IV
167. Options Analysis - Plain Vanilla Put Option
  
168. Real Options - Abandonment American Option
169. Real Options - Abandonment Bermudan Option
170. Real Options - Abandonment Customized Option
171. Real Options - Abandonment European Option
172. Real Options - Contraction American and European Option
173. Real Options - Contraction Bermudan Option
174. Real Options - Contraction Customized Option
175. Real Options - Dual-Asset Rainbow Option Pentanomial Lattice
176. Real Options – Excel-based Options Models
177. Real Options - Exotic Complex Floating American Chooser
178. Real Options - Exotic Complex Floating European Chooser
179. Real Options - Expand Contract Abandon American and European Option
180. Real Options - Expand Contract Abandon Bermudan Option
181. Real Options - Expand Contract Abandon Customized Option I
182. Real Options - Expand Contract Abandon Customized Option II
183. Real Options - Expansion American and European Option
184. Real Options - Expansion Bermudan Option
185. Real Options - Expansion Customized Option
186. Real Options - Jump Diffusion Calls and Puts using Quadrinomial Lattices
187. Real Options - Mean Reverting Calls and Puts using Trinomial Lattices
188. Real Options - Multiple Asset Competing Options (3D Binomial)
189. Real Options - Multiple Phased Complex Sequential Compound Option
190. Real Options - Multiple Phased Sequential Compound Option
191. Real Options - Multiple Phased Simultaneous Compound Option
192. Real Options - Simple Calls and Puts using Trinomial Lattices
193. Real Options - Simple Two Phased Sequential Compound Option
194. Real Options - Simple Two Phased Simultaneous Compound Option
195. Real Options - Strategic Cases - High-Tech Manufacturing Strategy A
196. Real Options - Strategic Cases - High-Tech Manufacturing Strategy B
197. Real Options - Strategic Cases - High-Tech Manufacturing Strategy C
198. Real Options - Strategic Cases - Oil and Gas - Strategy A
199. Real Options - Strategic Cases - Oil and Gas - Strategy B
200. Real Options - Strategic Cases - R&D Stage-Gate Process A
201. Real Options - Strategic Cases - R&D Stage-Gate Process B
202. Real Options - Strategic Cases - Switching Option's Strategy A
203. Real Options - Strategic Cases - Switching Option's Strategy B



- 204. Trinomial Lattices - American Call Option
- 205. Trinomial Lattices - American Put Option
- 206. Trinomial Lattices - European Call Option
- 207. Trinomial Lattices - European Put Option
- 208. Trinomial Lattices - Mean Reverting American Call Option
- 209. Trinomial Lattices - Mean Reverting American Put Option
- 210. Trinomial Lattices - Mean Reverting European Call Option
- 211. Trinomial Lattices - Mean Reverting European Put Option
- 212. Trinomial Lattices - Mean Reverting American Abandonment Option
- 213. Trinomial Lattices - Mean Reverting American Contraction Option
- 214. Trinomial Lattices - Mean Reverting American Expansion Option
- 215. Trinomial Lattices - Mean Reverting American Abandonment, Contraction, Expansion
- 216. Trinomial Lattices - Mean Reverting Bermudan Abandonment, Contraction, Expansion
- 217. Trinomial Lattices - Mean Reverting Customized Abandonment, Contraction, Expansion
- 218. Trinomial Lattices - Mean Reverting European Abandonment, Contraction, Expansion
  
- 219. Quadranomial Lattices - Jump Diffusion American Call Option
- 220. Quadranomial Lattices - Jump Diffusion American Put Option
- 221. Quadranomial Lattices - Jump Diffusion European Call Option
- 222. Quadranomial Lattices - Jump Diffusion European Put Option
- 223. Pentanomial Lattices - American Rainbow Call Option
- 224. Pentanomial Lattices - American Rainbow Put Option
- 225. Pentanomial Lattices - Dual Reverse Strike American Call (3D Binomial)
- 226. Pentanomial Lattices - Dual Reverse Strike American Put (3D Binomial)
- 227. Pentanomial Lattices - Dual Strike American Call (3D Binomial)
- 228. Pentanomial Lattices - Dual Strike American Put (3D Binomial)
- 229. Pentanomial Lattices - European Rainbow Call Option
- 230. Pentanomial Lattices - European Rainbow Put Option
- 231. Pentanomial Lattices - Exchange of Two Assets American Put (3D Binomial)
- 232. Pentanomial Lattices - Maximum of Two Assets American Call (3D Binomial)
- 233. Pentanomial Lattices - Maximum of Two Assets American Put (3D Binomial)
- 234. Pentanomial Lattices - Minimum of Two Assets American Call (3D Binomial)
- 235. Pentanomial Lattices - Minimum of Two Assets American Put (3D Binomial)
- 236. Pentanomial Lattices - Portfolio American Call (3D Binomial)
- 237. Pentanomial Lattices - Portfolio American Put (3D Binomial)
- 238. Pentanomial Lattices - Spread of Two Assets American Call (3D Binomial)
- 239. Pentanomial Lattices - Spread of Two Assets American Put (3D Binomial)

## **Risk Analysis**

- 240. **Integrated Risk Analysis**
- 241. **Interest Rate Risk**
- 242. **Portfolio Risk and Return Profile**

## **Risk Hedging**

- 243. **Delta Gamma Hedge**
- 244. **Delta Hedge**
- 245. **Effects of Fixed versus Floating Rates**
- 246. **Foreign Exchange Cash Flow Model**
- 247. **Foreign Exchange Exposure Hedging**

## **Sensitivity**

- 248. **Greeks**
- 249. **Tornado and Sensitivity Charts Linear**
- 250. **Tornado and Sensitivity Nonlinear**

## **Simulation**

- 251. **Basic Simulation Model**
- 252. **Best Surgical Team**
- 253. **Correlated Simulation**
- 254. **Correlation Effects Model**
- 255. **Data Fitting**
- 256. **DCF, ROI and Volatility**
- 257. **Debt Repayment and Amortization**
- 258. **Demand Curve and Elasticity Estimation**
- 259. **Infectious Diseases**
- 260. **Recruitment Budget (Negative Binomial and Multidimensional Simulation)**
- 261. **Retirement Funding with VBA Macros**
- 262. **Roulette Wheel**
- 263. **Time Value of Money**

## **Six Sigma**

- 264. **Confidence Intervals with Hypothesis Testing**
- 265. **Control Charts (c, n, p, u, X, XmR, R)**
- 266. **Delta Precision**
- 267. **Design of Experiments and Combinatorics**
- 268. **Hypothesis Testing and Bootstrap Simulation**
- 269. **Sample Size Correlation**
- 270. **Sample Size DPU**
- 271. **Sample Size Mean**
- 272. **Sample Size Proportion**

- 273. Sample Size Sigma
- 274. Statistical Analysis (CDF, PDF, ICDF) with Hypothesis Testing
- 275. Statistical Capability Measures
- 276. Unit Capability Measures

#### Valuation

- 277. APT, BETA and CAPM
- 278. Buy versus Lease
- 279. Caps and Floors
- 280. Convertible Bonds
- 281. Financial Ratios Analysis
- 282. Financial Statements Analysis
- 283. Valuation Model
- 284. Valuation - Warrant - Combined Value
- 285. Valuation - Warrant - Put Only
- 286. Valuation - Warrant - Warrant Only

#### Value at Risk

- 287. Optimized and Simulated Portfolio VaR
- 288. Options Delta Portfolio
- 289. Portfolio Operational and Capital Adequacy
- 290. Right Tail Capital Requirements
- 291. Static Covariance Method

#### Volatility

- 292. EWMA Volatility Models
- 293. GARCH Volatility Models
- 294. Implied Volatility
- 295. Log Asset Returns Approach
- 296. Log Cash Flow Returns Approach Probability to Volatility

#### Yield Curve

- 297. CIR Model
- 298. Curve Interpolation BIM
- 299. Curve Interpolation NS
- 300. Forward Rates from Spot Rates
- 301. Spline Interpolation and Extrapolation.xls
- 302. Term Structure of Volatility
- 303. US Treasury Risk Free Rate
- 304. Vasicek Model

## List of Functions

Below is a comprehensive list of the functions in Modeling Toolkit that can be accessed either through the analytical DLL libraries or in Excel. Please keep checking back at the website for a more updated list. The software is continually evolving and newer applications and models are constantly added. Finally, the applicable Risk Simulator tools applicable when using the Modeling Toolkit are also listed at the end.

**1. B2AEPMarketValueAsset**

Market Value of Asset using the Asset-Equity Parity Model.

**2. B2AEPMarketValueDebt**

Market Value of Debt using the Asset-Equity Parity Model.

**3. B2AEPRequiredReturnDebt**

Required Return on Risky Debt using the Asset-Equity Parity Model.

**4. B2AltDistributionCallOption**

Computes the European call option for an underlying asset returns distribution with skew and kurtosis, and is not perfectly normal. May return an error for unsolvable inputs.

**5. B2AltDistributionPutOption**

Computes the European put option for an underlying asset returns distribution with skew and kurtosis, and is not perfectly normal. May return an error for unsolvable inputs.

**6. B2AnnuityRate**

Returns the percentage equivalent of the required periodic payment on an annuity (e.g., mortgage payments, loan repayment). Returns the percentage of the total principal at initiation.

**7. B2AsianCallwithArithmeticAverageRate**

An average rate option is a cash-settled option whose payoff is based on the difference between the arithmetic average value of the underlying during the life of the option and a fixed strike.

**8. B2AsianCallwithGeometricAverageRate**

An average rate option is a cash-settled option whose payoff is based on the difference between the geometric average value of the underlying during the life of the option and a fixed strike.

**9. B2AsianPutwithArithmeticAverageRate**

An average rate option is a cash-settled option whose payoff is based on the difference between a fixed strike and the arithmetic average value of the underlying during the life of the option.

**10. B2AsianPutwithGeometricAverageRate**

An average rate option is a cash-settled option whose payoff is based on the difference between a fixed strike and the geometric average value of the underlying during the life of the option.

**11. B2AssetExchangeAmericanOption**

Option holder has the right up to and including expiration to swap out Asset 2 and receive Asset 1, with predetermined quantities.

**12. B2AssetExchangeEuropeanOption**

Option holder has the right at expiration to swap out Asset 2 and receive Asset 1, with predetermined quantities.

**13. B2AssetOrNothingCall**

At expiration, if in the money, the option holder receives the stock or asset. For a call option, as long as the stock or asset price exceeds the strike at expiration, the stock is received.

**14. B2AssetOrNothingPut**

At expiration, if in the money, the option holder receives the stock or asset. For a put option, stock is received only if the stock or asset value falls below the strike price.

**15. B2BarrierDoubleUpInDownInCall**

Valuable or knocked in the money only if either barrier (upper or lower) is breached (i.e., asset value is above the upper or below the lower barriers), and the payout is in the form of a call option on the underlying asset.

**16. B2BarrierDoubleUpInDownInPut**

Valuable or knocked in the money only if either barrier (upper or lower) is breached (i.e., asset value is above the upper or below the lower barriers), and the payout is in the form of a put option on the underlying asset.

**17. B2BarrierDoubleUpOutDownOutCall**

Valuable or stays in the money only if either barrier (upper or lower barrier) is not breached, and the payout is in the form of a call option on the underlying asset.

**18. B2BarrierDoubleUpOutDownOutPut**

Valuable or stays in the money only if either barrier (upper or lower barrier) is not breached, and the payout is in the form of a put option on the underlying asset.

**19. B2BarrierDownandInCall**

Becomes valuable or knocked in the money if the lower barrier is breached, and the payout is the call option on the underlying asset. Sometimes cash is paid at maturity, assuming that the option has not been knocked in.

**20. B2BarrierDownandInPut**

Becomes valuable or knocked in the money if the lower barrier is breached, and the payout is the put option on the underlying asset. Sometimes cash is paid at maturity, assuming that the option has not been knocked in.

**21. B2BarrierDownandOutCall**

Valuable or in the money only if the lower barrier is not breached, and the payout is the call option on the underlying asset. Sometimes cash is paid at maturity, assuming that the option has not been knocked out.

**22. B2BarrierDownandOutPut**

Valuable or in the money only if the lower barrier is not breached, and the payout is the put option on the underlying asset. Sometimes cash is paid at maturity, assuming that the option has not been knocked out.

**23. B2BarrierUpandInCall**

Becomes valuable or knocked in the money if the upper barrier is breached, and the payout is the call option on the underlying asset. Sometimes cash is paid at maturity, assuming that the option has not been knocked in.

**24. B2BarrierUpandInPut**

Becomes valuable or knocked in the money if the upper barrier is breached, and the payout is the put option on the underlying asset. Sometimes cash is paid at maturity, assuming that the option has not been knocked in.

**25. B2BarrierUpandOutCall**

Valuable or in the money only if the upper barrier is not breached, and the payout is the call option on the underlying asset. Sometimes cash is paid at maturity, assuming that the option has not been knocked out.

**26. B2BarrierUpandOutPut**

Valuable or in the money only if the upper barrier is not breached, and the payout is the put option on the underlying asset. Sometimes cash is paid at maturity, assuming that the option has not been knocked out.

**27. B2BDTAmericanCallonDebtLattice**

Computes the American call option on interest-based instruments and debt or bonds, and creates the entire pricing lattice.

**28. B2BDTAmericanCallonDebtValue**

Computes the American call option value on interest-based instruments and debt or bonds, and returns only one value instead of the entire lattice.

**29. B2BDTAmericanPutonDebtLattice**

Computes the American put option on interest-based instruments and debt or bonds, and creates the entire pricing lattice.

**30. B2BDTAmericanPutonDebtValue**

Computes the American put option value on interest-based instruments and debt or bonds, and returns only one value instead of the entire lattice.

**31. B2BDTCallableDebtPriceLattice**

Computes the revised price lattice of a callable debt such that the options adjusted spread can be imputed. Allows for changing interest and interest volatilities over time.

**32. B2BDTCallableDebtPriceValue**

Computes the present value of a coupon bond/debt that is callable, to see the differences in value from a noncallable debt. The lattice can be computed using the function call: B2BDTCallableDebtPriceLattice.

**33. B2BDTCallableSpreadValue**

Computes the option adjusted spread (i.e., the additional premium that should be charged on the callable option provision).

**34. B2BDTEuropeanCallonDebtLattice**

Computes the European call option on interest-based instruments and debt or bonds, and creates the entire pricing lattice.

**35. B2BDTEuropeanCallonDebtValue**

Computes the European call option value on interest-based instruments and debt or bonds, and returns only one value instead of the entire lattice.

**36. B2BDTEuropeanPutonDebtLattice**

Computes the European put option on interest-based instruments and debt or bonds, and creates the entire pricing lattice.

**37. B2BDTEuropeanPutonDebtValue**

Computes the European put option value on interest-based instruments and debt or bonds, and returns only one value instead of the entire lattice.

**38. B2BDTFloatingCouponPriceLattice**

Value of the floater bond's lattice (coupon rate is floating and can be directly or inversely related to interest rates; e.g., rates drop, coupon increases, the bond appreciates in price, and the yield increases).

**39. B2BDTFloatingCouponPriceValue**

Value of the floater bond (coupon rate is floating and can be directly or inversely related to interest rates; e.g., rates drop, coupon increases, the bond appreciates in price, and the yield increases).

**40. B2BDTNoncallableDebtPriceLattice**

Computes the pricing lattice of a coupon bond/debt that is not callable, to see the differences in value from a callable debt.

**41. B2BDTNoncallableDebtPriceValue**

Computes the present value of a coupon bond/debt that is not callable, to see the differences in value from a callable debt.

**42. B2BDTInterestRateLattice**

Computes the short rate interest lattice based on a term structure of interest rates and changing interest volatilities, as a means to compute option values.

**43. B2BDTNonCallableSpreadValue**

Computes the straight spread on a bond that is noncallable in order to compare it with the option provision of an option adjusted spread model.

**44. B2BDTZeroPriceLattice**

Computes the straight price lattice of zero bonds based on a term structure of interest rates and changing interest volatilities, as a means to compute interest-based option values.

**45. B2BDTZeroPriceLattice2**

Computes the straight price lattice of zero bonds based on a term structure of interest rates and changing interest volatilities, as a means to compute interest-based option values. Returns the same results as the B2BDTZeroPriceLattice function but requires interest rates and interest volatilities as inputs, rather than the entire interest rate lattice.

**46. B2BDTZeroPriceValue**

Computes the straight price of zero bonds at time zero, based on a term structure of interest rates and changing interest volatilities, as a means to compute interest-based option values.

**47. B2BinaryDownAndInAssetAtExpirationOrNothing**

Binary digital instrument receiving the asset at expiration, only if a corresponding asset hits a lower barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.

**48. B2BinaryDownAndInAssetAtExpirationOrNothingCall**

Binary digital call option receiving the asset at expiration if the asset hits a lower barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.

**49. B2BinaryDownAndInAssetAtExpirationOrNothingPut**

Binary digital put option receiving the asset at expiration if the asset hits a lower barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.

**50. B2BinaryDownAndInAssetAtHitOrNothing**

Binary digital instrument receiving the asset when it hits a lower barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.

**51. B2BinaryDownAndInCashAtExpirationOrNothing**

Binary digital instrument receiving a cash amount at expiration, only if a corresponding asset hits a lower barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.

**52. B2BinaryDownAndInCashAtExpirationOrNothingCall**

Binary digital call option receiving the cash at expiration if the asset hits a lower barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.

**53. B2BinaryDownAndInCashAtExpirationOrNothingPut**

Binary digital put option receiving the cash at expiration if the asset hits a lower barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.

**54. B2BinaryDownAndInCashAtHitOrNothing**

Binary digital instrument receiving a cash amount when a corresponding asset hits a lower barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.

**55. B2BinaryDownAndOutAssetAtExpirationOrNothing**

Binary digital instrument receiving the asset at expiration, only if a corresponding asset does not hit a lower barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.

**56. B2BinaryDownAndOutAssetAtExpirationOrNothingCall**

Binary digital call options receiving the asset at expiration, only if a corresponding asset does not hit a lower barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.

**57. B2BinaryDownAndOutAssetAtExpirationOrNothingPut**

Binary digital put options receiving the asset at expiration, only if a corresponding asset does not hit a lower barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.

**58. B2BinaryDownAndOutCashAtExpirationOrNothing**

Binary digital instrument receiving a cash amount at expiration, only if a corresponding asset does not hit a lower barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.

**59. B2BinaryDownAndOutCashAtExpirationOrNothingCall**

Binary digital call option receiving a cash amount at expiration, only if a corresponding asset does not hit a lower barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.

**60. B2BinaryDownAndOutCashAtExpirationOrNothingPut**

Binary digital put option receiving a cash amount at expiration, only if a corresponding asset does not hit a lower barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.



**61. B2BinaryUpAndInAssetAtExpirationOrNothing**

Binary digital instrument receiving the asset at expiration, only if a corresponding asset hits an upper barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.

**62. B2BinaryUpAndInAssetAtExpirationOrNothingCall**

Binary digital call option receiving the asset at expiration if the asset hits an upper barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.

**63. B2BinaryUpAndInAssetAtExpirationOrNothingPut**

Binary digital put option receiving the asset at expiration if the asset hits an upper barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.

**64. B2BinaryUpAndInAssetAtHitOrNothing**

Binary digital instrument receiving the asset when it hits an upper barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.

**65. B2BinaryUpAndInCashAtExpirationOrNothing**

Binary digital instrument receiving a cash amount at expiration, only if a corresponding asset hits an upper barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.

**66. B2BinaryUpAndInCashAtExpirationOrNothingCall**

Binary digital call option receiving the cash at expiration if the asset hits an upper barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.

**67. B2BinaryUpAndInCashAtExpirationOrNothingPut**

Binary digital put option receiving the cash at expiration if the asset hits an upper barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.

**68. B2BinaryUpAndInCashAtHitOrNothing**

Binary digital instrument receiving a cash amount when a corresponding asset hits an upper barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.

**69. B2BinaryUpAndOutAssetAtExpirationOrNothing**

Binary digital instrument receiving the asset at expiration, only if a corresponding asset does not hit an upper barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.

**70. B2BinaryUpAndOutAssetAtExpirationOrNothingCall**

Binary digital call options receiving the asset at expiration, only if a corresponding asset does not hit an upper barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.

**71. B2BinaryUpAndOutAssetAtExpirationOrNothingPut**

Binary digital put options receiving the asset at expiration, only if a corresponding asset does not hit an upper barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.

**72. B2BinaryUpAndOutCashAtExpirationOrNothing**

Binary digital instrument receiving a cash amount at expiration, only if a corresponding asset does not hit an upper barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.

**73. B2BinaryUpAndOutCashAtExpirationOrNothingCall**

Binary digital call option receiving a cash amount at expiration, only if a corresponding asset does not hit an upper barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.

**74. B2BinaryUpAndOutCashAtExpirationOrNothingPut**

Binary digital put option receiving a cash amount at expiration, only if a corresponding asset does not hit an upper barrier or receives nothing otherwise. DT is monitoring steps: 1/12 monthly, 1/52 weekly, 1/250 daily, 0 continuously.

**75. B2Binomial3DAmericanDualStrikeCallOption**

Returns the American option with the payoff  $[\text{Max}(Q_2S_2 - X_2, Q_1S_1 - X_1)]$  and valued using a 3D binomial lattice model.

**76. B2Binomial3DAmericanDualStrikePutOption**

Returns the American option with the payoff  $[\text{Max}(X_2 - Q_2S_2, X_1 - Q_1S_1)]$  and valued using a 3D binomial lattice model.

**77. B2Binomial3DEuropeanDualStrikeCallOption**

Returns the European option with the payoff  $[\text{Max}(Q_2S_2 - X_2, Q_1S_1 - X_1)]$  and valued using a 3D binomial lattice model.

**78. B2Binomial3DEuropeanDualStrikePutOption**

Returns the European option with the payoff  $[\text{Max}(X_2 - Q_2S_2, X_1 - Q_1S_1)]$  and valued using a 3D binomial lattice model.

**79. B2Binomial3DAmericanExchangeOption**

Returns the American and European call and put option (same values exist for all types) with the payoff  $(Q_2S_2 - Q_1S_1)$  and valued using a 3D binomial lattice model.

**80. B2Binomial3DAmericanMaximumTwoAssetsCallOption**

Returns the American option with the payoff  $[\text{Max}(Q_2S_2, Q_1S_1) - X]$  and valued using a 3D binomial lattice model.

**81. B2Binomial3DAmericanMaximumTwoAssetsPutOption**

Returns the American option with the payoff  $[X - \text{Max}(Q_2S_2, Q_1S_1)]$  and valued using a 3D binomial lattice model.

**82. B2Binomial3DEuropeanMaximumTwoAssetsCallOption**

Returns the European option with the payoff  $[\text{Max}(Q_2S_2, Q_1S_1) - X]$  and valued using a 3D binomial lattice model.

**83. B2Binomial3DEuropeanMaximumTwoAssetsPutOption**

Returns the European option with the payoff  $[X - \text{Max}(Q_2S_2, Q_1S_1)]$  and valued using a 3D binomial lattice model.

**84. B2Binomial3DAmericanMinimumTwoAssetsCallOption**

Returns the American option with the payoff  $[\text{Min}(Q_2S_2, Q_1S_1) - X]$  and valued using a 3D binomial lattice model.

- 85. B2Binomial3DAmericanMinimumTwoAssetsPutOption**  
Returns the American option with the payoff  $[X - \min(Q_2S_2, Q_1S_1)]$  and valued using a 3D binomial lattice model.
- 86. B2Binomial3DEuropeanMinimumTwoAssetsCallOption**  
Returns the European option with the payoff  $[\min(Q_2S_2, Q_1S_1) - X]$  and valued using a 3D binomial lattice model.
- 87. B2Binomial3DEuropeanMinimumTwoAssetsPutOption**  
Returns the European option with the payoff  $[X - \min(Q_2S_2, Q_1S_1)]$  and valued using a 3D binomial lattice model.
- 88. B2Binomial3DAmericanPortfolioCallOption**  
Returns the American option with the payoff  $(Q_2S_2 + Q_1S_1 - X)$  and valued using a 3D binomial lattice model.
- 89. B2Binomial3DAmericanPortfolioPutOption**  
Returns the American option with the payoff  $(X - Q_2S_2 + Q_1S_1)$  and valued using a 3D binomial lattice model.
- 90. B2Binomial3DEuropeanPortfolioCallOption**  
Returns the European option with the payoff  $(Q_2S_2 + Q_1S_1 - X)$  and valued using a 3D binomial lattice model.
- 91. B2Binomial3DEuropeanPortfolioPutOption**  
Returns the European option with the payoff  $(X - Q_2S_2 + Q_1S_1)$  and valued using a 3D binomial lattice model.
- 92. B2Binomial3DAmericanReverseDualStrikeCallOption**  
Returns the American option with the payoff  $[\max(X_2 - Q_2S_2, Q_1S_1 - X_1)]$  and valued using a 3D binomial lattice model.
- 93. B2Binomial3DAmericanReverseDualStrikePutOption**  
Returns the American option with the payoff  $[\max(Q_2S_2 - X_2, X_1 - Q_1S_1)]$  and valued using a 3D binomial lattice model.
- 94. B2Binomial3DEuropeanReverseDualStrikeCallOption**  
Returns the European option with the payoff  $[\max(X_2 - Q_2S_2, Q_1S_1 - X_1)]$  and valued using a 3D binomial lattice model.
- 95. B2Binomial3DEuropeanReverseDualStrikePutOption**  
Returns the American option with the payoff  $[\max(Q_2S_2 - X_2, X_1 - Q_1S_1)]$  and valued using a 3D binomial lattice model.
- 96. B2Binomial3DAmericanSpreadCallOption**  
Returns the American option with the payoff  $(Q_1S_1 - Q_2S_2 - X)$  and valued using a 3D binomial lattice model.
- 97. B2Binomial3DAmericanSpreadPutOption**  
Returns the American option with the payoff  $(X + Q_2S_2 - Q_1S_1)$  and valued using a 3D binomial lattice model.
- 98. B2Binomial3DEuropeanSpreadCallOption**  
Returns the European option with the payoff  $(Q_1S_1 - Q_2S_2 - X)$  and valued using a 3D binomial lattice model.

**99. B2Binomial3DEuropeanSpreadPutOption**

Returns the European option with the payoff  $(X + Q_2S_2 - Q_1S_1)$  and valued using a 3D binomial lattice model.

**100. B2BinomialAdjustedBarrierSteps**

Computes the correct binomial lattice steps to use for convergence and barrier matching when running a barrier option.

**101. B2BinomialAmericanCall**

Returns the American call option with a continuous dividend yield using a binomial lattice, where the option can be exercised at any time up to and including maturity.

**102. B2BinomialAmericanPut**

Returns the American put option with a continuous dividend yield using a binomial lattice, where the option can be exercised at any time up to and including maturity.

**103. B2BinomialBermudanCall**

Returns the American call option with a continuous dividend yield using a binomial lattice, where the option can be exercised at any time up to and including maturity except during the vesting period.

**104. B2BinomialBermudanPut**

Returns the American put option with a continuous dividend yield using a binomial lattice, where the option can be exercised at any time up to and including maturity except during the vesting period.

**105. B2BinomialEuropeanCall**

Returns the European call option with a continuous dividend yield using a binomial lattice, where the option can be exercised only at maturity.

**106. B2BinomialEuropeanPut**

Returns the European put option with a continuous dividend yield using a binomial lattice, where the option can be exercised only at maturity.

**107. B2BlackCallOptionModel**

Returns the Black model (modified Black-Scholes-Merton) for forward contracts and interest-based call options.

**108. B2BlackPutOptionModel**

Returns the Black model (modified Black-Scholes-Merton) for forward contracts and interest-based put options.

**109. B2BlackFuturesCallOption**

Computes the value of a commodities futures call option given the value of the futures contract.

**110. B2BlackFuturesPutOption**

Computes the value of a commodities futures put option given the value of the futures contract.

**111. B2BlackScholesCall**

European call option using the Black-Scholes-Merton model.

**112. B2BlackScholesProbabilityAbove**

Computes the expected probability the stock price will rise above the strike price under a Black-Scholes paradigm.

**113. B2BlackScholesPut**

European put option using the Black-Scholes-Merton model.

**114. B2BondCIRBondDiscountFactor**

Returns the discount factor on a bond or risky debt using the Cox-Ingersoll-Ross model, accounting for mean-reverting interest rates.

**115. B2BondCIRBondPrice**

Cox-Ross model on Zero Coupon Bond Pricing assuming no arbitrage and mean-reverting interest rates.

**116. B2BondCIRBondYield**

Cox-Ross model on Zero Coupon Bond Yield assuming no arbitrage and mean-reverting interest rates.

**117. B2BondConvexityContinuous**

Returns the debt's Convexity or second order sensitivity using a series of cash flows and current interest rate, with continuous discounting.

**118. B2BondConvexityDiscrete**

Returns the debt's Convexity or second order sensitivity using a series of cash flows and current interest rate, with discrete discounting.

**119. B2BondConvexityYTMContinuous**

Returns the debt's Convexity or second order sensitivity using an internal Yield to Maturity of the cash flows, with continuous discounting.

**120. B2BondConvexityYTMDiscrete**

Returns the debt's Convexity or second order sensitivity using an internal Yield to Maturity of the cash flows, with discrete discounting.

**121. B2BondDurationContinuous**

Returns the debt's first order sensitivity Duration measure using continuous discounting.

**122. B2BondDurationDiscrete**

Returns the debt's first order sensitivity Duration measure using discrete discounting.

**123. B2BondHullWhiteBondCallOption**

Values a European call option on a bond where the interest rates are stochastic and mean-reverting. Make sure Bond Maturity > Option Maturity.

**124. B2BondHullWhiteBondPutOption**

Values a European put option on a bond where the interest rates are stochastic and mean-reverting. Make sure Bond Maturity > Option Maturity.

**125. B2BondMacaulayDuration**

Returns the debt's first order sensitivity Macaulay Duration measure.

**126. B2BondMertonBondPrice**

Bond price using Merton Stochastic Interest and Stochastic Asset Model.

**127. B2BondModifiedDuration**

Returns the debt's first order sensitivity Modified Duration measure.

**128. B2BondPriceContinuous**

Returns the bond price of a cash flow series given the time and discount rate, using continuous discounting.

**129. B2BondPriceDiscrete**

Returns the bond price of a cash flow series given the time and discount rate, using discrete discounting.

**130. B2BondVasicekBondCallOption**

Values a European call option on a bond where the interest rates are stochastic and mean-reverting to a long-term rate. Make sure Bond Maturity > Option Maturity.

**131. B2BondVasicekBondPrice**

Vasicek Zero Coupon Price assuming no arbitrage and mean-reverting interest rates.

**132. B2BondVasicekBondPutOption**

Values a European put option on a bond where the interest rates are stochastic and mean-reverting to a long-term rate. Make sure Bond Maturity > Option Maturity.

**133. B2BondVasicekBondYield**

Vasicek Zero Coupon Yield assuming no arbitrage and mean-reverting interest rates.

**134. B2BondYTMContinuous**

Returns bond's Yield to Maturity assuming continuous discounting.

**135. B2BondYTMDiscrete**

Returns bond's Yield to Maturity assuming discrete discounting.

**136. B2CallDelta**

Returns the option valuation sensitivity Delta (a call option value's sensitivity to changes in the asset value).

**137. B2CallGamma**

Returns the option valuation sensitivity Gamma (a call option value's sensitivity to changes in the Delta value).

**138. B2CallOptionOnTheMax**

The maximum values at expiration of both assets are used in option exercise, where the call option payoff at expiration is the maximum price between Asset 1 and Asset 2 against the strike price.

**139. B2CallOptionOnTheMin**

The minimum values at expiration of both assets are used in option exercise, where the call option payoff at expiration is the minimum price between Asset 1 and Asset 2 against the strike price.

**140. B2CallRho**

Returns the option valuation sensitivity Rho (a call option value's sensitivity to changes in the interest rate).

**141. B2CallTheta**

Returns the option valuation sensitivity Theta (a call option value's sensitivity to changes in the maturity).

**142. B2CallVega**

Returns the option valuation sensitivity Vega (a call option value's sensitivity to changes in the volatility).

**143. B2CashOrNothingCall**

At expiration, if the option is in the money, the option holder receives a predetermined cash payment. For a call option, as long as the stock or asset price exceeds the strike at expiration, cash is received.

**144. B2CashOrNothingPut**

At expiration, if the option is in the money, the option holder receives a predetermined cash payment. For a put option, cash is received only if the stock or asset value falls below the strike price.

**145. B2ChooserBasicOption**

Holder chooses whether the option is a call or a put by the chooser time, with the same strike price and maturity. Typically cheaper than buying a call and a put together while providing the same level of hedge.

**146. B2ChooserComplexOption**

Holder gets to choose whether the option is a call or a put within the Chooser Time, with different strike prices and maturities. Typically cheaper than buying a call and a put, while providing the same level of hedge.

**147. B2ClosedFormAmericanCall**

Returns the American option approximation model with a continuous dividend yield call option.

**148. B2ClosedFormAmericanPut**

Returns the American option approximation model with a continuous dividend yield put option.

**149. B2CoefficientofVariationPopulation**

Computes the population coefficient of variation (standard deviation of the sample divided by the mean), to obtain a relative measure of risk and dispersion.

**150. B2CoefficientofVariationSample**

Computes the sample coefficient of variation (standard deviation of the sample divided by the mean), to obtain a relative measure of risk and dispersion.

**151. B2CommodityCallOptionModel**

Computes the value of a commodity-based call option based on spot and futures market, and accounting for volatility of the forward rate.

**152. B2CommodityPutOptionModel**

Computes the value of a commodity-based put option based on spot and futures market, and accounting for volatility of the forward rate.

**153. B2CompoundOptionsCallonCall**

A compound option allowing the holder to buy (call) a call option with some maturity, in the future within the option maturity period, for a specified strike price on the option.

**154. B2CompoundOptionsCallonPut**

A compound option allowing the holder to buy (call) a put option with some maturity, in the future within the option maturity period, for a specified strike price on the option.

**155. B2CompoundOptionsPutonCall**

A compound option allowing the holder to sell (put) a call option with some maturity, in the future within the option maturity period, for a specified strike price on the option.

**156. B2CompoundOptionsPutonPut**

A compound option allowing the holder to sell (put) a put option with some maturity, in the future within the option maturity period, for a specified strike price on the option.

**157. B2ConvenienceYield**

The convenience yield is simply the rate differential between a non-arbitrage futures and spot price and a real-life fair market value of the futures price.

**158. B2ConvertibleBondAmerican**

Computes the value of an American convertible bond using binomial lattices, and accounting for the stock's volatility and dividend yield, as well as the bond's credit spread above risk-free.

**159. B2ConvertibleBondEuropean**

Computes the value of a European convertible bond using binomial lattices, and accounting for the stock's volatility and dividend yield, as well as the bond's credit spread above risk-free.

**160. B2CreditAcceptanceCost**

Computes the risk-adjusted cost of accepting a new credit line with a probability of default.

**161. B2CreditAssetSpreadCallOption**

Provides protection from an increase in spread but ceases to exist if the underlying asset defaults and the option is based on the price of the asset.

**162. B2CreditAssetSpreadPutOption**

Provides protection from a decrease in spread but ceases to exist if the underlying asset defaults and the option is based on the price of the asset.

**163. B2CreditDefaultSwapSpread**

Returns the valuation of a credit default swap (CDS) spread, allowing the holder to sell a bond/debt at par value when a credit event occurs.

**164. B2CreditDefaultSwapCorrelatedBondandSwapPrice**

Computes the valuation of a bond with a credit default swap where both parties are correlated and each has a probability of default and possible recovery rates. At default, the holder receives the notional principal or par value of the bond.

**165. B2CreditDefaultSwapCorrelatedBondPrice**

Computes the valuation of a bond without any credit default swap where the bond or debt has a probability of default and possible recovery rate.

**166. B2CreditDefaultSwapCorrelatedSwapPrice**

Computes the price of a credit default swap where both parties are correlated and each has a probability of default and possible recovery rates. At default, the holder receives the notional principal or par value of the bond.

**167. B2CreditRatingWidth**

Computes the credit ratings width to generate the credit ratings table.

**168. B2CreditRejectionCost**

Computes the risk-adjusted cost of rejecting a new credit line with a probability of default.

**169. B2CreditRiskShortfall**

Returns the Credit Risk Shortfall given probability of default and recovery rates.

**170. B2CreditSpreadCallOption**

Provides protection from an increase in spread but ceases to exist if the underlying asset defaults. Only credit default swaps can cover default events. Credit spread options (CSOs) are sometimes combined with CDSs.



**171. B2CreditSpreadPutOption**

Provides protection from a decrease in spread but ceases to exist if the underlying asset defaults. Only credit default swaps can cover default events (CSOs are sometimes combined with CDSs).

**172. B2CubicSpline**

Interpolates and extrapolates the unknown  $Y$  values (based on the required  $X$  value) given some series of known  $X$  and  $Y$  values, and can be used to interpolate inside the data sample or extrapolate outside the known sample.

**173. B2CurrencyCallOption**

Option to exchange foreign currency into domestic currency by buying domestic currency (selling foreign currency) at a set exchange rate on a specified date. Exchange rate is foreign currency to domestic currency.

**174. B2CurrencyForwardCallOption**

Computes the value of a currency forward call option.

**175. B2CurrencyForwardPutOption**

Computes the value of a currency forward put option.

**176. B2CurrencyPutOption**

Option to exchange domestic currency into foreign currency by selling domestic currency (buying foreign currency) at a set exchange rate on a specified date. Exchange rate is foreign currency to domestic currency.

**177. B2DeltaGammaHedgeCallBought**

Computes the total amount of call values that has to be bought to perform a Delta-Gamma neutral hedge. Returns a negative value indicating cash outflow.

**178. B2DeltaGammaHedgeCallSold**

Computes the single unit of call value that has to be sold to perform a Delta-Gamma neutral hedge. Returns a positive value indicating cash inflow.

**179. B2DeltaGammaHedgeMoneyBorrowed**

Computes the amount of money that has to be borrowed to perform a Delta-Gamma neutral hedge. Returns a positive value indicating cash inflow.

**180. B2DeltaGammaHedgeSharesBought**

Computes the total value of stocks that have to be bought to perform a Delta-Gamma neutral hedge. Returns a negative value indicating cash outflow.

**181. B2DeltaHedgeCallSold**

Computes the single unit of call value that has to be sold to perform a Delta-neutral hedge. Returns a positive value indicating cash inflow.

**182. B2DeltaHedgeMoneyBorrowed**

Computes the amount of money that has to be borrowed to perform a Delta-neutral hedge. Returns a positive value indicating cash inflow.

**183. B2DeltaHedgeSharesBought**

Computes the total value of stocks that have to be bought to perform a Delta-neutral hedge. Returns a negative value indicating cash outflow.

**184. B2DistributionBernoulliKurtosis**

Returns the Bernoulli distribution's theoretical excess kurtosis (fourth moment), measuring the peakedness of the distribution and its extreme tail events. An excess kurtosis of 0 implies a normal tail.

**185. B2DistributionBernoulliMean**

Returns the Bernoulli distribution's theoretical mean or expected value (first moment), measuring the central tendency of the distribution.

**186. B2DistributionBernoulliSkew**

Returns the Bernoulli distribution's theoretical skew (third moment), measuring the direction of the distribution's tail. Positive skew means average exceeds median and the tail points to the right, whereas negative skew means average is less than median and the tail points to the left.

**187. B2DistributionBernoulliStdev**

Returns the Bernoulli distribution's theoretical standard deviation (second moment), measuring the width and average dispersion of all points around the mean.

**188. B2DistributionBetaKurtosis**

Returns the Beta distribution's theoretical excess kurtosis (fourth moment), measuring the peakedness of the distribution and its extreme tail events. An excess kurtosis of 0 implies a normal tail.

**189. B2DistributionBetaMean**

Returns the Beta distribution's theoretical mean or expected value (first moment), measuring the central tendency of the distribution.

**190. B2DistributionBetaSkew**

Returns the Beta distribution's theoretical skew (third moment), measuring the direction of the distribution's tail. Positive skew means average exceeds median and the tail points to the right, whereas negative skew means average is less than median and the tail points to the left.

**191. B2DistributionBetaStdev**

Returns the Beta distribution's theoretical standard deviation (second moment), measuring the width and average dispersion of all points around the mean.

**192. B2DistributionBinomialKurtosis**

Returns the Binomial distribution's theoretical excess kurtosis (fourth moment), measuring the peakedness of the distribution and its extreme tail events. An excess kurtosis of 0 implies a normal tail.

**193. B2DistributionBinomialMean**

Returns the Binomial distribution's theoretical mean or expected value (first moment), measuring the central tendency of the distribution.

**194. B2DistributionBinomialSkew**

Returns the Binomial distribution's theoretical skew (third moment), measuring the direction of the distribution's tail. Positive skew means average exceeds median and the tail points to the right, whereas negative skew means average is less than median and the tail points to the left.

**195. B2DistributionBinomialStdev**

Returns the Binomial distribution's theoretical standard deviation (second moment), measuring the width and average dispersion of all points around the mean.

**196. B2DistributionCauchyKurtosis**

Returns the Cauchy distribution's theoretical excess kurtosis (fourth moment), measuring the peakedness of the distribution and its extreme tail events. An excess kurtosis of 0 implies a normal tail.

**197. B2DistributionCauchyMean**

Returns the Cauchy distribution's theoretical mean or expected value (first moment), measuring the central tendency of the distribution.

**198. B2DistributionCauchySkew**

Returns the Cauchy distribution's theoretical skew (third moment), measuring the direction of the distribution's tail. Positive skew means average exceeds median and the tail points to the right, whereas negative skew means average is less than median and tail points to left.

**199. B2DistributionCauchyStdev**

Returns the Cauchy distribution's theoretical standard deviation (second moment), measuring the width and average dispersion of all points around the mean.

**200. B2DistributionChiSquareKurtosis**

Returns the Chi-Square distribution's theoretical excess kurtosis (fourth moment), measuring the peakedness of the distribution and its extreme tail events. An excess kurtosis of 0 implies a normal tail.

**201. B2DistributionChiSquareMean**

Returns the Chi-Square distribution's theoretical mean or expected value (first moment), measuring the central tendency of the distribution.

**202. B2DistributionChiSquareSkew**

Returns the Chi-Square distribution's theoretical skew (third moment), measuring the direction of the distribution's tail. Positive skew means average exceeds median and the tail points to the right, whereas negative skew means average is less than median and tail points to left.

**203. B2DistributionChiSquareStdev**

Returns the Chi-Square distribution's theoretical standard deviation (second moment), measuring the width and average dispersion of all points around the mean.

**204. B2DistributionDiscreteUniformKurtosis**

Returns the Discrete Uniform distribution's theoretical excess kurtosis (fourth moment), measuring the peakedness of the distribution and its extreme tail events. An excess kurtosis of 0 implies a normal tail.

**205. B2DistributionDiscreteUniformMean**

Returns the Discrete Uniform distribution's theoretical mean or expected value (first moment), measuring the central tendency of the distribution.

**206. B2DistributionDiscreteUniformSkew**

Returns the Discrete Uniform distribution's theoretical skew (third moment), measuring the direction of the distribution's tail. Positive skew means average exceeds median and the tail points to the right, whereas negative skew means average is less than median and tail points to left.

**207. B2DistributionDiscreteUniformStdev**

Returns the Discrete Uniform distribution's theoretical standard deviation (second moment), measuring the width and average dispersion of all points around the mean.

**208. B2DistributionExponentialKurtosis**

Returns the Exponential distribution's theoretical excess kurtosis (fourth moment), measuring the peakedness of the distribution and its extreme tail events. An excess kurtosis of 0 implies a normal tail.

**209. B2DistributionExponentialMean**

Returns the Exponential distribution's theoretical mean or expected value (first moment), measuring the central tendency of the distribution.

**210. B2DistributionExponentialSkew**

Returns the Exponential distribution's theoretical skew (third moment), measuring the direction of the distribution's tail. Positive skew means average exceeds median and the tail points to the right, whereas negative skew means average is less than median and tail points to left.

**211. B2DistributionExponentialStdev**

Returns the Exponential distribution's theoretical standard deviation (second moment), measuring the width and average dispersion of all points around the mean.

**212. B2DistributionFKurtosis**

Returns the F distribution's theoretical excess kurtosis (fourth moment), measuring the peakedness of the distribution and its extreme tail events. An excess kurtosis of 0 implies a normal tail.

**213. B2DistributionFMean**

Returns the F distribution's theoretical mean or expected value (first moment), measuring the central tendency of the distribution.

**214. B2DistributionFSkew**

Returns the F distribution's theoretical skew (third moment), measuring the direction of the distribution's tail. Positive skew means average exceeds median and the tail points to the right, whereas negative skew means average is less than median and tail points to left.

**215. B2DistributionFStdev**

Returns the F distribution's theoretical standard deviation (second moment), measuring the width and average dispersion of all points around the mean.

**216. B2DistributionGammaKurtosis**

Returns the Gamma distribution's theoretical excess kurtosis (fourth moment), measuring the peakedness of the distribution and its extreme tail events. An excess kurtosis of 0 implies a normal tail.

**217. B2DistributionGammaMean**

Returns the Gamma distribution's theoretical mean or expected value (first moment), measuring the central tendency of the distribution.

**218. B2DistributionGammaSkew**

Returns the Gamma distribution's theoretical skew (third moment), measuring the direction of the distribution's tail. Positive skew means average exceeds median and the tail points to the right, whereas negative skew means average is less than median and tail points to left.

**219. B2DistributionGammaStdev**

Returns the Gamma distribution's theoretical standard deviation (second moment), measuring the width and average dispersion of all points around the mean.

**220. B2DistributionGeometricKurtosis**

Returns the Geometric distribution's theoretical excess kurtosis (fourth moment), measuring the peakedness of the distribution and its extreme tail events. An excess kurtosis of 0 implies a normal tail.

**221. B2DistributionGeometricMean**

Returns the Geometric distribution's theoretical mean or expected value (first moment), measuring the central tendency of the distribution.

**222. B2DistributionGeometricSkew**

Returns the Geometric distribution's theoretical skew (third moment), measuring the direction of the distribution's tail. Positive (negative) skew means average exceeds (is less than) median and the tail points to the right (left).

**223. B2DistributionGeometricStdev**

Returns the Geometric distribution's theoretical standard deviation (second moment), measuring the width and average dispersion of all points around the mean.

**224. B2DistributionGumbelMaxKurtosis**

Returns the Gumbel Max distribution's theoretical excess kurtosis (fourth moment), measuring the peakedness of the distribution and its extreme tail events. An excess kurtosis of 0 implies a normal tail.

**225. B2DistributionGumbelMaxMean**

Returns the Gumbel Max distribution's theoretical mean or expected value (first moment), measuring the central tendency of the distribution.

**226. B2DistributionGumbelMaxSkew**

Returns the Gumbel Max distribution's theoretical skew (third moment), measuring the direction of the distribution's tail. Positive (negative) skew means average exceeds (is less than) median and the tail points to the right (left).

**227. B2DistributionGumbelMaxStdev**

Returns the Gumbel Max distribution's theoretical standard deviation (second moment), measuring the width and average dispersion of all points around the mean.

**228. B2DistributionGumbelMinKurtosis**

Returns the Gumbel Min distribution's theoretical excess kurtosis (fourth moment), measuring the peakedness of the distribution and its extreme tail events. An excess kurtosis of 0 implies a normal tail.

**229. B2DistributionGumbelMinMean**

Returns the Gumbel Min distribution's theoretical mean or expected value (first moment), measuring the central tendency of the distribution.

**230. B2DistributionGumbelMinSkew**

Returns the Gumbel Min distribution's theoretical skew (third moment), measuring the direction of the distribution's tail. Positive (negative) skew means average exceeds (is less than) median and the tail points to the right (left).

**231. B2DistributionGumbelMinStdev**

Returns the Gumbel Min distribution's theoretical standard deviation (second moment), measuring the width and average dispersion of all points around the mean.

**232. B2DistributionHypergeometricKurtosis**

Returns the Hypergeometric distribution's theoretical excess kurtosis (fourth moment), measuring the peakedness of the distribution and its extreme tail events. An excess kurtosis of 0 implies a normal tail.

**233. B2DistributionHypergeometricMean**

Returns the Hypergeometric distribution's theoretical mean or expected value (first moment), measuring the central tendency of the distribution.

**234. B2DistributionHypergeometricSkew**

Returns the Hypergeometric distribution's theoretical skew (third moment), measuring the direction of the distribution's tail. Positive (negative) skew means average exceeds (is less than) median and the tail points to the right (left).

**235. B2DistributionHypergeometricStdev**

Returns the Hypergeometric distribution's theoretical standard deviation (second moment), measuring the width and average dispersion of all points around the mean.

**236. B2DistributionLogisticKurtosis**

Returns the Logistic distribution's theoretical excess kurtosis (fourth moment), measuring the peakedness of the distribution and its extreme tail events. An excess kurtosis of 0 implies a normal tail.

**237. B2DistributionLogisticMean**

Returns the Logistic distribution's theoretical mean or expected value (first moment), measuring the central tendency of the distribution.

**238. B2DistributionLogisticSkew**

Returns the Logistic distribution's theoretical skew (third moment), measuring the direction of the distribution's tail. Positive (negative) skew means average exceeds (is less than) median and the tail points to the right (left).

**239. B2DistributionLogisticStdev**

Returns the Logistic distribution's theoretical standard deviation (second moment), measuring the width and average dispersion of all points around the mean.

**240. B2DistributionLognormalKurtosis**

Returns the Lognormal distribution's theoretical excess kurtosis (fourth moment), measuring the peakedness of the distribution and its extreme tail events. An excess kurtosis of 0 implies a normal tail.

**241. B2DistributionLognormalMean**

Returns the Lognormal distribution's theoretical mean or expected value (first moment), measuring the central tendency of the distribution.

**242. B2DistributionLognormalSkew**

Returns the Lognormal distribution's theoretical skew (third moment), measuring the direction of the distribution's tail. Positive (negative) skew means average exceeds (is less than) median and the tail points to the right (left).

**243. B2DistributionLognormalStdev**

Returns the Lognormal distribution's theoretical standard deviation (second moment), measuring the width and average dispersion of all points around the mean.

**244. B2DistributionNegativeBinomialKurtosis**

Returns the Negative Binomial distribution's theoretical excess kurtosis (fourth moment), measuring the peakedness of the distribution and its extreme tail events. An excess kurtosis of 0 implies a normal tail.

**245. B2DistributionNegativeBinomialMean**

Returns the Negative Binomial distribution's theoretical mean or expected value (first moment), measuring the central tendency of the distribution.

**246. B2DistributionNegativeBinomialSkew**

Returns the Negative Binomial distribution's theoretical skew (third moment), measuring the direction of the distribution's tail. Positive (negative) skew means average exceeds (is less than) median and the tail points to the right (left).

**247. B2DistributionNegativeBinomialStdev**

Returns the Negative Binomial distribution's theoretical standard deviation (second moment), measuring the width and average dispersion of all points around the mean.

**248. B2DistributionNormalKurtosis**

Returns the Normal distribution's theoretical excess kurtosis (fourth moment), measuring the peakedness of the distribution and its extreme tail events. An excess kurtosis of 0 implies a normal tail.

**249. B2DistributionNormalMean**

Returns the Normal distribution's theoretical mean or expected value (first moment), measuring the central tendency of the distribution.

**250. B2DistributionNormalSkew**

Returns the Normal distribution's theoretical skew (third moment), measuring the direction of the distribution's tail. Positive (negative) skew means average exceeds (is less than) median and the tail points to the right (left).

**251. B2DistributionNormalStdev**

Returns the Normal distribution's theoretical standard deviation (second moment), measuring the width and average dispersion of all points around the mean.

**252. B2DistributionParetoKurtosis**

Returns the Pareto distribution's theoretical excess kurtosis (fourth moment), measuring the peakedness of the distribution and its extreme tail events. An excess kurtosis of 0 implies a normal tail.

**253. B2DistributionParetoMean**

Returns the Pareto distribution's theoretical mean or expected value (first moment), measuring the central tendency of the distribution.

**254. B2DistributionParetoSkew**

Returns the Pareto distribution's theoretical skew (third moment), measuring the direction of the distribution's tail. Positive (negative) skew means average exceeds (is less than) median and the tail points to the right (left).

**255. B2DistributionParetoStdev**

Returns the Pareto distribution's theoretical standard deviation (second moment), measuring the width and average dispersion of all points around the mean.

**256. B2DistributionPoissonKurtosis**

Returns the Poisson distribution's theoretical excess kurtosis (fourth moment), measuring the peakedness of the distribution and its extreme tail events. An excess kurtosis of 0 implies a normal tail.

**257. B2DistributionPoissonMean**

Returns the Poisson distribution's theoretical mean or expected value (first moment), measuring the central tendency of the distribution.

**258. B2DistributionPoissonSkew**

Returns the Poisson distribution's theoretical skew (third moment), measuring the direction of the distribution's tail. Positive (negative) skew means average exceeds (is less than) median and the tail points to the right (left).

**259. B2DistributionPoissonStdev**

Returns the Poisson distribution's theoretical standard deviation (second moment), measuring the width and average dispersion of all points around the mean.

**260. B2DistributionRayleighKurtosis**

Returns the Rayleigh distribution's theoretical excess kurtosis (fourth moment), measuring the peakedness of the distribution and its extreme tail events. An excess kurtosis of 0 implies a normal tail.

**261. B2DistributionRayleighMean**

Returns the Rayleigh distribution's theoretical mean or expected value (first moment), measuring the central tendency of the distribution.

**262. B2DistributionRayleighSkew**

Returns the Rayleigh distribution's theoretical skew (third moment), measuring the direction of the distribution's tail. Positive (negative) skew means average exceeds (is less than) median and the tail points to the right (left).

**263. B2DistributionRayleighStdev**

Returns the Rayleigh distribution's theoretical standard deviation (second moment), measuring the width and average dispersion of all points around the mean.

**264. B2DistributionTKurtosis**

Returns the Student's T distribution's theoretical excess kurtosis (fourth moment), measuring the peakedness of the distribution and its extreme tail events. An excess kurtosis of 0 implies a normal tail.

**265. B2DistributionTMean**

Returns the Student's T distribution's theoretical mean or expected value (first moment), measuring the central tendency of the distribution.

**266. B2DistributionTSkew**

Returns the Student's T distribution's theoretical skew (third moment), measuring the direction of the distribution's tail. Positive (negative) skew means average exceeds (is less than) median and the tail points to the right (left).

**267. B2DistributionTStdev**

Returns the Student's T distribution's theoretical standard deviation (second moment), measuring the width and average dispersion of all points around the mean.



**268. B2DistributionTriangularKurtosis**

Returns the Triangular distribution's theoretical excess kurtosis (fourth moment), measuring the peakedness of the distribution and its extreme tail events. An excess kurtosis of 0 implies a normal tail.

**269. B2DistributionTriangularMean**

Returns the Triangular distribution's theoretical mean or expected value (first moment), measuring the central tendency of the distribution.

**270. B2DistributionTriangularSkew**

Returns the Triangular distribution's theoretical skew (third moment), measuring the direction of the distribution's tail. Positive (negative) skew means average exceeds (is less than) median and the tail points to the right (left).

**271. B2DistributionTriangularStdev**

Returns the Triangular distribution's theoretical standard deviation (second moment), measuring the width and average dispersion of all points around the mean.

**272. B2DistributionUniformKurtosis**

Returns the Uniform distribution's theoretical excess kurtosis (fourth moment), measuring the peakedness of the distribution and its extreme tail events. An excess kurtosis of 0 implies a normal tail.

**273. B2DistributionUniformMean**

Returns the Uniform distribution's theoretical mean or expected value (first moment), measuring the central tendency of the distribution.

**274. B2DistributionUniformSkew**

Returns the Uniform distribution's theoretical skew (third moment), measuring the direction of the distribution's tail. Positive (negative) skew means average exceeds (is less than) median and the tail points to the right (left).

**275. B2DistributionUniformStdev**

Returns the Uniform distribution's theoretical standard deviation (second moment), measuring the width and average dispersion of all points around the mean.

**276. B2DistributionWeibullKurtosis**

Returns the Weibull distribution's theoretical excess kurtosis (fourth moment), measuring the peakedness of the distribution and its extreme tail events. An excess kurtosis of 0 implies a normal tail.

**277. B2DistributionWeibullMean**

Returns the Weibull distribution's theoretical mean or expected value (first moment), measuring the central tendency of the distribution.

**278. B2DistributionWeibullSkew**

Returns the Weibull distribution's theoretical skew (third moment), measuring the direction of the distribution's tail. Positive (negative) skew means average exceeds (is less than) median and the tail points to the right (left).

**279. B2DistributionWeibullStdev**

Returns the Weibull distribution's theoretical standard deviation (second moment), measuring the width and average dispersion of all points around the mean.

**280. B2DistributionCDFBernoulli**

Computes the Bernoulli distribution's theoretical Cumulative Distribution Function (CDF)—that is, the cumulative probability of the distribution at all points less than or equal to  $X$ .

**281. B2DistributionCDFBeta**

Computes the Beta distribution's theoretical Cumulative Distribution Function (CDF)—that is, the cumulative probability of the distribution at all points less than or equal to  $X$ .

**282. B2DistributionCDFBinomial**

Computes the Binomial distribution's theoretical Cumulative Distribution Function (CDF)—that is, the cumulative probability of the distribution at all points less than or equal to  $X$ .

**283. B2DistributionCDFChiSquare**

Computes the Chi-Square distribution's theoretical Cumulative Distribution Function (CDF)—that is, the cumulative probability of the distribution at all points less than or equal to  $X$ .

**284. B2DistributionCDFDiscreteUniform**

Computes the Discrete Uniform distribution's theoretical Cumulative Distribution Function (CDF)—that is, the cumulative probability of the distribution at all points less than or equal to  $X$ .

**285. B2DistributionCDFExponential**

Computes the Exponential distribution's theoretical Cumulative Distribution Function (CDF)—that is, the cumulative probability of the distribution at all points less than or equal to  $X$ .

**286. B2DistributionCDFFDist**

Computes the F distribution's theoretical Cumulative Distribution Function (CDF)—that is, the cumulative probability of the distribution at all points less than or equal to  $X$ .

**287. B2DistributionCDFGamma**

Computes the Gamma distribution's theoretical Cumulative Distribution Function (CDF)—that is, the cumulative probability of the distribution at all points less than or equal to  $X$ .

**288. B2DistributionCDFGeometric**

Computes the Geometric distribution's theoretical Cumulative Distribution Function (CDF)—that is, the cumulative probability of the distribution at all points less than or equal to  $X$ .

**289. B2DistributionCDFGumbelMax**

Computes the Gumbel Max distribution's theoretical Cumulative Distribution Function (CDF)—that is, the cumulative probability of the distribution at all points less than or equal to  $X$ .

**290. B2DistributionCDFGumbelMin**

Computes the Gumbel Min distribution's theoretical Cumulative Distribution Function (CDF)—that is, the cumulative probability of the distribution at all points less than or equal to  $X$ .

**291. B2DistributionCDFLogistic**

Computes the Logistic distribution's theoretical Cumulative Distribution Function (CDF)—that is, the cumulative probability of the distribution at all points less than or equal to  $X$ .

**292. B2DistributionCDFLognormal**

Computes the Lognormal distribution's theoretical Cumulative Distribution Function (CDF)—that is, the cumulative probability of the distribution at all points less than or equal to  $X$ .

**293. B2DistributionCDFNormal**

Computes the Normal distribution's theoretical Cumulative Distribution Function (CDF)—that is, the cumulative probability of the distribution at all points less than or equal to  $X$ .

**294. B2DistributionCDFPareto**

Computes the Pareto distribution's theoretical Cumulative Distribution Function (CDF)—that is, the cumulative probability of the distribution at all points less than or equal to  $X$ .

**295. B2DistributionCDFPoisson**

Computes the Poisson distribution's theoretical Cumulative Distribution Function (CDF)—that is, the cumulative probability of the distribution at all points less than or equal to  $X$ .

**296. B2DistributionCDFRayleigh**

Computes the Rayleigh distribution's theoretical Cumulative Distribution Function (CDF)—that is, the cumulative probability of the distribution at all points less than or equal to  $X$ .

**297. B2DistributionCDFStandardNormal**

Computes the Standard Normal distribution's theoretical Cumulative Distribution Function (CDF)—that is, the cumulative probability of the distribution at all points less than or equal to  $X$ .

**298. B2DistributionCDFTDist**

Computes the Student's T distribution's theoretical Cumulative Distribution Function (CDF)—that is, the cumulative probability of the distribution at all points less than or equal to  $X$ .

**299. B2DistributionCDFTriangular**

Computes the Triangular distribution's theoretical Cumulative Distribution Function (CDF)—that is, the cumulative probability of the distribution at all points less than or equal to  $X$ .

**300. B2DistributionCDFUniform**

Computes the Uniform distribution's theoretical Cumulative Distribution Function (CDF)—that is, the cumulative probability of the distribution at all points less than or equal to  $X$ .

**301. B2DistributionCDFWeibull**

Computes the Weibull distribution's theoretical Cumulative Distribution Function (CDF)—that is, the cumulative probability of the distribution at all points less than or equal to  $X$ .

**302. B2DistributionICDFBernoulli**

Computes the Bernoulli distribution's theoretical Inverse Cumulative Distribution Function (ICDF); that is, given the cumulative probability between 0 and 1 and the distribution's parameters, the function returns the relevant  $X$  value.

**303. B2DistributionICDFBeta**

Computes the Beta distribution's theoretical Inverse Cumulative Distribution Function (ICDF); that is, given the cumulative probability between 0 and 1 and the distribution's parameters, the function returns the relevant  $X$  value.

**304. B2DistributionICDFBinomial**

Computes the Binomial distribution's theoretical Inverse Cumulative Distribution Function (ICDF); that is, given the cumulative probability between 0 and 1 and the distribution's parameters, the function returns the relevant  $X$  value.

**305. B2DistributionICDFChiSquare**

Computes the Chi-Square distribution's theoretical Inverse Cumulative Distribution Function (ICDF); that is, given the cumulative probability between 0 and 1 and the distribution's parameters, the function returns the relevant  $X$  value.

**306. B2DistributionICDFDiscreteUniform**

Computes the Discrete Uniform distribution's theoretical Inverse Cumulative Distribution Function (ICDF); that is, given the cumulative probability between 0 and 1 and the distribution's parameters, the function returns the relevant  $X$  value.

**307. B2DistributionICDFExponential**

Computes the Exponential distribution's theoretical Inverse Cumulative Distribution Function (ICDF); that is, given the cumulative probability between 0 and 1 and the distribution's parameters, the function returns the relevant  $X$  value.

**308. B2DistributionICDFFDist**

Computes the F distribution's theoretical Inverse Cumulative Distribution Function (ICDF); that is, given the cumulative probability between 0 and 1 and the distribution's parameters, the function returns the relevant  $X$  value.

**309. B2DistributionICDFGamma**

Computes the Gamma distribution's theoretical Inverse Cumulative Distribution Function (ICDF); that is, given the cumulative probability between 0 and 1 and the distribution's parameters, the function returns the relevant  $X$  value.

**310. B2DistributionICDFGeometric**

Computes the Geometric distribution's theoretical Inverse Cumulative Distribution Function (ICDF); that is, given the cumulative probability between 0 and 1 and the distribution's parameters, the function returns the relevant  $X$  value.

**311. B2DistributionICDFGumbelMax**

Computes the Gumbel Max distribution's theoretical Inverse Cumulative Distribution Function (ICDF); that is, given the cumulative probability between 0 and 1 and the distribution's parameters, the function returns the relevant  $X$  value.

**312. B2DistributionICDFGumbelMin**

Computes the Gumbel Min distribution's theoretical Inverse Cumulative Distribution Function (ICDF); that is, given the cumulative probability between 0 and 1 and the distribution's parameters, the function returns the relevant  $X$  value.

**313. B2DistributionICDFLogistic**

Computes the Logistic distribution's theoretical Inverse Cumulative Distribution Function (ICDF); that is, given the cumulative probability between 0 and 1 and the distribution's parameters, the function returns the relevant  $X$  value.

**314. B2DistributionICDFLognormal**

Computes the Lognormal distribution's theoretical Inverse Cumulative Distribution Function (ICDF); that is, given the cumulative probability between 0 and 1 and the distribution's parameters, the function returns the relevant  $X$  value.

**315. B2DistributionICDFNormal**

Computes the Normal distribution's theoretical Inverse Cumulative Distribution Function (ICDF); that is, given the cumulative probability between 0 and 1 and the distribution's parameters, the function returns the relevant  $X$  value.

**316. B2DistributionICDFPareto**

Computes the Pareto distribution's theoretical Inverse Cumulative Distribution Function (ICDF); that is, given the cumulative probability between 0 and 1 and the distribution's parameters, the function returns the relevant  $X$  value.

**317. B2DistributionICDFPoisson**

Computes the Poisson distribution's theoretical Inverse Cumulative Distribution Function (ICDF); that is, given the cumulative probability between 0 and 1 and the distribution's parameters, the function returns the relevant  $X$  value.

**318. B2DistributionICDFRayleigh**

Computes the Rayleigh distribution's theoretical Inverse Cumulative Distribution Function (ICDF); that is, given the cumulative probability between 0 and 1 and the distribution's parameters, the function returns the relevant  $X$  value.

**319. B2DistributionICDFStandardNormal**

Computes the Standard Normal distribution's theoretical Inverse Cumulative Distribution Function (ICDF); that is, given the cumulative probability between 0 and 1 and the distribution's parameters, the function returns the relevant  $X$  value.

**320. B2DistributionICDFTDist**

Computes the Student's T distribution's theoretical Inverse Cumulative Distribution Function (ICDF); that is, given the cumulative probability between 0 and 1 and the distribution's parameters, the function returns the relevant  $X$  value.

**321. B2DistributionICDFTriangular**

Computes the Triangular distribution's theoretical Inverse Cumulative Distribution Function (ICDF); that is, given the cumulative probability between 0 and 1 and the distribution's parameters, the function returns the relevant  $X$  value.

**322. B2DistributionICDFUniform**

Computes the Uniform distribution's theoretical Inverse Cumulative Distribution Function (ICDF); that is, given the cumulative probability between 0 and 1 and the distribution's parameters, the function returns the relevant  $X$  value.

**323. B2DistributionICDFWeibull**

Computes the Weibull distribution's theoretical Inverse Cumulative Distribution Function (ICDF); that is, given the cumulative probability between 0 and 1 and the distribution's parameters, the function returns the relevant  $X$  value.

**324. B2DistributionPDFBernoulli**

Computes the Bernoulli distribution's theoretical Probability Density Function (PDF). The PDF of a discrete distribution returns the exact probability mass function or probability of occurrence, but the PDFs of continuous distributions are only theoretical values and not exact probabilities.

**325. B2DistributionPDFBeta**

Computes the Beta distribution's theoretical Probability Density Function (PDF). The PDF of a discrete distribution returns the exact probability mass function or probability of occurrence, but the PDFs of continuous distributions are only theoretical values and not exact probabilities.

**326. B2DistributionPDFBinomial**

Computes the Binomial distribution's theoretical Probability Density Function (PDF). The PDF of a discrete distribution returns the exact probability mass function or probability of occurrence, but the PDFs of continuous distributions are only theoretical values and not exact probabilities.

**327. B2DistributionPDFChiSquare**

Computes the Chi-Square distribution's theoretical Probability Density Function (PDF). The PDF of a discrete distribution returns the exact probability mass function or probability of occurrence, but the PDFs of continuous distributions are only theoretical values and not exact probabilities.

**328. B2DistributionPDFDiscreteUniform**

Computes the Discrete Uniform distribution's theoretical Probability Density Function (PDF). The PDF of a discrete distribution returns the exact probability mass function or probability of occurrence, but the PDFs of continuous distributions are only theoretical values and not exact probabilities.

**329. B2DistributionPDFExponential**

Computes the Exponential distribution's theoretical Probability Density Function (PDF). The PDF of a discrete distribution returns the exact probability mass function or probability of occurrence, but the PDFs of continuous distributions are only theoretical values and not exact probabilities.

**330. B2DistributionPDFFDist**

Computes the F distribution's theoretical Probability Density Function (PDF). The PDF of a discrete distribution returns the exact probability mass function or probability of occurrence, but the PDFs of continuous distributions are only theoretical values and not exact probabilities.

**331. B2DistributionPDFGamma**

Computes the Gamma distribution's theoretical Probability Density Function (PDF). The PDF of a discrete distribution returns the exact probability mass function or probability of occurrence, but the PDFs of continuous distributions are only theoretical values and not exact probabilities.

**332. B2DistributionPDFGeometric**

Computes the Geometric distribution's theoretical Probability Density Function (PDF). The PDF of a discrete distribution returns the exact probability mass function or probability of occurrence, but the PDFs of continuous distributions are only theoretical values and not exact probabilities.

**333. B2DistributionPDFGumbelMax**

Computes the Gumbel Max distribution's theoretical Probability Density Function (PDF). The PDF of a discrete distribution returns the exact probability mass function or probability of occurrence, but the PDFs of continuous distributions are only theoretical values and not exact probabilities.

**334. B2DistributionPDFGumbelMin**

Computes the Gumbel Min distribution's theoretical Probability Density Function (PDF). The PDF of a discrete distribution returns the exact probability mass function or probability of occurrence, but the PDFs of continuous distributions are only theoretical values and not exact probabilities.

**335. B2DistributionPDFLogistic**

Computes the Logistic distribution's theoretical Probability Density Function (PDF). The PDF of a discrete distribution returns the exact probability mass function or probability of occurrence, but the PDFs of continuous distributions are only theoretical values and not exact probabilities.

**336. B2DistributionPDFLognormal**

Computes the Lognormal distribution's theoretical Probability Density Function (PDF). The PDF of a discrete distribution returns the exact probability mass function or probability of occurrence, but the PDFs of continuous distributions are only theoretical values and not exact probabilities.

**337. B2DistributionPDFNormal**

Computes the Normal distribution's theoretical Probability Density Function (PDF). The PDF of a discrete distribution returns the exact probability mass function or probability of occurrence, but the PDFs of continuous distributions are only theoretical values and not exact probabilities.

**338. B2DistributionPDFPareto**

Computes the Pareto distribution's theoretical Probability Density Function (PDF). The PDF of a discrete distribution returns the exact probability mass function or probability of occurrence, but the PDFs of continuous distributions are only theoretical values and not exact probabilities.

**339. B2DistributionPDFPoisson**

Computes the Poisson distribution's theoretical Probability Density Function (PDF). The PDF of a discrete distribution returns the exact probability mass function or probability of occurrence, but the PDFs of continuous distributions are only theoretical values and not exact probabilities.

**340. B2DistributionPDFRayleigh**

Computes the Rayleigh distribution's theoretical Probability Density Function (PDF). The PDF of a discrete distribution returns the exact probability mass function or probability of occurrence, but the PDFs of continuous distributions are only theoretical values and not exact probabilities.

**341. B2DistributionPDFStandardNormal**

Computes the Standard Normal distribution's theoretical Probability Density Function (PDF). The PDF of a discrete distribution returns the exact probability mass function or probability of occurrence, but the PDFs of continuous distributions are only theoretical values and not exact probabilities.

**342. B2DistributionPDFTDist**

Computes the Student's T distribution's theoretical Probability Density Function (PDF). The PDF of a discrete distribution returns the exact probability mass function or probability of occurrence, but the PDFs of continuous distributions are only theoretical values and not exact probabilities.

**343. B2DistributionPDFTriangular**

Computes the Triangular distribution's theoretical Probability Density Function (PDF). The PDF of a discrete distribution returns the exact probability mass function or probability of occurrence, but the PDFs of continuous distributions are only theoretical values and not exact probabilities.

**344. B2DistributionPDFUniform**

Computes the Uniform distribution's theoretical Probability Density Function (PDF). The PDF of a discrete distribution returns the exact probability mass function or probability of occurrence, but the PDFs of continuous distributions are only theoretical values and not exact probabilities.

**345. B2DistributionPDFWeibull**

Computes the Weibull distribution's theoretical Probability Density Function (PDF). The PDF of a discrete distribution returns the exact probability mass function or probability of occurrence, but the PDFs of continuous distributions are only theoretical values and not exact probabilities.

**346. B2EquityLinkedFXCallOptionDomesticValue**

Call options whose underlying asset is in a foreign equity market, and the fluctuations of the foreign exchange risk are hedged by having a strike price on the foreign exchange rate. Resulting valuation is in the domestic currency.

**347. B2EquityLinkedFXPutOptionDomesticValue**

Put options whose underlying asset is in a foreign equity market, and the fluctuations of the foreign exchange risk are hedged by having a strike price on the foreign exchange rate. Resulting valuation is in the domestic currency.

**348. B2EWMAVolatilityForecastGivenPastPrices**

Computes the annualized volatility forecast of the next period, given a series of historical prices and the corresponding weights placed on the previous volatility estimate.

**349. B2EWMAVolatilityForecastGivenPastVolatility**

Computes the annualized volatility forecast of the next period given the previous period's volatility and changes in stock returns in the previous period.

**350. B2ExtremeSpreadCallOption**

Maturities are divided into two segments, and the call option pays the difference between the max assets from segment two and max of segment one.

**351. B2ExtremeSpreadPutOption**

Maturities are divided into two segments, and the put option pays the difference between the min of segment two's asset value and the min of segment one's asset value.

**352. B2ExtremeSpreadReverseCallOption**

Maturities are divided into two segments, and a reverse call pays the min from segment one less the min of segment two.

**353. B2ExtremeSpreadReversePutOption**

Maturities are divided into two segments, and a reverse put pays the max of segment one less the max of the segment two.

**354. B2FiniteDifferenceAmericanCall**

Computes the American call option using finite differencing methods, as an alternative to simulation, closed-form approximation models, and lattices.

**355. B2FiniteDifferenceAmericanPut**

Computes the American put option using finite differencing methods, as an alternative to simulation, closed-form approximation models, and lattices.

**356. B2FiniteDifferenceEuropeanCall**

Computes the European call option using finite differencing methods, as an alternative to simulation, closed-form approximation models, and lattices.

**357. B2FiniteDifferenceEuropeanPut**

Computes the European put option using finite differencing methods, as an alternative to simulation, closed-form approximation models, and lattices.

**358. B2FixedStrikeLookbackCall**

Strike price is fixed, while at expiration the payoff is the difference between the maximum asset price less the strike price during the lifetime of the option.

**359. B2FixedStrikeLookbackPut**

Strike price is fixed, while at expiration the payoff is the maximum difference between the lowest observed asset price less the strike price during the lifetime of the option.

**360. B2FixedStrikePartialLookbackCall**

Strike price is fixed, while at expiration the payoff is the difference between the maximum asset price less the strike price during the starting period of the lookback to the maturity of the option.

**361. B2FixedStrikePartialLookbackPut**

Strike price is fixed, while at expiration the payoff is the maximum difference between the lowest observed asset price less the strike price during the starting period of the lookback to the maturity of the option.

**362. B2FloatingStrikeLookbackCallonMin**

Strike price is floating, while at expiration the payoff on the call option is being able to purchase the underlying asset at the minimum observed price during the life of the option.

**363. B2FloatingStrikeLookbackPutonMax**

Strike price is floating, while at expiration the payoff on the put option is being able to sell the underlying asset at the maximum observed asset price during the life of the option.

**364. B2FloatingStrikePartialLookbackCallonMin**

Strike price is floating, while at expiration the payoff on the call option is being able to purchase the underlying at the minimum observed asset price from inception to the end of the lookback time.

**365. B2FloatingStrikePartialLookbackPutonMax**

Strike price is floating, while at expiration the payoff on the put option is being able to sell the underlying at the maximum observed asset price from inception to the end of the lookback time.

**366. B2ForecastBrownianMotionSimulatedSeries**

Computes the entire time-series of Brownian motion stochastic process forecast values.



**367. B2ForecastDistributionValue**

Computes the forecast price of an asset in the future, assuming the asset follows a Brownian motion random walk and returns the forecast price given the cumulative probability level.

**368. B2ForecastDistributionValuePercentile**

Computes the cumulative probability or percentile of an asset in the future, assuming the asset follows a Brownian motion random walk and returns the forecast cumulative percentile given the future price.

**369. B2ForecastDistributionReturns**

Computes the forecast return of an asset in the future, assuming the asset follows a Brownian motion random walk and returns the forecast percent return given the cumulative probability level.

**370. B2ForecastDistributionReturnsPercentile**

Computes the cumulative probability or percentile of an asset's returns in the future, assuming the asset follows a Brownian motion random walk and returns the forecast cumulative percentile given the return.

**371. B2ForecastJumpDiffusionSimulatedSeries**

Computes the entire time-series of a jump-diffusion stochastic process forecast values.

**372. B2ForecastMeanReversionSimulatedSeries**

Computes the entire time-series of a mean-reverting stochastic process forecast values.

**373. B2ForecastIncrementalFinancialNeeds**

Computes the incremental funds required to cover the projected organic sales growth of the company based on the projected year's financials.

**374. B2ForecastIncrementalPercentSalesGrowthFinancedExternally**

Computes the incremental funds as a percent of sales growth that is required from external funding to cover the projected organic sales growth of the company.

**375. B2ForeignEquityDomesticCurrencyCall**

Computes the value of a foreign-based equity call option struck in a domestic currency and accounting for the exchange rate volatility.

**376. B2ForeignEquityDomesticCurrencyPut**

Computes the value of a foreign-based equity put option struck in a domestic currency and accounting for the exchange rate volatility.

**377. B2ForeignEquityFixedFXRateDomesticValueQuantoCall**

Quanto call options are denominated in another currency than the underlying asset, with expanding or contracting protection coverage of the foreign exchange rates.

**378. B2ForeignEquityFixedFXRateDomesticValueQuantoPut**

Quanto put options are denominated in another currency than the underlying asset, with expanding or contracting protection coverage of the foreign exchange rates.

**379. B2ForwardRate**

Computes the Forward Interest Rate given two Spot Rates.

**380. B2ForwardStartCallOption**

Starts proportionally in or out of the money in the future. Alpha < 1: call starts (1 - A)% in the money, put starts (1 - A)% out of the money. Alpha > 1: call (A - 1)% out of the money, put (A - 1)% in the money.

**381. B2ForwardStartPutOption**

Starts proportionally in or out of the money in the future.  $\text{Alpha} < 1$ : call starts  $(1 - A)\%$  in the money, put starts  $(1 - A)\%$  out of the money.  $\text{Alpha} > 1$ : call  $(A - 1)\%$  out of the money, put  $(A - 1)\%$  in the money.

**382. B2FuturesForwardsCallOption**

Similar to a regular option but the underlying asset is a futures of a forward contract. A call option is the option to buy a futures contract, with the specified futures strike price at which the futures is traded if the option is exercised.

**383. B2FuturesForwardsPutOption**

Similar to a regular option but the underlying asset is a futures of a forward contract. A put option is the option to sell a futures contract, with the specified futures strike price at which the futures is traded if the option is exercised.

**384. B2FuturesSpreadCall**

The payoff of a spread option is the difference between the two futures' values at expiration. The spread is  $\text{Futures 1} - \text{Futures 2}$ , and the call payoff is  $\text{Spread} - \text{Strike}$ .

**385. B2FuturesSpreadPut**

The payoff of a spread option is the difference between the two futures' values at expiration. The spread is  $\text{Futures 1} - \text{Futures 2}$ , and the put payoff is  $\text{Strike} - \text{Spread}$ .

**386. B2GARCH**

Computes the forward-looking volatility forecast using the generalized autoregressive conditional heteroskedasticity (p, q) model where future volatilities are forecast based on historical price levels and information.

**387. B2GapCallOption**

The call option is knocked in if the asset exceeds the reference Strike 1, and the option payoff is the asset price less Strike 2 for the underlying.

**388. B2GapPutOption**

The put option is knocked in only if the underlying asset is less than the reference Strike 1, providing a payoff of Strike 2 less the underlying asset value.

**389. B2GeneralizedBlackScholesCall**

Returns the Black-Scholes model with a continuous dividend yield call option.

**390. B2GeneralizedBlackScholesCallCashDividends**

Modification of the Generalized Black-Scholes model to solve European call options, assuming a series of dividend cash flows that may be even or uneven. A series of dividend payments and time are required.

**391. B2GeneralizedBlackScholesPut**

Returns the Black-Scholes model with a continuous dividend yield put option.

**392. B2GeneralizedBlackScholesPutCashDividends**

Modification of the Generalized Black-Scholes model to solve European put options, assuming a series of dividend cash flows that may be even or uneven. A series of dividend payments and time are required.

**393. B2GraduatedBarrierDownandInCall**

Barriers are graduated ranges between lower and upper values. The option is knocked in the money proportionally depending on how low the asset value is in the range.

**394. B2GraduatedBarrierDownandOutCall**

Barriers are graduated ranges between lower and upper values. The option is knocked out of the money proportionally depending on how low the asset value is in the range.

**395. B2GraduatedBarrierUpandInPut**

Barriers are graduated ranges between lower and upper values. The option is knocked in the money proportionally depending on how high the asset value is in the range.

**396. B2GraduatedBarrierUpandOutPut**

Barriers are graduated ranges between lower and upper values. The option is knocked out of the money proportionally depending on how high the asset value is in the range.

**397. B2ImpliedVolatilityBestCase**

Computes the implied volatility given an expected value of an asset, along with an alternative best-case scenario value and its corresponding percentile (must be above 50%).

**398. B2ImpliedVolatilityCall**

Computes the implied volatility in a European call option given all the inputs parameters and the option value.

**399. B2ImpliedVolatilityPut**

Computes the implied volatility in a European put option given all the inputs parameters and the option value.

**400. B2ImpliedVolatilityWorstCase**

Computes the implied volatility given an expected value of an asset, along with an alternative worst-case scenario value and its corresponding percentile (must be below 50%).

**401. B2InterestAnnualtoPeriodic**

Computes the periodic compounding rate based on the annualized compounding interest rate per year.

**402. B2InterestCaplet**

Computes the interest rate caplet (sum all the caplets into the total value of the interest rate cap) and acts like an interest rate call option.

**403. B2InterestContinuousToDiscrete**

Returns the corresponding discrete compounding interest rate, given the continuous compounding rate.

**404. B2InterestContinuousToPeriodic**

Computes the periodic compounding interest rate based on a continuous compounding rate.

**405. B2InterestDiscreteToContinuous**

Returns the corresponding continuous compounding interest rate, given the discrete compounding rate.

**406. B2InterestFloorlet**

Computes the interest rate floorlet (sum all the floorlets into the total value of the interest rate floor) and acts like an interest rate put option.

**407. B2InterestPeriodictoAnnual**

Computes the annualized compounding interest rate per year based on a periodic compounding rate.

**408. B2InterestPeriodictoContinuous**

Computes the continuous compounding rate based on the periodic compounding interest rate.

**409. B2InverseGammaCallOption**

Computes the European call option assuming an inverse Gamma distribution, rather than a normal distribution, and is important for deep out-of-the-money options.

**410. B2InverseGammaPutOption**

Computes the European put option assuming an inverse Gamma distribution, rather than a normal distribution, and is important for deep out-of-the-money options.

**411. B2IRRContinuous**

Returns the continuously discounted Internal Rate of Return for a cash flow series with its respective cash flow times in years.

**412. B2IRRDiscrete**

Returns the discretely discounted Internal Rate of Return for a cash flow series with its respective cash flow times in years.

**413. B2LinearInterpolation**

Interpolates and fills in the missing values of a time series.

**414. B2MarketPriceRisk**

Computes the market price of risk used in a variety of options analyses, using market return, risk-free return, volatility of the market, and correlation between the market and the asset.

**415. B2MathGammaLog**

Returns the result from a log gamma function.

**416. B2MathIncompleteBeta**

Returns the result from an incomplete Beta function.

**417. B2MathIncompleteGammaP**

Returns the result from an incomplete Gamma P function.

**418. B2MathIncompleteGammaQ**

Returns the result from an incomplete Gamma Q function.

**419. B2MatrixMultiplyAxB**

Multiplies two compatible matrices, such as  $M \times N$  and  $N \times M$ , to create an  $M \times M$  matrix. Copy and paste function and use Ctrl+Shift+Enter to obtain the matrix.

**420. B2MatrixMultiplyAxTransposeB**

Multiplies the first matrix with the transpose of the second matrix (multiplies  $M \times N$  with  $M \times N$  matrix by transposing the second matrix to  $N \times M$ , generating an  $M \times M$  matrix). Copy and paste function and use Ctrl+Shift+Enter to obtain the matrix.

**421. B2MatrixMultiplyTransposeAxB**

Multiplies the transpose of the first matrix with the second matrix (multiplies  $M \times N$  with  $M \times N$  matrix by transposing the first matrix to  $N \times M$ , generating an  $N \times N$  matrix). Copy and paste function and use Ctrl+Shift+Enter to obtain the matrix.

**422. B2MatrixTranspose**

Transposes a matrix from  $M \times N$  to  $N \times M$ . Copy and paste function and use Ctrl+Shift+Enter to obtain the matrix.

**423. B2MertonJumpDiffusionCall**

Call value of an underlying whose asset returns are assumed to follow a Poisson Jump Diffusion process; that is, prices jump several times a year, and cumulatively these jumps explain a percentage of the total asset volatility.

**424. B2MertonJumpDiffusionPut**

Put value of an underlying whose asset returns are assumed to follow a Poisson Jump Diffusion process; that is, prices jump several times a year, and cumulatively these jumps explain a percentage of the total asset volatility.

**425. B2NormalTransform**

Converts values into a normalized distribution.

**426. B2NPVContinuous**

Returns the Net Present Value of a cash flow series given the time and discount rate, using continuous discounting.

**427. B2NPVDiscrete**

Returns the Net Present Value of a cash flow series given the time and discount rate, using discrete discounting.

**428. B2OptionStrategyLongBearCreditSpread**

Returns the matrix [stock price, buy put, sell put, profit] of a long bearish credit spread (buying a higher strike put with a high price and selling a lower strike put with a low price).

**429. B2OptionStrategyLongBullCreditSpread**

Returns the matrix [stock price, buy put, sell put, profit] of a bullish credit spread (buying a lower strike put at a low price and selling a higher strike put at a high price).

**430. B2OptionStrategyLongBearDebitSpread**

Returns the matrix [stock price, buy call, sell call, profit] of a long bearish debit spread (buying a higher strike call with a low price and selling a lower strike call with a high price).

**431. B2OptionStrategyLongBullDebitSpread**

Returns the matrix [stock price, buy call, sell call, profit] of a bullish debit spread (buying a lower strike call at a high price and selling a further out-of-the-money higher strike call at a low price).

**432. B2OptionStrategyLongCoveredCall**

Returns the matrix [stock price, buy stock, sell call, profit] of a long covered call position (buying the stock and selling a call of the same asset).

**433. B2OptionStrategyLongProtectivePut**

Returns the matrix [stock price, buy stock, buy put, profit] of a long protective put position (buying the stock and buying a put of the same asset).

**434. B2OptionStrategyLongStraddle**

Returns the matrix [stock price, buy call, buy put, profit] of a long straddle position (buying an equal number of puts and calls with identical strike price and expiration) to profit from high volatility.

**435. B2OptionStrategyLongStrangle**

Returns the matrix [stock price, buy call, buy put, profit] of a long strangle (buying a higher strike call at a low price and buying a lower strike put at a low price—close expirations) to profit from high volatility.

**436. B2OptionStrategyWriteCoveredCall**

Returns the matrix [stock price, sell stock, buy call, profit] of writing a covered call (selling the stock and buying a call of the same asset).

**437. B2OptionStrategyWriteProtectivePut**

Returns the matrix [stock price, sell stock, sell put, profit] of a long protective put position (selling the stock and selling a put of the same asset).

**438. B2OptionStrategyWriteStraddle**

Returns the matrix [stock price, sell call, sell put, profit] of writing a straddle position (selling an equal number of puts and calls with identical strike price and expiration) to profit from low volatility.

**439. B2OptionStrategyWriteStrangle**

Returns the matrix [stock price, sell call, sell put, profit] of writing a strangle (sell a higher strike call at a low price and sell a lower strike put at a low price—close expirations) to profit from low volatility.

**440. B2Payback**

Computes the payback in years given some initial investment and subsequent cash flows.

**441. B2PerpetualCallOption**

Computes the American perpetual call option. Note that it returns an error if dividend is 0% (this is because the American option reverts to European and a perpetual European has no value).

**442. B2PerpetualPutOption**

Computes the American perpetual put option. Note that it returns an error if dividend is 0% (this is because the American option reverts to European and a perpetual European has no value).

**443. B2PortfolioReturns**

Computes the portfolio weighted average expected returns given individual asset returns and allocations.

**444. B2PortfolioRisk**

Computes the portfolio risk given individual asset allocations and variance-covariance matrix.

**445. B2PortfolioVariance**

Computes the portfolio variance given individual asset allocations and variance-covariance matrix. Take the square root of the result to obtain the portfolio risk.

**446. B2ProbabilityDefaultAdjustedBondYield**

Computes the required risk-adjusted yield (premium spread plus risk-free rate) to charge given the cumulative probability of default.

**447. B2ProbabilityDefaultAverageDefaults**

Credit Risk Plus' average number of credit defaults per period using total portfolio credit exposures, average cumulative probability of default, and percentile Value at Risk for the portfolio.

**448. B2ProbabilityDefaultCorrelation**

Computes the correlations of default probabilities given the probabilities of default of each asset and the correlation between their equity prices. The result is typically much smaller than the equity correlation.

**449. B2ProbabilityDefaultCumulativeBondYieldApproach**

Computes the cumulative probability of default from Year 0 to Maturity using a comparable zero bond yield versus a zero risk-free yield and accounting for a recovery rate.

**450. B2ProbabilityDefaultCumulativeSpreadApproach**

Computes the cumulative probability of default from Year 0 to Maturity using a comparable risky debt's spread (premium) versus the risk-free rate and accounting for a recovery rate.

**451. B2ProbabilityDefaultHazardRate**

Computes the hazard rate for a specific year (in survival analysis) using a comparable zero bond yield versus a zero risk-free yield and accounting for a recovery rate.

**452. B2ProbabilityDefaultMertonDefaultDistance**

Distance to Default (does not require market returns and correlations but requires the internal growth rates).

**453. B2ProbabilityDefaultMertonI**

Probability of Default (without regard to Equity Value or Equity Volatility, but requires asset, debt, and market values).

**454. B2ProbabilityDefaultMertonII**

Probability of Default (does not require market returns and correlations but requires the internal growth rates).

**455. B2ProbabilityDefaultMertonImputedAssetValue**

Returns the imputed market value of asset given external equity value, equity volatility, and other option inputs. Used in the Merton probability of default model.

**456. B2ProbabilityDefaultMertonImputedAssetVolatility**

Returns the imputed volatility of asset given external equity value, equity volatility, and other option inputs. Used in the Merton probability of default model.

**457. B2ProbabilityDefaultMertonMVDebt**

Computes the market value of debt (for risky debt) in the Merton-based simultaneous options model.

**458. B2ProbabilityDefaultMertonRecoveryRate**

Computes the rate of recovery in percent for risky debt in the Merton-based simultaneous options model.

**459. B2ProbabilityDefaultPercentileDefaults**

Credit Risk Plus method to compute the percentile given some estimated average number of defaults per period.

**460. B2PropertyDepreciation**

Value of the periodic depreciation allowed on a commercial real estate project, given the percent of price going to improvement and the allowed recovery period.

**461. B2PropertyEquityRequired**

Value of the required equity down payment on a commercial real estate project, given the valuation of the project.

**462. B2PropertyLoanAmount**

Value of the required mortgage amount on a commercial real estate project, given the value of the project and the loan required (loan-to-value ratio or the percentage of the value that a loan represents is required).

**463. B2PropertyValuation**

Value of a commercial real estate property assuming Gross Rent, Vacancy, Operating Expenses, and the Cap Rate at Purchase Date (Net Operating Income/Sale Price).

**464. B2PutCallParityCalltoPut**

Computes the European put option value given the value of a corresponding European call option with identical input assumptions.

**465. B2PutCallParityCalltoPutCurrencyOptions**

Computes the European currency put option value given the value of a corresponding European currency call option on futures and forwards with identical input assumptions.

**466. B2PutCallParityCalltoPutFutures**

Computes the value of a European put option on futures and forwards given the value of a corresponding European call option on futures and forwards with identical input assumptions.

**467. B2PutCallParityPuttoCall**

Computes the European call option value given the value of a corresponding European put option with identical input assumptions.

**468. B2PutCallParityPuttoCallCurrencyOptions**

Computes the value of a European currency call option given the value of a corresponding European currency put option on futures and forwards with identical input assumptions.

**469. B2PutCallParityPuttoCallFutures**

Computes the value of a European call option on futures and forwards given the value of a corresponding European put option on futures and forwards with identical input assumptions.

**470. B2PutDelta**

Returns the option valuation sensitivity Delta (a put option value's sensitivity to changes in the asset value).

**471. B2PutGamma**

Returns the option valuation sensitivity Gamma (a put option value's sensitivity to changes in the Delta value).

**472. B2PutOptionOnTheMax**

The maximum values at expiration of both assets are used in option exercise, where the call option payoff at expiration is the strike price against the maximum price between Asset 1 and Asset 2.

**473. B2PutOptionOnTheMin**

The minimum values at expiration of both assets are used in option exercise, where the call option payoff at expiration is the strike price against the minimum price between Asset 1 and Asset 2.

**474. B2PutRho**

Returns the option valuation sensitivity Rho (a put option value's sensitivity to changes in the interest rate).

**475. B2PutTheta**

Returns the option valuation sensitivity Theta (a put option value's sensitivity to changes in the maturity).

**476. B2PutVega**

Returns the option valuation sensitivity Vega (a put option value's sensitivity to changes in the volatility).



**477. B2QueuingMCAveCustomersinSystem**

Average number of customers in the system, using a multiple-channel queuing model assuming a Poisson arrival rate with Exponential distribution of service times.

**478. B2QueuingMCAveCustomersWaiting**

Average number of customers in the waiting line, using a multiple-channel queuing model assuming a Poisson arrival rate with Exponential distribution of service times.

**479. B2QueuingMCAveTimeinSystem**

Average time a customer spends in the system, using a multiple-channel queuing model assuming a Poisson arrival rate with Exponential distribution of service times.

**480. B2QueuingMCAveTimeWaiting**

Average time a customer spends in the waiting line, using a multiple-channel queuing model assuming a Poisson arrival rate with Exponential distribution of service times.

**481. B2QueuingMCProbHaveToWait**

Probability an arriving customer has to wait, using a multiple-channel queuing model assuming a Poisson arrival rate with Exponential distribution of service times.

**482. B2QueuingMCProbNoCustomer**

Probability that no customers are in the system, using a multiple-channel queuing model assuming a Poisson arrival rate with Exponential distribution of service times.

**483. B2QueuingMGKAveCustomersinSystem**

Average number of customers in the system, using a multiple-channel queuing model assuming a Poisson arrival rate with unknown distribution of service times.

**484. B2QueuingMGKCostPerPeriod**

Total cost per time period, using a multiple-channel queuing model assuming a Poisson arrival rate with unknown distribution of service times.

**485. B2QueuingMGKProbBusy**

Probability a channel will be busy, using a multiple-channel queuing model assuming a Poisson arrival rate with unknown distribution of service times.

**486. B2QueuingSCAAveCustomersinSystem**

Average number of customers in the system, using an MG1 single-channel arbitrary queuing model assuming a Poisson arrival rate with unknown distribution of service times.

**487. B2QueuingSCAAveCustomersWaiting**

Average number of customers in the waiting line, using an MG1 single-channel arbitrary queuing model assuming a Poisson arrival rate with unknown distribution of service times.

**488. B2QueuingSCAAveTimeinSystem**

Average time a customer spends in the system, using an MG1 single-channel arbitrary queuing model assuming a Poisson arrival rate with unknown distribution of service times.

**489. B2QueuingSCAAveTimeWaiting**

Average time a customer spends in the waiting line, using an MG1 single-channel arbitrary queuing model assuming a Poisson arrival rate with unknown distribution of service times.

**490. B2QueuingSCAProbHaveToWait**

Probability an arriving customer has to wait, using an MG1 single-channel arbitrary queuing model assuming a Poisson arrival rate with unknown distribution of service times.

**491. B2QueuingSCAProbNoCustomer**

Probability that no customers are in the system, using an MG1 single-channel arbitrary queuing model assuming a Poisson arrival rate with unknown distribution of service times.

**492. B2QueuingSCAveCustomersinSystem**

Average number of customers in the system, using a single-channel queuing model.

**493. B2QueuingSCAveCustomersWaiting**

Returns the average number of customers in the waiting line, using a single-channel queuing model.

**494. B2QueuingSCAveTimeinSystem**

Average time a customer spends in the system, using a single-channel queuing model.

**495. B2QueuingSCAveTimeWaiting**

Average time a customer spends in the waiting line, using a single-channel queuing model.

**496. B2QueuingSCProbHaveToWait**

Probability an arriving customer has to wait, using a single-channel queuing model.

**497. B2QueuingSCProbNoCustomer**

Returns the probability that no customers are in the system, using a single-channel queuing model.

**498. B2RatiosBasicEarningPower**

Computes the basic earning power (BEP) by accounting for earnings before interest and taxes (EBIT) and the amount of total assets employed.

**499. B2RatiosBetaLevered**

Computes the levered beta from an unlevered beta level after accounting for the tax rate, total debt, and equity values.

**500. B2RatiosBetaUnlevered**

Computes the unlevered beta from a levered beta level after accounting for the tax rate, total debt, and equity values.

**501. B2RatiosBookValuePerShare**

Computes the book value per share (BV) by accounting for the total common equity amount and number of shares outstanding.

**502. B2RatiosCapitalCharge**

Computes the capital charge value (typically used to compute the economic profit of a project).

**503. B2RatiosCAPM**

Computes the capital asset pricing model's required rate of return in percent, given some benchmark market return, beta risk coefficient, and risk-free rate.

**504. B2RatiosCashFlowtoEquityLeveredFirm**

Cash flow to equity for a levered firm (accounting for operating expenses, taxes, depreciation, amortization, capital expenditures, change in working capital, preferred dividends, principal repaid, and new debt issues).

**505. B2RatiosCashFlowtoEquityUnleveredFirm**

Cash flow to equity for an unlevered firm (accounting for operating expenses, taxes, depreciation, amortization, capital expenditures, change in working capital, and taxes).

**506. B2RatiosCashFlowtoFirm**

Cash flow to the firm (accounting for earnings before interest and taxes [EBIT], tax rate, depreciation, capital expenditures, and change in working capital).

**507. B2RatiosCashFlowtoFirm2**

Cash flow to the firm (accounting for net operating profit after taxes [NOPAT], depreciation, capital expenditures, and change in working capital).

**508. B2RatiosContinuingValue1**

Computes the continuing value based on a constant growth rate of free cash flows to perpetuity using a Gordon Growth Model.

**509. B2RatiosContinuingValue2**

Computes the continuing value based on a constant growth rate of free cash flows to perpetuity using net operating profit after taxes (NOPAT), return on invested capital (ROIC), growth rate, and current free cash flow.

**510. B2RatiosCostEquity**

Computes the cost of equity (as used in a CAPM model) using the dividend rate, growth rate of dividends, and current equity price.

**511. B2RatiosCurrentRatio**

Computes the current ratio by accounting for the individual asset and liabilities.

**512. B2RatiosDaysSalesOutstanding**

Computes the days sales outstanding by looking at the accounts receivable value, total annual sales, and number of days per year.

**513. B2RatiosDebtAssetRatio**

Computes the debt-to-asset ratio by accounting for the total debt and total asset values.

**514. B2RatiosDebtEquityRatio**

Computes the debt-to-equity ratio by accounting for the total debt and total common equity levels.

**515. B2RatiosDebtRatio1**

Computes the debt ratio by accounting for the total debt and total asset values.

**516. B2RatiosDebtRatio2**

Computes the debt ratio by accounting for the total equity and total asset values.

**517. B2RatiosDividendsPerShare**

Computes the dividends per share (DPS) by accounting for the dividend payment amount and number of shares outstanding.

**518. B2RatiosEarningsPerShare**

Computes the earnings per share (EPS) by accounting for the net income amount and number of shares outstanding.

**519. B2RatiosEconomicProfit1**

Computes the economic profit using invested capital, return on invested capital (ROIC), and weighted average cost of capital (WACC).

**520. B2RatiosEconomicProfit2**

Computes the economic profit using net operating profit after taxes (NOPAT), return on invested capital (ROIC), and weighted average cost of capital (WACC).

**521. B2RatiosEconomicProfit3**

Computes the economic profit using net operating profit after taxes (NOPAT) and capital charge.

**522. B2RatiosEconomicValueAdded**

Computes the economic value added using earnings before interest and taxes (EBIT), total capital employed, tax rate, and weighted average cost of capital (WACC).

**523. B2RatiosEquityMultiplier**

Computes the equity multiplier (the ratio of total assets to total equity).

**524. B2RatiosFixedAssetTurnover**

Computes the fixed asset turnover by accounting for the annual sales levels and net fixed assets.

**525. B2RatiosInventoryTurnover**

Computes the inventory turnover using sales and inventory levels.

**526. B2RatiosMarketBookRatio1**

Computes the market to book value (BV) per share by accounting for the share price and the book value per share.

**527. B2RatiosMarketBookRatio2**

Computes the market to book value per share by accounting for the share price, total common equity value, and number of shares outstanding.

**528. B2RatiosMarketValueAdded**

Computes the market value added by accounting for the stock price, total common equity, and number of shares outstanding.

**529. B2RatiosNominalCashFlow**

Computes the nominal cash flow amount assuming some inflation rate, real cash flow, and the number of years in the future.

**530. B2RatiosNominalDiscountRate**

Computes the nominal discount rate assuming some inflation rate and real discount rate.

**531. B2RatiosPERatio1**

Computes the price-to-earnings (P/E) ratio using stock price and earnings per share (EPS).

**532. B2RatiosPERatio2**

Computes the price-to-earnings (P/E) ratio using stock price, net income, and number of shares outstanding.

**533. B2RatiosPERatio3**

Computes the price-to-earnings (P/E) ratio using growth rates, rate of return, and discount rate.

**534. B2RatiosProfitMargin**

Computes the profit margin by taking the ratio of net income to annual sales.

**535. B2RatiosQuickRatio**

Computes the quick ratio by accounting for the individual assets and liabilities.

**536. B2RatiosRealCashFlow**

Computes the real cash flow amount assuming some inflation rate, nominal cash flow (Nominal CF), and the number of years in the future.

**537. B2RatiosRealDiscountRate**

Computes the real discount rate assuming some inflation rate and nominal discount rate.

**538. B2RatiosReturnonAsset1**

Computes the return on assets using net income amount and total assets employed.

**539. B2RatiosReturnonAsset2**

Computes the return on assets using net profit margin percentage and total asset turnover ratio.

**540. B2RatiosReturnonEquity1**

Computes return on equity using net income and total common equity values.

**541. B2RatiosReturnonEquity2**

Computes return on equity using return on assets (ROA), total assets, and total equity values.

**542. B2RatiosReturnonEquity3**

Computes return on equity using net income, total sales, total assets, and total common equity values.

**543. B2RatiosReturnonEquity4**

Computes return on equity using net profit margin, total asset turnover, and equity multiplier values.

**544. B2RatiosROIC**

Computes the return on invested capital (typically used for computing economic profit) accounting for change in working capital; property, plant, and equipment (PPE); and other assets.

**545. B2RatiosShareholderEquity**

Computes the common shareholder's equity after accounting for total assets, total liabilities, and preferred stocks.

**546. B2RatiosTimesInterestEarned**

Computes the times interest earned ratio by accounting for earnings before interest and taxes (EBIT) and the amount of interest payment.

**547. B2RatiosTotalAssetTurnover**

Computes the total asset turnover by accounting for the annual sales levels and total assets.

**548. B2RatiosWACC1**

Computes the weighted average cost of capital (WACC) using market values of debt, preferred equity, and common equity, as well as their respective costs.

**549. B2RatiosWACC2**

Computes the weighted average cost of capital (WACC) using market values of debt, market values of common equity, as well as their respective costs.

**550. B2ROBinomialAmericanAbandonContract**

Returns the American option to abandon and contract using a binomial lattice model.

**551. B2ROBinomialAmericanAbandonContractExpand**

Returns the American option to abandon, contract, and expand using a binomial lattice model.

**552. B2ROBinomialAmericanAbandonExpand**

Returns the American option to abandon and expand using a binomial lattice model.

**553. B2ROBinomialAmericanAbandonment**

Returns the American option to abandon using a binomial lattice model.

**554. B2ROBinomialAmericanCall**

Returns the American call option with dividends using a binomial lattice model.

**555. B2ROBinomialAmericanChangingRiskFree**

Returns the American call option with dividends and assuming the risk-free rate changes over time, using a binomial lattice model.

**556. B2ROBinomialAmericanChangingVolatility**

Returns the American call option with dividends and assuming the volatility changes over time, using a binomial lattice model. Use small number of steps or it will take a long time to compute!

**557. B2ROBinomialAmericanContractExpand**

Returns the American option to contract and expand using a binomial lattice model.

**558. B2ROBinomialAmericanContraction**

Returns the American option to contract using a binomial lattice model.

**559. B2ROBinomialAmericanCustomCall**

Returns the American option call option with changing inputs, vesting periods, and suboptimal exercise multiple using a binomial lattice model.

**560. B2ROBinomialAmericanExpansion**

Returns the American option to expand using a binomial lattice model.

**561. B2ROBinomialAmericanPut**

Returns the American put option with dividends using a binomial lattice model.

**562. B2ROBinomialBermudanAbandonContract**

Returns the Bermudan option to abandon and contract using a binomial lattice model, where there is a vesting/blackout period during which the option cannot be executed.

**563. B2ROBinomialBermudanAbandonContractExpand**

Returns the Bermudan option to abandon, contract, and expand, using a binomial lattice model, where there is a vesting/blackout period during which the option cannot be executed.

**564. B2ROBinomialBermudanAbandonExpand**

Returns the Bermudan option to abandon and expand using a binomial lattice model, where there is a vesting/blackout period during which the option cannot be executed.

**565. B2ROBinomialBermudanAbandonment**

Returns the Bermudan option to abandon using a binomial lattice model, where there is a vesting/blackout period during which the option cannot be executed.

**566. B2ROBinomialBermudanCall**

Returns the Bermudan call option with dividends, where there is a vesting/blackout period during which the option cannot be executed.

**567. B2ROBinomialBermudanContractExpand**

Returns the Bermudan option to contract and expand, using a binomial lattice model, where there is a vesting/blackout period during which the option cannot be executed.

**568. B2ROBinomialBermudanContraction**

Returns the Bermudan option to contract using a binomial lattice model, where there is a vesting/blackout period during which the option cannot be executed.

**569. B2ROBinomialBermudanExpansion**

Returns the Bermudan option to expand using a binomial lattice model, where there is a vesting/blackout period during which the option cannot be executed.

**570. B2ROBinomialBermudanPut**

Returns the Bermudan put option with dividends, where there is a vesting/blackout period during which the option cannot be executed.

**571. B2ROBinomialEuropeanAbandonContract**

Returns the European option to abandon and contract, using a binomial lattice model, where the option can be executed only at expiration.

**572. B2ROBinomialEuropeanAbandonContractExpand**

Returns the European option to abandon, contract, and expand, using a binomial lattice model, where the option can be executed only at expiration.

**573. B2ROBinomialEuropeanAbandonExpand**

Returns the European option to abandon and expand, using a binomial lattice model, where the option can be executed only at expiration.

**574. B2ROBinomialEuropeanAbandonment**

Returns the European option to abandon using a binomial lattice model, where the option can be executed only at expiration.

**575. B2ROBinomialEuropeanCall**

Returns the European call option with dividends, where the option can be executed only at expiration.

**576. B2ROBinomialEuropeanContractExpand**

Returns the European option to contract and expand, using a binomial lattice model, where the option can be executed only at expiration.

**577. B2ROBinomialEuropeanContraction**

Returns the European option to contract using a binomial lattice model, where the option can be executed only at expiration.

**578. B2ROBinomialEuropeanExpansion**

Returns the European option to expand using a binomial lattice model, where the option can be executed only at expiration.

**579. B2ROBinomialEuropeanPut**

Returns the European put option with dividends, where the option can be executed only at expiration.

**580. B2ROJumpDiffusionCall**

Returns the closed-form model for a European call option whose underlying asset follows a Poisson Jump Diffusion process.

**581. B2ROJumpDiffusionPut**

Returns the closed-form model for a European put option whose underlying asset follows a Poisson Jump Diffusion process.

**582. B2ROMeanRevertingCall**

Returns the closed-form model for a European call option whose underlying asset follows a mean-reversion process.

**583. B2ROMeanRevertingPut**

Returns the closed-form model for a European put option whose underlying asset follows a mean-reversion process.

**584. B2ROPentanomialAmericanCall**

Returns the Rainbow American call option with two underlying assets (these are typically price and quantity, and are multiplied together to form a new combinatorial pentanomial lattice).

**585. B2ROPentanomialAmericanPut**

Returns the Rainbow American put option with two underlying assets (these are typically price and quantity, and are multiplied together to form a new combinatorial pentanomial lattice).

**586. B2ROPentanomialEuropeanCall**

Returns the Rainbow European call option with two underlying assets (these are typically price and quantity, and are multiplied together to form a new combinatorial pentanomial lattice).

**587. B2ROPentanomialEuropeanPut**

Returns the Rainbow European put option with two underlying assets (these are typically price and quantity, and are multiplied together to form a new combinatorial pentanomial lattice).

**588. B2ROQuadranomialJumpDiffusionAmericanCall**

Returns the American call option whose underlying asset follows a Poisson Jump Diffusion process, using a combinatorial quadranomial lattice.

**589. B2ROQuadranomialJumpDiffusionAmericanPut**

Returns the American put option whose underlying asset follows a Poisson Jump Diffusion process, using a combinatorial quadranomial lattice.

**590. B2ROQuadranomialJumpDiffusionEuropeanCall**

Returns the European call option whose underlying asset follows a Poisson Jump Diffusion process, using a combinatorial quadranomial lattice.

**591. B2ROQuadranomialJumpDiffusionEuropeanPut**

Returns the European put option whose underlying asset follows a Poisson Jump Diffusion process, using a combinatorial quadranomial lattice.

**592. B2ROStateAmericanCall**

Returns the American call option using a state jump function, where the up and down states can be asymmetrical, solved in a lattice model.

**593. B2ROStateAmericanPut**

Returns the American put option using a state jump function, where the up and down states can be asymmetrical, solved in a lattice model.

**594. B2ROStateBermudanCall**

Returns the Bermudan call option using a state jump function, where the up and down states can be asymmetrical, solved in a lattice model, and where the option cannot be exercised during certain vesting/blackout periods.

**595. B2ROStateBermudanPut**

Returns the Bermudan put option using a state jump function, where the up and down states can be asymmetrical, solved in a lattice model, and where the option cannot be exercised during certain vesting/blackout periods.



**596. B2ROStateEuropeanCall**

Returns the European call option using a state jump function, where the up and down states can be asymmetrical, solved in a lattice model, and where the option can be exercised only at maturity.

**597. B2ROStateEuropeanPut**

Returns the European put option using a state jump function, where the up and down states can be asymmetrical, solved in a lattice model, and where the option can be exercised only at maturity.

**598. B2ROTrinomialAmericanCall**

Returns the American call option with dividend, solved using a trinomial lattice.

**599. B2ROTrinomialAmericanMeanRevertingCall**

Returns the American call option with dividend, assuming the underlying asset is mean-reverting, and solved using a trinomial lattice.

**600. B2ROTrinomialAmericanMeanRevertingPut**

Returns the American put option with dividend, assuming the underlying asset is mean-reverting, and solved using a trinomial lattice.

**601. B2ROTrinomialAmericanPut**

Returns the American put option with dividend, solved using a trinomial lattice.

**602. B2ROTrinomialBermudanCall**

Returns the Bermudan call option with dividend, solved using a trinomial lattice, where during certain vesting/blackout periods the option cannot be exercised.

**603. B2ROTrinomialBermudanPut**

Returns the Bermudan put option with dividend, solved using a trinomial lattice, where during certain vesting/blackout periods the option cannot be exercised.

**604. B2ROTrinomialEuropeanCall**

Returns the European call option with dividend, solved using a trinomial lattice, where the option can be exercised only at maturity.

**605. B2ROTrinomialEuropeanMeanRevertingCall**

Returns the European call option with dividend, solved using a trinomial lattice, assuming the underlying asset is mean-reverting, and where the option can be exercised only at maturity.

**606. B2ROTrinomialEuropeanMeanRevertingPut**

Returns the European put option with dividend, solved using a trinomial lattice, assuming the underlying asset is mean-reverting, and where the option can be exercised only at maturity.

**607. B2ROTrinomialEuropeanPut**

Returns the European put option with dividend, solved using a trinomial lattice, where the option can be exercised only at maturity.

**608. B2SCurveValue**

Computes the S-Curve extrapolation's next forecast value based on previous value, growth rate, and maximum capacity levels.

**609. B2SCurveValueSaturation**

Computes the S-Curve extrapolation's saturation level based on previous value, growth rate, and maximum capacity levels.

**610. B2SemiStandardDeviationPopulation**

Computes the semi-standard deviation of the population; that is, only the values below the mean are used to compute an adjusted population standard deviation, a more appropriate measure of downside risk.

**611. B2SemiStandardDeviationSample**

Computes the semi-standard deviation of the sample; that is, only the values below the mean are used to compute an adjusted sample standard deviation, a more appropriate measure of downside risk.

**612. B2SharpeRatio**

Computes the Sharpe Ratio (returns-to-risk ratio) based on a series of stock prices of an asset and a market benchmark series of prices.

**613. B2SimulateBernoulli**

Returns simulated random numbers from the Bernoulli distribution. Type in RAND() as the random input parameter to generate volatile random values from this distribution.

**614. B2SimulateBeta**

Returns simulated random numbers from the Beta distribution. Type in RAND() as the random input parameter to generate volatile random values from this distribution.

**615. B2SimulateBinomial**

Returns simulated random numbers from the Binomial distribution. Type in RAND() as the random input parameter to generate volatile random values from this distribution.

**616. B2SimulateChiSquare**

Returns simulated random numbers from the Chi-Square distribution. Type in RAND() as the random input parameter to generate volatile random values from this distribution.

**617. B2SimulatedEuropeanCall**

Returns the Monte Carlo simulated European call option (only European options can be approximated well with simulation). This function is volatile.

**618. B2SimulatedEuropeanPut**

Returns the Monte Carlo simulated European put option (only European options can be approximated well with simulation). This function is volatile.

**619. B2SimulateDiscreteUniform**

Returns simulated random numbers from the Discrete Uniform distribution. Type in RAND() as the random input parameter to generate volatile random values from this distribution.

**620. B2SimulateExponential**

Returns simulated random numbers from the Exponential distribution. Type in RAND() as the random input parameter to generate volatile random values from this distribution.

**621. B2SimulateFDist**

Returns simulated random numbers from the F distribution. Type in RAND() as the random input parameter to generate volatile random values from this distribution.

**622. B2SimulateGamma**

Returns simulated random numbers from the Gamma distribution. Type in RAND() as the random input parameter to generate volatile random values from this distribution.

**623. B2SimulateGeometric**

Returns simulated random numbers from the Geometric distribution. Type in RAND() as the random input parameter to generate volatile random values from this distribution.

**624. B2SimulateGumbelMax**

Returns simulated random numbers from the Gumbel Max distribution. Type in RAND() as the random input parameter to generate volatile random values from this distribution.

**625. B2SimulateGumbelMin**

Returns simulated random numbers from the Gumbel Min distribution. Type in RAND() as the random input parameter to generate volatile random values from this distribution.

**626. B2SimulateLogistic**

Returns simulated random numbers from the Logistic distribution. Type in RAND() as the random input parameter to generate volatile random values from this distribution.

**627. B2SimulateLognormal**

Returns simulated random numbers from the Lognormal distribution. Type in RAND() as the random input parameter to generate volatile random values from this distribution.

**628. B2SimulateNormal**

Returns simulated random numbers from the Normal distribution. Type in RAND() as the random input parameter to generate volatile random values from this distribution.

**629. B2SimulatePareto**

Returns simulated random numbers from the Pareto distribution. Type in RAND() as the random input parameter to generate volatile random values from this distribution.

**630. B2SimulatePoisson**

Returns simulated random numbers from the Poisson distribution. Type in RAND() as the random input parameter to generate volatile random values from this distribution.

**631. B2SimulateRayleigh**

Returns simulated random numbers from the Rayleigh distribution. Type in RAND() as the random input parameter to generate volatile random values from this distribution.

**632. B2SimulateStandardNormal**

Returns simulated random numbers from the Standard Normal distribution. Type in RAND() as the random input parameter to generate volatile random values from this distribution.

**633. B2SimulateTDist**

Returns simulated random numbers from the Student's T distribution. Type in RAND() as the random input parameter to generate volatile random values from this distribution.

**634. B2SimulateTriangular**

Returns simulated random numbers from the Triangular distribution. Type in RAND() as the random input parameter to generate volatile random values from this distribution.

**635. B2SimulateUniform**

Returns simulated random numbers from the Uniform distribution. Type in RAND() as the random input parameter to generate volatile random values from this distribution.

**636. B2SimulateWeibull**

Returns simulated random numbers from the Weibull distribution. Type in RAND() as the random input parameter to generate volatile random values from this distribution.

**637. B2SixSigmaControlCChartCL**

Computes the center line in a control c-chart. C-charts are applicable when only the number of defects is important.

**638. B2SixSigmaControlCChartDown1Sigma**

Computes the lower 1 sigma limit in a control c-chart. C-charts are applicable when only the number of defects is important.

**639. B2SixSigmaControlCChartDown2Sigma**

Computes the lower 2 sigma limit in a control c-chart. C-charts are applicable when only the number of defects is important.

**640. B2SixSigmaControlCChartLCL**

Computes the lower control limit in a control c-chart. C-charts are applicable when only the number of defects is important.

**641. B2SixSigmaControlCChartUCL**

Computes the upper control limit in a control c-chart. C-charts are applicable when only the number of defects is important.

**642. B2SixSigmaControlCChartUp1Sigma**

Computes the upper 1 sigma limit in a control c-chart. C-charts are applicable when only the number of defects is important.

**643. B2SixSigmaControlCChartUp2Sigma**

Computes the upper 2 sigma limit in a control c-chart. C-charts are applicable when only the number of defects is important.

**644. B2SixSigmaControlNPChartCL**

Computes the center line in a control np-chart. NP-charts are applicable when proportions of defects are important, and where in each experimental subgroup the number of sample sizes is constant.

**645. B2SixSigmaControlNPChartDown1Sigma**

Computes the lower 1 sigma limit in a control np-chart. NP-charts are applicable when proportions of defects are important, and where in each experimental subgroup the number of sample sizes is constant.

**646. B2SixSigmaControlNPChartDown2Sigma**

Computes the lower 2 sigma limit in a control np-chart. NP-charts are applicable when proportions of defects are important, and where in each experimental subgroup the number of sample sizes is constant.

**647. B2SixSigmaControlNPChartLCL**

Computes the lower control limit in a control np-chart. NP-charts are applicable when proportions of defects are important, and where in each experimental subgroup the number of sample sizes is constant.

**648. B2SixSigmaControlNPChartUCL**

Computes the upper control limit in a control np-chart. NP-charts are applicable when proportions of defects are important, and where in each experimental subgroup the number of sample sizes is constant.

**649. B2SixSigmaControlNPChartUp1Sigma**

Computes the upper 1 sigma limit in a control np-chart. NP-charts are applicable when proportions of defects are important, and where in each experimental subgroup the number of sample sizes is constant.

**650. B2SixSigmaControlNPChartUp2Sigma**

Computes the upper 2 sigma limit in a control np-chart. NP-charts are applicable when proportions of defects are important, and where in each experimental subgroup the number of sample sizes is constant.

**651. B2SixSigmaControlPChartCL**

Computes the center line in a control p-chart. P-charts are applicable when proportions of defects are important, and where in each experimental subgroup the number of sample sizes might be different.

**652. B2SixSigmaControlPChartDown1Sigma**

Computes the lower 1 sigma limit in a control p-chart. P-charts are applicable when proportions of defects are important, and where in each experimental subgroup the number of sample sizes might be different.

**653. B2SixSigmaControlPChartDown2Sigma**

Computes the lower 2 sigma limit in a control p-chart. P-charts are applicable when proportions of defects are important, and where in each experimental subgroup the number of sample sizes might be different.

**654. B2SixSigmaControlPChartLCL**

Computes the lower control limit in a control p-chart. P-charts are applicable when proportions of defects are important, and where in each experimental subgroup the number of sample sizes might be different.

**655. B2SixSigmaControlPChartUCL**

Computes the upper control limit in a control p-chart. P-charts are applicable when proportions of defects are important, and where in each experimental subgroup the number of sample sizes might be different.

**656. B2SixSigmaControlPChartUp1Sigma**

Computes the upper 1 sigma limit in a control p-chart. P-charts are applicable when proportions of defects are important, and where in each experimental subgroup the number of sample sizes might be different.

**657. B2SixSigmaControlPChartUp2Sigma**

Computes the upper 2 sigma limit in a control p-chart. P-charts are applicable when proportions of defects are important, and where in each experimental subgroup the number of sample sizes might be different.

**658. B2SixSigmaControlRChartCL**

Computes the center line in a control R-chart. R-charts are used when the number of defects is important; in each subgroup experiment multiple measurements are taken, and the range of the measurements is the variable plotted.

**659. B2SixSigmaControlRChartLCL**

Computes the lower control limit in a control R-chart. R-charts are used when the number of defects is important; in each subgroup experiment multiple measurements are taken, and the range of the measurements is the variable plotted.

**660. B2SixSigmaControlRChartUCL**

Computes the upper control limit in a control R-chart. R-charts are used when the number of defects is important; in each subgroup experiment multiple measurements are taken, and the range of the measurements is the variable plotted.

**661. B2SixSigmaControlUChartCL**

Computes the center line in a control u-chart. U-charts are applicable when the number of defects is important, and where in each experimental subgroup the number of sample sizes is the same.

**662. B2SixSigmaControlUChartDown1Sigma**

Computes the lower 1 sigma limit in a control u-chart. U-charts are applicable when the number of defects is important, and where in each experimental subgroup the number of sample sizes is the same.

**663. B2SixSigmaControlUChartDown2Sigma**

Computes the lower 2 sigma limit in a control u-chart. U-charts are applicable when the number of defects is important, and where in each experimental subgroup the number of sample sizes is the same.

**664. B2SixSigmaControlUChartLCL**

Computes the lower control limit in a control u-chart. U-charts are applicable when the number of defects is important, and where in each experimental subgroup the number of sample sizes is the same.

**665. B2SixSigmaControlUChartUCL**

Computes the upper control limit in a control u-chart. U-charts are applicable when the number of defects is important, and where in each experimental subgroup the number of sample sizes is the same.

**666. B2SixSigmaControlUChartUp1Sigma**

Computes the upper 1 sigma limit in a control u-chart. U-charts are applicable when the number of defects is important, and where in each experimental subgroup the number of sample sizes is the same.

**667. B2SixSigmaControlUChartUp2Sigma**

Computes the upper 2 sigma limit in a control u-chart. U-charts are applicable when the number of defects is important, and where in each experimental subgroup the number of sample sizes is the same.

**668. B2SixSigmaControlXChartCL**

Computes the center line in a control X-chart. X-charts are used when the number of defects is important; in each subgroup experiment multiple measurements are taken, and the average of the measurements is the variable plotted.

**669. B2SixSigmaControlXChartLCL**

Computes the lower control limit in a control X-chart. X-charts are used when the number of defects is important; in each subgroup experiment multiple measurements are taken, and the average of the measurements is the variable plotted.

**670. B2SixSigmaControlXChartUCL**

Computes the upper control limit in a control X-chart. X-charts are used when the number of defects is important; in each subgroup experiment multiple measurements are taken, and the average of the measurements is the variable plotted.

**671. B2SixSigmaControlXMRChartCL**

Computes the center line in a control XmR-chart. XmR-charts are used when the number of defects is important; there is only a single measurement for each sample, and a time series of moving ranges is the variable plotted.

**672. B2SixSigmaControlIXMRChartLCL**

Computes the lower control limit in a control XmR-chart. XmR-charts are used when the number of defects is important; there is only a single measurement for each sample, and a time series of moving ranges is the variable plotted.

**673. B2SixSigmaControlIXMRChartUCL**

Computes the upper control limit in a control XmR-chart. XmR-charts are used when the number of defects is important; there is only a single measurement for each sample, and a time series of moving ranges is the variable plotted.

**674. B2SixSigmaDeltaPrecision**

Computes the error precision given specific levels of Type I and Type II errors, as well as the sample size and variance.

**675. B2SixSigmaSampleSize**

Computes the required minimum sample size given Type I and Type II errors, as well as the required precision of the mean and the error tolerances.

**676. B2SixSigmaSampleSizeDPU**

Computes the required minimum sample size given Type I and Type II errors, as well as the required precision of the defects per unit and the error tolerances.

**677. B2SixSigmaSampleSizeProportion**

Computes the required minimum sample size given Type I and Type II errors, as well as the required precision of the proportion of defects and the error tolerances.

**678. B2SixSigmaSampleSizeStdev**

Computes the required minimum sample size given Type I and Type II errors, as well as the required precision of the standard deviation and the error tolerances.

**679. B2SixSigmaSampleSizeZeroCorrelTest**

Computes the required minimum sample size to test whether a correlation is statistically significant at an alpha of 0.05 and beta of 0.10.

**680. B2SixSigmaStatCP**

Computes the potential process capability index Cp given the actual mean and sigma of the process, including the upper and lower specification limits.

**681. B2SixSigmaStatCPK**

Computes the process capability index Cpk given the actual mean and sigma of the process, including the upper and lower specification limits.

**682. B2SixSigmaStatDPMO**

Computes the defects per million opportunities (DPMO) given the actual mean and sigma of the process, including the upper and lower specification limits.

**683. B2SixSigmaStatDPU**

Computes the proportion of defects per unit (DPU) given the actual mean and sigma of the process, including the upper and lower specification limits.

**684. B2SixSigmaStatProcessSigma**

Computes the process sigma level given the actual mean and sigma of the process, including the upper and lower specification limits.

**685. B2SixSigmaStatYield**

Computes the nondefective parts or the yield of the process, given the actual mean and sigma of the process, including the upper and lower specification limits.

**686. B2SixSigmaUnitCPK**

Computes the process capability index Cpk given the actual counts of defective parts and the total opportunities in the population.

**687. B2SixSigmaUnitDPMO**

Computes the defects per million opportunities (DPMO) given the actual counts of defective parts and the total opportunities in the population.

**688. B2SixSigmaUnitDPU**

Computes the proportion of defects per unit (DPU) given the actual counts of defective parts and the total opportunities in the population.

**689. B2SixSigmaUnitProcessSigma**

Computes the process sigma level given the actual counts of defective parts and the total opportunities in the population.

**690. B2SixSigmaUnitYield**

Computes the nondefective parts or the yield of the process given the actual counts of defective parts and the total opportunities in the population.

**691. B2StandardNormalBivariateCDF**

Given the two Z-scores and correlation, returns the value of the bivariate standard normal (means of zero, variances of 1) cumulative distribution function.

**692. B2StandardNormalCDF**

Given the Z-score, returns the value of the standard normal (mean of zero, variance of 1) cumulative distribution function.

**693. B2StandardNormalInverseCDF**

Computes the inverse cumulative distribution function of a standard normal distribution (mean of zero, variance of 1).

**694. B2StandardNormalPDF**

Given the Z-score, returns the value of the standard normal (mean of zero, variance of 1) probability density function.

**695. B2StockIndexCallOption**

Similar to a regular call option but the underlying asset is a reference stock index such as the Standard & Poor's 500. The analysis can be solved using a Generalized Black-Scholes-Merton model as well.

**696. B2StockIndexPutOption**

Similar to a regular put option but the underlying asset is a reference stock index such as the Standard & Poor's 500. The analysis can be solved using a Generalized Black-Scholes-Merton model as well.

**697. B2SuperShareOptions**

The option has value only if the stock or asset price is between the upper and lower barriers, and at expiration provides a payoff equivalent to the stock or asset price divided by the lower strike price (S/X Lower).

**698. B2SwaptionEuropeanPayer**

European Call Interest Swaption.

**699. B2SwaptionEuropeanReceiver**

European Put Interest Swaption.



**700. B2TakeoverFXOption**

At a successful takeover (foreign firm value in foreign currency is less than the foreign currency units), option holder can purchase the foreign units at a predetermined strike price (in exchange rates of the domestic to foreign currency).

**701. B2TimeSwitchOptionCall**

Holder gets  $\text{AccumAmount} \times \text{TimeSteps}$  each time asset > strike for a call. TimeSteps is the frequency at which the asset price is checked as to whether the strike is breached (e.g., for 252 trading days, set DT as 1/252).

**702. B2TimeSwitchOptionPut**

Holder gets  $\text{AccumAmount} \times \text{TimeSteps}$  each time asset < strike for a put. TimeSteps is the frequency at which the asset price is checked as to whether the strike is breached (e.g., for 252 trading days, set DT as 1/252).

**703. B2TradingDayAdjustedCall**

Call option corrected for varying volatilities (higher on trading days than on nontrading days). Trading Days Ratio is the number of trading days left until maturity divided by total trading days per year (between 250 and 252).

**704. B2TradingDayAdjustedPut**

Put option corrected for varying volatilities (higher on trading days than on nontrading days). Trading Days Ratio is the number of trading days left until maturity divided by total trading days per year (between 250 and 252).

**705. B2TrinomialImpliedArrowDebreuLattice**

Computes the complete set of implied Arrow-Debreu prices in an implied trinomial lattice using actual observed data. Copy and paste the function and use Ctrl+Shift+Enter to obtain the matrix.

**706. B2TrinomialImpliedArrowDebreuValue**

Computes the single value of implied Arrow-Debreu price (for a specific step/column and up-down event/row) in an implied trinomial lattice using actual observed data.

**707. B2TrinomialImpliedCallOptionValue**

Computes the European call option using an implied trinomial lattice approach, taking into account actual observed inputs.

**708. B2TrinomialImpliedDownProbabilityLattice**

Computes the complete set of implied DOWN probabilities in an implied trinomial lattice using actual observed data. Copy and paste the function and use Ctrl+Shift+Enter to obtain the matrix.

**709. B2TrinomialImpliedDownProbabilityValue**

Computes the single value of implied DOWN probability (for a specific step/column and up-down event/row) in an implied trinomial lattice using actual observed data.

**710. B2TrinomialImpliedLocalVolatilityLattice**

Computes the complete set of implied local volatilities in an implied trinomial lattice using actual observed data. Copy and paste the function and use Ctrl+Shift+Enter to obtain the matrix.

**711. B2TrinomialImpliedLocalVolatilityValue**

Computes the single value of implied localized volatility (for a specific step/column and up-down event/row) in an implied trinomial lattice using actual observed data.

**712. B2TrinomialImpliedUpProbabilityLattice**

Computes the complete set of implied UP probabilities in an implied trinomial lattice using actual observed data. Copy and paste the function and use Ctrl+Shift+Enter to obtain the matrix.

**713. B2TrinomialImpliedUpProbabilityValue**

Computes the single value of implied UP probability (for a specific step/column and up-down event/row) in an implied trinomial lattice using actual observed data.

**714. B2TrinomialImpliedPutOptionValue**

Computes the European put option using an implied trinomial lattice approach, taking into account actual observed inputs.

**715. B2TwoAssetBarrierDownandInCall**

Valuable or knocked in the money only if the lower barrier is breached (reference Asset 2 goes below the barrier), and the payout is in the option on Asset 1 less the strike price.

**716. B2TwoAssetBarrierDownandInPut**

Valuable or knocked in the money only if the lower barrier is breached (reference Asset 2 goes below the barrier), and the payout is in the option on the strike price less the Asset 1 value.

**717. B2TwoAssetBarrierDownandOutCall**

Valuable or stays in-the-money only if the lower barrier is not breached (reference Asset 2 does not go below the barrier), and the payout is in the option on Asset 1 less the strike price.

**718. B2TwoAssetBarrierDownandOutPut**

Valuable or stays in the money only if the lower barrier is not breached (reference Asset 2 does not go below the barrier), and the payout is in the option on the strike price less the Asset 1 value.

**719. B2TwoAssetBarrierUpandInCall**

Valuable or knocked in the money only if the upper barrier is breached (reference Asset 2 goes above the barrier), and the payout is in the option on Asset 1 less the strike price.

**720. B2TwoAssetBarrierUpandInPut**

Valuable or knocked in the money only if the upper barrier is breached (reference Asset 2 goes above the barrier), and the payout is in the option on the strike price less the Asset 1 value.

**721. B2TwoAssetBarrierUpandOutCall**

Valuable or stays in the money only if the upper barrier is not breached (reference Asset 2 does not go above the barrier), and the payout is in the option on Asset 1 less the strike price.

**722. B2TwoAssetBarrierUpandOutPut**

Valuable or stays in the money only if the upper barrier is not breached (reference Asset 2 does not go above the barrier), and the payout is in the option on the strike price less the Asset 1 value.

**723. B2TwoAssetCashOrNothingCall**

Pays cash at expiration as long as both assets are in the money. For call options, both asset values must be above their respective strike prices.

**724. B2TwoAssetCashOrNothingDownUp**

Cash will be paid only if at expiration the first asset is below the first strike, and the second asset is above the second strike.

**725. B2TwoAssetCashOrNothingPut**

Pays cash at expiration as long as both assets are in the money. For put options, both assets must be below their respective strike prices.

**726. B2TwoAssetCashOrNothingUpDown**

Cash will be paid only if the first asset is above the first strike price, and the second asset is below the second strike price at maturity.

**727. B2TwoAssetCorrelationCall**

Asset 1 is the benchmark asset, whereby if at expiration Asset 1's value exceeds Strike 1's value, then the call option is knocked in the money, and the payoff on the option is Asset 2 – Strike 2; otherwise the option becomes worthless.

**728. B2TwoAssetCorrelationPut**

Asset 1 is the benchmark asset, whereby if at expiration Asset 1's value is below Strike 1's value, then the put option is knocked in the money, and the payoff on the option is Strike 2 – Asset 2; otherwise the option becomes worthless.

**729. B2VaRCorrelationMethod**

Computes the Value at Risk using the Variance-Covariance and Correlation method, accounting for a specific VaR percentile and holding period.

**730. RB2VaROptions**

Computes the Value at Risk of a portfolio of correlated options.

**731. B2Volatility**

Returns the Annualized Volatility of time-series cash flows. Enter in the number of periods in a cycle to annualize the volatility (1 = annual, 4 = quarterly, 12 = monthly data).

**732. B2VolatilityImpliedforDefaultRisk**

Used only when computing the implied volatility required for optimizing an option model to compute the probability of default.

**733. B2WarrantsDilutedValue**

Returns the value of a warrant (like an option) that is convertible to stock while accounting for dilution effects based on the number of shares and warrants outstanding.

**734. B2WriterExtendibleCallOption**

The call option is extended beyond the initial maturity to an extended date with a new extended strike if at maturity the option is out of the money, providing a safety net of time for the option holder.

**735. B2WriterExtendiblePutOption**

The put option is extended beyond the initial maturity to an extended date with a new extended strike if at maturity the option is out of the money, providing a safety net of time for the option holder.

**736. B2YieldCurveBIM**

Returns the Yield Curve at various points in time using the Bliss model.

**737. B2YieldCurveNS**

Returns the Yield Curve at various points in time using the Nelson-Siegel approach.

**738. B2ZEOB**

Returns the Economic Order Batch or the optimal quantity to be manufactured on each production batch.

**739. B2ZEOBBatch**

Returns the Economic Order Batch analysis' optimal number of batches to be manufactured per year.

**740. B2ZEOB HoldingCost**

Returns the Economic Order Batch analysis' cost of holding excess units per year if manufactured at the optimal level.

**741. B2ZEOBProductionCost**

Returns the Economic Order Batch analysis' total cost of setting up production per year if manufactured at the optimal level.

**742. B2ZEOBTotalCost**

Returns the Economic Order Batch analysis' total cost of production and holding costs per year if manufactured at the optimal level.

**743. B2ZEOQ**

Economic Order Quantity's order size on each order.

**744. B2ZEOQExcess**

Economic Order Quantity's excess safety stock level.

**745. B2ZEOQOrders**

Economic Order Quantity's number of orders per year.

**746. B2ZEOQProbability**

Economic Order Quantity's probability of out of stock.

**747. B2ZEOQReorderPoint**

Economic Order Quantity's reorder point.

**The following lists the statistical and analytical tools in the Modeling Toolkit:**

**748. Statistical Tool: Chi-Square Goodness of Fit Test**

**749. Statistical Tool: Chi-Square Independence Test**

**750. Statistical Tool: Chi-Square Population Variance Test**

**751. Statistical Tool: Dependent Means (T)**

**752. Statistical Tool: Friedman's Test**

**753. Statistical Tool: Independent and Equal Variances (T)**

**754. Statistical Tool: Independent and Unequal Variances (T)**

**755. Statistical Tool: Independent Means (Z)**

**756. Statistical Tool: Independent Proportions (Z)**

**757. Statistical Tool: Independent Variances (F)**

**758. Statistical Tool: Kruskal-Wallis Test**

**759. Statistical Tool: Lilliefors Test**

- 760. Statistical Tool: Principal Component Analysis
- 761. Statistical Tool: Randomized Block Multiple Treatments
- 762. Statistical Tool: Runs Test
- 763. Statistical Tool: Single Factor Multiple Treatments
- 764. Statistical Tool: Testing Means (T)
- 765. Statistical Tool: Testing Means (Z)
- 766. Statistical Tool: Testing Proportions (Z)
- 767. Statistical Tool: Two-Way ANOVA
- 768. Statistical Tool: Variance-Covariance Matrix
- 769. Statistical Tool: Wilcoxon Signed-Rank Test (One Variable)
- 770. Statistical Tool: Wilcoxon Signed-Rank Test (Two Variables)
- 771. Valuation Tool: Lattice Maker for Debt
- 772. Valuation Tool: Lattice Maker for Yield

**The following lists Risk Simulator tools/applications that are used in the Modeling Toolkit:**

- 773. Monte Carlo Simulation Using 25 Statistical Distributions
- 774. Monte Carlo Simulation: Simulations with Correlations
- 775. Monte Carlo Simulation: Simulations with Precision Control
- 776. Monte Carlo Simulation: Simulations with Truncation
- 777. Stochastic Forecasting: Box-Jenkins ARIMA
- 778. Stochastic Forecasting: Maximum Likelihood
- 779. Stochastic Forecasting: Nonlinear Extrapolation
- 780. Stochastic Forecasting: Regression Analysis
- 781. Stochastic Forecasting: Stochastic Processes
- 782. Stochastic Forecasting: Time-Series Analysis
- 783. Portfolio Optimization: Discrete Binary Decision Variables
- 784. Portfolio Optimization: Discrete and Continuous Decision Variables
- 785. Portfolio Optimization: Discrete Decision Variables
- 786. Portfolio Optimization: Static Optimization

- 787. Portfolio Optimization: Dynamic Optimization
- 788. Portfolio Optimization: Stochastic Optimization
- 789. Simulation Tools: Bootstrap Simulation
- 790. Simulation Tools: Custom Historical Simulation
- 791. Simulation Tools: Data Diagnostics
- 792. Simulation Tools: Distributional Analysis
- 793. Simulation Tools: Multiple Correlated Data Fitting
- 794. Simulation Tools: Scenario Analysis
- 795. Simulation Tools: Sensitivity Analysis
- 796. Simulation Tools: Single Data Fitting
- 797. Simulation Tools: Statistical Analysis
- 798. Simulation Tools: Tornado Analysis

**The following lists Real Options SLS tools/applications that are used in the Modeling Toolkit:**

- 799. Audit Sheet Functions
- 800. Changing Volatility and Risk-Free Rates Model
- 801. Lattice Maker
- 802. SLS Single Asset and Single Phase: American Options
- 803. SLS Single Asset and Single Phase: Bermudan Options
- 804. SLS Single Asset and Single Phase: Customized Options
- 805. SLS Single Asset and Single Phase: European Options
- 806. SLS Multiple Asset and Multiple Phases
- 807. SLS Multinomial Lattices: Pentanomials
- 808. SLS Multinomial Lattices: Quadrinomials
- 809. SLS Multinomial Lattices: Trinomials
- 810. SLS Multinomial Lattices: Trinomials Mean-Reversion

## Glossary of Input Variables and Parameters in the Modeling Toolkit Software

Each of the inputs used in the Modeling Toolkit functions are listed here. Typically, most inputs are single point estimates, that is, a single value such as 10.50, with the exception of the input variables listed with "Series" in parenthesis.

### A

This is the first input variable that determines the shape of the beta and gamma functions, and is required to compute the Incomplete Beta and Incomplete Gamma values. The Incomplete Beta function is a generalization of the beta function that replaces the definite integral of the beta function with an indefinite integral, and is a mathematical expression used to compute a variety of probability distributions such as the gamma and beta distributions. The same can be said about the Incomplete Beta function. This input is used exclusively in the B2MathIncompleteBeta, B2MathIncompleteGammaP, and B2MathIncompleteGammaQ functions, and the parameter is a positive value.

### Above Below

This input variable is used in the partial floating lookback options where the strike price is floating at the Above Below ratio, which has to be a positive value, and is greater than or equal to 1 for a call, and less than or equal to 1 for a put.

### Accruals

This is the amount in notes accruals, a subsection of current liabilities in the balance sheet. This variable is typically zero or a positive dollar or currency amount.

### Additional Cost

This is the amount in additional operating cost used in the B2CreditAcceptanceCost function to determine if a specific credit should be accepted or rejected. This variable is typically a positive dollar or currency amount, and the amount can be zero or positive.

### Alpha

Alpha is used in several places and has various definitions. In the first instance, alpha is the shape parameter in several distributions such as the beta, gamma, Gumbel, logistic, and Weibull distributions. It is also used in the Forward Call Option where if  $\text{Alpha} < 1$ , then a call option starts  $(1 - \text{Alpha})\%$  in the money (a put option will be the same amount out of the money), or if  $\text{Alpha} > 1$ , then the call starts  $(\text{Alpha} - 1)\%$  out of the money (a put option will be the same amount in the money). Finally, alpha is also used as the alpha error level, or Type I error, also known as the significance level in a hypothesis test. It measures the probability of not having the true population mean included in the confidence interval of the sample. That is, it computes the probability of rejecting a true hypothesis.  $1 - \text{Alpha}$  is of course the confidence interval, or the probability that the true population mean resides in the sample confidence interval, and is used in several Six Sigma models. Regardless of use, this parameter has to be a positive value.

### Amortization

This is the amount in amortization in the financial income statement of a firm, and is used to compute the cash flow to equity for both a levered and unlevered firm. This amount is typically zero or positive.

### **Amounts (Series)**

This is a series of numbers (typically listed in a single column with multiple rows) indicating the dollar or currency amounts invested in a specific asset class, used to compute the total portfolio's Value at Risk and used only in the B2VaRCorrelationMethod function. These parameters have to be positive values and arranged in a column with multiple rows.

### **Arithmetic Mean**

This is the simple average used in the lognormal distribution. We differentiate this from the geometric or harmonic means, as this arithmetic mean or simple average is the one used as an input parameter in the lognormal distribution. This parameter has to be a positive value, as the lognormal distribution takes on only positive values.

### **Arithmetic Standard Deviation**

This is a simple population standard deviation that is used in the lognormal distribution. You can use Excel's STDEVP to compute this value from a series of data points. This parameter has to be a positive value.

### **Arrival Rate**

This is the rate of arrival on average to a queue in a specific time period (e.g., the average number of people arriving at a restaurant per day or per hour), and typically follows a Poisson distribution. This parameter has to be a positive value.

### **Asset 1 and Asset 2**

These are the first and second assets in a two-asset exotic option or exchange of asset options. Typically, the first asset (Asset 1) is the payoff asset, whereas the second asset (Asset 2) is some sort of benchmark asset. This is not to be confused with PVAsset, which is the present value of the asset used in a real options analysis. These parameters must be positive values.

### **Asset Allocation (Series)**

These are a series of percentage allocations of assets in a portfolio and must sum to 100%, and this series is used to compute a portfolio's total risk and return levels. These parameters are arranged in a single column with multiple rows and can take on zero or positive values, but the sum of these values must equal 100%.

### **Asset Turnover**

This is the total asset turnover financial ratio, or equivalent to annual total sales divided by total assets, used to compute return on equity or return on assets ratios. It has to be a positive value.

### **Asset Volatility**

This is the internal asset volatility (not to be confused with regular volatility in an options model where we compute it using external equity values) used in determining probabilities of default and distance to default on risky debt (e.g., Merton models); it has to be a positive value. This value can only be determined through optimization either using Risk Simulator to solve for a multiple simultaneous equation function or using the B2MertonImputedAssetVolatility function.



**Average Lead**

This is the average lead time in days required in order to receive an order that is placed. This parameter is typically a positive value, and is used in the economic order quantity models.

**Average Measurement (Series)**

This is a series of the average measurements per sample subgroup in a Six Sigma environment to determine the upper and lower control limits for a control chart (e.g., in an experiment, 5 measurements are taken of a production output, and the experiment is repeated 10 different times with 5 samples taken each time, and the 10 averages of the 5 samples are computed). These values are typically zero or positive, and are arranged in a single column with multiple rows.

**Average Price**

This is the average of historically observed stock prices during a specific lookback period, used to determine the value of Asian options. This parameter has to be positive.

**B**

This is the second input variable for the scale of the beta or gamma functions, and is required to compute the Incomplete Beta and Incomplete Gamma values. The Incomplete Beta function is a generalization of the Beta function that replaces the definite integral of the beta function with an indefinite integral, and is a mathematical expression used to compute a variety of probability distributions such as the gamma and beta distributions. The same can be said about the Incomplete Gamma function. This input is used exclusively in B2MathIncompleteBeta, B2MathIncompleteGammaP, and B2MathIncompleteGammaQ functions, and the parameter is a positive value.

**Barrier**

This is the stock price barrier (it can be an upper or lower barrier) for certain exotic barrier and binary options where if the barrier is breached within the lifetime of the option, the option either comes into the money or goes out of the money, or an asset or cash is exchanged. This parameter is a positive value.

**Base**

This is the power value for determining and calibrating the width of the credit tables. Typically, it ranges between 1 and 4 and has to be a positive value.

**Baseline DPU**

This is the average number of defects per unit in a Six Sigma process, and is used to determine the number of trials required to obtain a specific error boundary and significance level based on this average DPU. This parameter has to be a positive value.

**Batch Cost**

This is the total dollar or currency value of the cost to manufacture a batch of products each time the production line is run. This parameter is a positive value.

**Benchmark Prices (Series)**

This is a series of benchmark prices or levels arranged in a single column with multiple rows, such as the market Standard & Poor's 500, to be used as a benchmark against another equity price level in order to determine the Sharpe ratio.

**Best Case**

This is the best-case scenario value or dollar/currency, used in concert with the Expected Value and Percentile value, to determine the volatility of the process or project. This value is typically positive and has to exceed the expected value.

**Beta**

This parameter is used in several places and denotes different things. When used in the beta, gamma, Gumbel, logistic, and Weibull distributions, it is used to denote the scale of the distribution. When used in the capital asset pricing model (CAPM), it is used to denote the beta relative risk (covariance between a stock's returns and market returns divided by the variance of the market returns). Finally, beta is also used as the beta error or Type II error, measuring the probability of accepting a false hypothesis, or the probability of not being able to detect the standard deviation's changes.  $1 - \text{Beta}$  is the power of the test, and this parameter is used in statistical sampling and sample size determination in the Six Sigma models. Regardless, this parameter has to be a positive value.

**Beta 0, 1, and 2**

These are mathematical parameters in a yield curve construction when applying the Bliss and Nelson-Siegel models for forecasting interest rates. The exact values of these parameters need to be calibrated with optimization, but are either zero or positive values.

**Beta Levered**

This is the relative risk beta level of a company that is levered or has debt, and can be used to determine the equivalent level of an unlevered company's beta. This parameter has to be a positive value.

**Beta Unlevered**

This is the relative risk beta level of a company that is unlevered or has zero debt, and can be used to determine the equivalent level of a levered company's beta with debt. This parameter has to be a positive value.

**Bond Maturity**

This is the maturity of a bond, measured in years, and has to be a positive value.

**Bond Price**

This is the market price of the bond in dollars or other currency units, and has to be a positive value.

**Bond Yield**

This is the bond's yield to maturity—that is, the internal rate of return on the bond when held to maturity—and has to be a positive value. These could be applied to corporate bonds or Treasury zero coupon bonds.

**Buy Cap Rate**

This is the capitalization rate computed by (net operating income/sale price) at the time of purchase of a property, and is typically a positive value, used in the valuation of real estate properties.

**BV Asset**

This is the book value of assets in a company, including all short-term and long-term assets.

**BV Debt and BV Liabilities**

This is the book value of debt or all liabilities in a company, including all short-term and long-term debt or liabilities, and has to be a positive value.

**BV Per Share**

This is the book value price of a share of stock, typically recorded at the initial public offering price available through the company's balance sheet, and has to be a positive value.

**Calendar Ratio**

This ratio is a positive value and is used in pricing an option with a Trading Day Correction, which looks at a typical option and corrects it for the varying volatilities. Specifically, volatility tends to be higher on trading days than on nontrading days. The Trading Days Ratio is simply the number of trading days left until maturity divided by the total number of trading days per year (typically between 250 and 252), and the Calendar Days Ratio is the number of calendar days left until maturity divided by the total number of days per year (365).

**Callable Price**

This is the amount that, when a bond is called, the bondholder will be paid, and is typically higher than the par value of the bond. This parameter requires a positive value.

**Callable Step**

This is the step number on a binomial lattice representing the time period when a bond can be called, and this parameter is a positive integer. For instance, in a 10-year bond when the bond is callable starting on the fifth anniversary, the callable step is 50 in a 100-step lattice model.

**Call Maturity**

This is the maturity of the call option in years, and is used in the complex chooser option (i.e., the exotic option where the holder can decide to make it a call or a put, and each option has its own maturity and strike values), and must be a positive value.

**Call Strike**

This is the strike price of the call option in dollars or currency, and is used in the complex chooser option (i.e., the exotic option where the holder can decide to make it a call or a put, and each option has its own maturity and strike values), and must be a positive value. Sometimes, this variable has different suffixes (e.g., Call Strike Sell Low, Call Strike Buy High, and so forth, whenever there might be more than one call option in the portfolio of option strategies, and these suffixes represent whether this particular call is bought or sold, and whether the strike price is higher or lower than the other call option).

**Call Value**

This is the value of a call option, and is used in the put-call parity model, whereby the value of a corresponding put can be determined given the price of the call with similar option parameters, and this parameter has to be a positive value. Sometimes, this variable has different suffixes (e.g., Call Value Sell Low, Call Value Buy High, and so forth, whenever there might be more than one call option in the portfolio of option

strategies, and these suffixes represent whether this particular call is bought or sold, and whether the premium paid for the option or the option's value is higher or lower than the other call option).

### **Cap**

This is the interest rate cap (ceiling) in an interest cap derivative, and has to be a positive value. The valuation of the cap is done through computing the value of each of its caplets and summing them up for the price of the derivative.

### **Capacity**

This is the maximum capacity level, and is used in forecasting using the S-curve model (where the capacity is the maximum demand or load the market or environment can hold), as well as in the economic order quantity (batch production) model; it has to be a positive value.

### **Capital Charge**

This is the amount of invested capital multiplied by the weighted average cost of capital or hurdle rate or required rate of return. This value is used to compute the economic profit of a project, and is a positive value.

### **Capital Expenditures**

This is used to compute the cash flow to the firm and the cash flow to equity for a firm. Capital expenditures are deducted from the net cash flow to a firm as an expenditure, and this input parameter can be zero or a positive value.

### **Cash**

This variable is used in several places. The first and most prominent is the amount of money that is paid when a binary or barrier option comes into the money, whereas it is also used to denote the amount of cash available in a current asset on a balance sheet. This parameter is zero or positive.

### **Cash Dividend**

This is the dividend rate or dividend yield, in percent, and is typically either zero or positive. This parameter is not to be confused with Cash Dividends series, which is a dollar or currency unit amount, and which can also be zero or positive. This variable is used many times in exotic and real options models.

### **Cash Dividends (Series)**

This is a series of cash dividends in dollars or currency units, which come as lump sum payments of dividends on the underlying stock of an option and can be zero or positive values. This input variable is used in the Generalized Black-Scholes model with cash dividends, and the timing of these cash dividends (Dividend Times) are also listed as a series in a single column with multiple rows.

### **Cash Flows (Series)**

This is a series of cash flows used for a variety of models, including the computation of volatility (using the logarithmic cash flow returns approach) and bond models (bond pricing, convexity, and duration computations), and each cash flow value must be a positive number, arranged in a column with multiple rows.

**Channels**

This is the number of channels available in a queuing model—for instance, the number of customer service or point of sale cash registers available in a McDonald's fast-food restaurant, where patrons can obtain service. This parameter is a positive integer.

**Channels Busy**

This is the number of channels that are currently busy and serving customers at any given moment. This parameter can be zero or a positive integer.

**Choose Time or Chooser Time**

This is the time available for the holder of a complex chooser option whereby the option holder can choose to make the option a call or a put, with different maturities and strike prices. This parameter is a positive value.

**Column**

The column number in a lattice; for instance, if there is a 20-step lattice for 10 years, then the column number for the third year is the sixth step in the lattice and the column is set to 6, corresponding to the step in the lattice.

**Columnwise**

This variable is used in the changing risk-free and changing volatility option model, where the default is 1, indicating that the data (risk-free rates and volatilities) are arranged in a column. This parameter is either a 1 (values are listed in a column) or a 0 (values are listed in a row).

**Common Equity**

This is the total common equity listed in the balance sheet of a company, and is used in financial ratios analysis to determine the return on equity as well as other profitability and efficiency measures, and this parameter is a positive value. This value is different than Total Equity, which also includes other forms such as preferred equity.

**Compounding**

This is the number of compounding periods per year for the European Swaptions (payer and receiver) and requires a positive integer (e.g., set it as 365 for daily compounding, 12 for monthly compounding, and so forth).

**Contract Factor**

This is the contraction factor used in a real option to contract, and this value is computed as the after-contracting net present value divided by the existing base-case net present value (stated another way, this value is  $1 - X$  where  $X$  is the fraction that is forgone if contraction occurs, or the portion that is shared with an alliance or joint venture partner or outsourcing outfit), and the parameter has to be between 0 and 1, noninclusive.

**Conversion Date**

This is the number of days in the future where the convertible bond can be converted into an equivalent value of equity.

**Corporate Bond Yield**

This is the yield of a risky debt or a risky corporate bond in percent, and is used to compute the implied probability of default of a risky debt given a comparable zero coupon risk-free bond with similar maturity. This input has to be a positive value.

**Correlation**

This variable is used in multiple places, including exotic options with multiple underlying assets (e.g., exchange of assets, two-asset options, foreign exchange, and futures or commodity options) and the bivariate normal distribution where we combine two correlated normal distributions.

**Correlations (Series)**

This is an  $n \times n$  correlation matrix and is used to value the portfolio Value at Risk where the individual components of the portfolio are correlated with one another.

**Cost, Cost 1, and Cost 2**

This is a dollar or currency amount corresponding to the cost to execute a particular project or option, and has to be a positive value. This variable is used most frequently in real options models. When there are multiple costs (Cost 1 and Cost 2), this implies several underlying assets and their respective costs or strike prices.

**Cost of Debt**

This is the cost of debt before tax in percent, used to compute the weighted average cost of capital for a project or firm, and is typically a zero or positive value.

**Cost of Equity**

This is the cost of equity before tax in percent, used to compute the weighted average cost of capital for a project or firm, and is typically a zero or positive value.

**Cost of Funds**

This is the cost of obtaining additional funds, in percent, and used in determining credit acceptance levels, and this parameter can be zero or a positive value.

**Cost of Losing a Unit**

This is the monetary dollar or currency amount lost or forgone if one unit of sales is lost when there is an insufficient number of channels in the queuing models to determine the optimal number of channels to have available, and can be zero or a positive value.

**Cost of Order**

This is a dollar or currency amount of the cost of placing an order for additional inventory, used in the economic order quantity models to determine the optimal quantity of inventory to order and to have on hand.

**Cost of Preferred Equity**

This is the before-tax cost of preferred equity in percent, used to compute the cost of funds using the weighted average cost of capital model, and is either zero or a positive value.

**Cost to Add Channel**

This is the monetary dollar or currency amount required to add another channel in the queuing models, to determine the optimal number of channels to have available, and is a positive value.

**Coupon and Coupons (Series)**

This is the coupon payment in dollars or currency of a debt or callable debt, and is used in the options adjusted spread model to determine the required spreads for a risky and callable bond. For Coupons, it is a time series of cash coupon payments at specific times.

**Coupon Rate**

This is the coupon payment per year, represented in percent, and is used in various debt-based options and credit options where the underlying is a coupon-paying bond or debt, and this value can be zero or positive.

**Covariances (Series)**

This is the  $n \times n$  variance-covariance matrix required to compute the portfolio returns and risk levels given each individual asset's allocation (see Asset Allocation), and these values can be negative, zero, or positive values. The Variance-Covariance Matrix tool in the Modeling Toolkit can be used to compute this matrix given the raw data of each asset's historical values.

**Credit Exposures**

This is the number of credit or debt lines that exists in a portfolio, and has to be a positive integer.

**Credit Spread**

This is the percentage spread difference between a risky debt or security and the risk-free rate with comparable maturity, and is typically a positive value.

**Cum Amount**

This is a dollar or currency amount, used in a Time Switch option, where the holder receives the Accumulated (Cum) Amount  $\times$  Time Steps each time the asset price exceeds the strike price for a call option (or falls below the strike price for a put option).

**Currency Units**

This input parameter is a positive value and is used in a Foreign Takeover option with a foreign exchange element, which means that if a successful takeover ensues (if the value of the foreign firm denominated in foreign currency is less than the foreign currency units required), then the option holder has the right to purchase the number of foreign currency units at the predetermined strike price (denominated in exchange rates of the domestic currency to the foreign currency) at the expiration date of the option.

**Current Asset**

This is the sum of cash, accounts receivable, and inventories on a balance sheet, that is, the short-term liquid assets, and has to be a positive value.

**Current Price**

This is the price level of a variable at the current time. This known value has to be positive, and is used for forecasting future price levels.

**Current Yield**

This is the current spot interest rate or yield, used to price risky debt with callable and embedded option features, and has to be a positive value.

### **Custom Risk-free (Series)**

This is a series of risk-free rates with the relevant times of occurrence—that is, where there are two columns with multiple rows and the first column is the time in years (positive values) and the second column lists the risk-free rates (each value has to be a positive percentage), and both columns have multiple rows. This variable is used in the custom option models where risk-free rates and volatilities are allowed to change over time.

### **Custom Volatility (Series)**

This is a series of annualized volatilities with the relevant times of occurrence—that is, where there are two columns with multiple rows and the first column is the time in years (positive values) and the second column lists the volatilities (each value has to be a positive percentage), and both columns have multiple rows. This variable is used in the custom option models where risk-free rates and volatilities are allowed to change over time.

### **CY Reversion**

This is the rate of mean reversion of the convenience yield of a futures and commodities contract, and has to be zero or a positive value. The convenience yield is simply the rate differential between a nonarbitrage futures and spot price and a real-life fair market value of the futures price, and can be computed using the B2ConvenienceYield function. With the raw data or computed convenience yields, the mean reversion rate can be calibrated using Risk Simulator's statistical analysis tool.

### **CY Volatility**

This is the annualized volatility of the convenience yield of a futures and commodities contract, and has to be a positive value. The convenience yield is simply the rate differential between a nonarbitrage futures and spot price and a real-life fair market value of the futures price, and can be computed using the B2ConvenienceYield function. The volatility can be computed using various approaches as discussed in the Volatility definition.

### **Daily Volatilities (Series)**

This is a series of daily volatilities of various asset classes (arranged in a column with multiple rows), used in computing the portfolio Value at Risk, where each volatility is typically small but has to be a positive value.

### **Days Per Year**

This is the number of days per year to compute days sales outstanding, and is typically set to 365 or 360. The parameter has to be a positive integer.

### **Debt Maturity**

The maturity period measured in years for the debt, typically this is the maturity of a corporate bond, and is a positive value, used in the asset-equity parity models, to determine the market value of assets and market value of debt, based on the book value of debt and book value of assets as well as the equity volatility.

### **Defaults**

This is the number of credit or debt defaults within some specified period, and can be zero or a positive integer.



**Default Probability**

This is the probability of default, set between 0% and 100%, to compute the credit risk shortfall value, and can be computed using the Merton probability of default models, as well as other probability of default models in the Modeling Toolkit.

**Defective Units (Series)**

These is the series of numbers of defective units in Six Sigma models, to compute the upper and lower control limits for quality control charts; the numbers are typically zero or positive integers, arranged in a column with multiple rows.

**Defects**

This is a single value indicative of the number of defects in a process for Six Sigma quality control, to determine items such as process capability (Cpk) defects per million opportunities (DPMO) and defects per unit (DPU). This parameter is either zero or a positive integer.

**Delta**

Delta is a precision measure used in Six Sigma models. Specifically, the Delta Precision is the accuracy or precision with which the standard deviation may be estimated. For instance, a 0.10% Delta with 5% Alpha for 2 tails means that the estimated mean is plus or minus 0.10%, at a 90% ( $1 - 2 \times \text{Alpha}$ ) confidence level.

**Deltas (Series)**

This is a series of delta measures, where the delta is defined here as a sensitivity measure of an option. Specifically, it is the instantaneous change of the option value with an instantaneous change in the stock price. You can use the B2CallDelta function to compute this input, which typically consists of positive values arranged in a column with multiple rows.

**Demand**

This is the level of demand for a particular manufactured product, used to determine the optimal economic order quantity or the optimal level of inventory to have on hand, and has to be a positive integer.

**Depreciation**

This is the level of depreciation, measured in dollars or currency levels, as a noncash expense add-back to obtain the cash flows available to equity and cash flows available to the firm.

**DF**

This is the degrees of freedom input used in the chi-square and t-distributions. The higher this value, the more closely these distributions approach the normal Gaussian distribution. This input parameter is a positive integer, and is typically larger than 1. You can use Risk Simulator's distributional fitting tool to fit your existing data to obtain the best estimate of DF. Alternatively, the distributional analysis tool can also be used to see the effects of higher and lower DF values.

**DF Denominator**

This is the degrees of freedom of the denominator used in the F-distribution. This input parameter is a positive integer, and is typically larger than 1. You can use Risk Simulator's distributional fitting tool to fit your existing data to obtain the best estimate of

DF. Alternatively, the distributional analysis tool can also be used to see the effects of higher and lower DF values.

#### **DF Numerator**

This is the degrees of freedom of the numerator used in the F-distribution. This input parameter is a positive integer, and is typically larger than 1. You can use Risk Simulator's distributional fitting tool to fit your existing data to obtain the best estimate of DF. Alternatively, the distributional analysis tool can also be used to see the effects of higher and lower DF values.

#### **Discount Rate**

This is the discount rate used to determine the price-to-earnings multiple by first using this input to value the future stock price. This parameter is a positive value, and in the case of the PE Ratio model it needs to be higher than the growth rate. Sometimes the weighted average cost of capital is used in its place for simplicity.

#### **Dividend, Dividend Rate, Dividend 1 and 2**

This is the dividend rate or dividend yield, in percent, and is typically either zero or positive. This parameter is not to be confused with Cash Dividend, which is a dollar or currency unit amount and can also be zero or positive. This variable is used many times in exotic and real options models. Dividend 1 and Dividend 2 are simply the dividend yields on the two underlying assets in a two-asset option.

#### **Dividend Times (Series)**

This is a series of times in years when the cash dividends in dollars or currency are paid on the underlying stock of an option, and can be zero or positive values. This input variable is used in the Generalized Black-Scholes model with cash dividends, and the timing of these cash dividends is listed as a series in a single column with multiple rows.

#### **Domestic RF**

This is the domestic risk-free rate used in foreign or takeover options that requires the inputs of a domestic and foreign risk-free rate, which in this case has to be a positive value.

#### **Down**

This is the down step size used in an asymmetrical state option pricing model, and needs to be a value between 0 and 1.

#### **DSO**

This is days sales outstanding, or the average accounts receivables divided by the average sales per day, to be used to compute the profitability of issuing new credit to a corporation. This input variable can be computed using the B2RatiosDaysSalesOutstanding function, and the parameter has to be a positive value.

#### **DT**

This is the time between steps; that is, suppose a bond or an option has a maturity of 10 years and a 100-step lattice is used. DT is 0.1, or 0.1 years will elapse with every lattice step taken. This parameter has to be a positive value, and is used in the B2BDT lattice functions.

**Duration**

This variable is typically computed using some B2BondDuration function, but as an input it represents the conversion factor used in converting a spread or interest rate differential into a dollar currency amount, and is used in several debt-based options. This input has to be a positive value, and in some cases is set to 1 in order to determine the debt-based option's value in percentage terms.

**EBIT**

Earnings before interest and taxes (EBIT) is used in several financial ratios analysis models. EBIT is also sometimes called operating income, and can be a negative or positive value.

**Ending Plot**

This variable is used in the options trading strategies (e.g., straddles, strangles, bull spreads, and so forth), representing the last value to plot for the terminal stock price (the x-axis on an option payoff chart); it has to be higher than the Starting Plot value, and is a positive input.

**EPS**

Earnings per share (EPS) is net income divided by the number of shares outstanding; EPS is used in several financial ratios analysis models, and can take on either negative or positive values.

**Equity Correlation**

This is the correlation coefficient between two equity stock prices (not returns), and can be between  $-1$  and  $+1$  (inclusive), including 0.

**Equity Multiplier**

Equity multiplier is the ratio of total assets to the total equity of the company, indicating the amount of increase in the ability of the existing equity to generate the available total assets, and has to be a positive value.

**Equity Price or Share Price**

This is the same as stock price per share, and has to be a positive value.

**Equity Value or Total Equity**

This is the same as total equity in a firm, computed by the number of shares outstanding times the market share price, and can be either zero or a positive value.

**Equity Volatility**

This is the volatility of stock prices, not to be confused with the volatility of internal assets. The term Volatility is used interchangeably with Equity Volatility, but this term is used in models that require both equity volatility and some other volatility (e.g., asset volatility or foreign exchange rate volatility), and this value is typically positive.

**Exchange Rate**

This is the foreign exchange rate from one currency to another, and is the spot rate for domestic currency to foreign currency; it has to be a positive value.

**Exercise Multiple**

This is the suboptimal exercise multiple ratio, computed as the historical average stock price at which an option with similar type and class, held by a similar group of people, was executed, divided by the strike price of the option. This multiple has to be greater than 1. This input variable is used in valuing employee stock options with suboptimal exercise behaviors.

**Expand Factor**

This is the expansion factor for real options models of options to expand, and has to be a positive value greater than 1.0, computed using the total expanded net present value (base case plus the expanded case) divided by the base case net present value.

**Expected Value**

This is the expected value or mean value of a project's net present value, used to determine the rough estimate of an annualized implied volatility of a project using the management approach (volatility to probability approach), and is typically a positive value.

**Face Value**

This is the face value of a bond, in dollars or currency, and has to be a positive value. This face value is the redeemable value at the maturity of the bond (typically, this value is \$1,000 or \$10,000).

**First Period**

This input variable is used in a spread option, where the maturity of a spread option is divided into two periods (from time zero to this first period, and from the first period to maturity) and the spread option pays the difference between the maximum values of these two periods. This input parameter has to be greater than zero and less than the maturity of the spread option.

**First Variable**

This is the first variable used in a pentanomial lattice model to value exotic or real options problems. In the pentanomial lattice, two binomial lattices (a binomial lattice models two outcomes, up or down, evolved through the entire lattice) are combined to create a single rainbow lattice with two underlying variables multiplied together, to create five possible outcomes (UP1 and UP2, UP1 and DOWN2, Unchanged 1 and Unchanged 2, DOWN1 and UP2, and DOWN2 and DOWN2). This input parameter has to be a positive value.

**Fixed FX Rate**

This input variable is used in valuing Quanto options that are traded on exchanges around the world, (also known as foreign equity options). The options are denominated in another currency than that of the underlying asset. The option has an expanding or contracting coverage of the foreign exchange value of the underlying asset, based on the fixed exchange rate (domestic currency to foreign currency), and has to be a positive value.

**Floor**

This is the interest rate floor and is an interest derivative; it has to be a positive value. The valuation of the floor is done through computing the value of each of its floorlets and summing them up for the price of the derivative.

**Foreign Exchange Volatility or Forex Volatility**

This is the annualized volatility of foreign exchange rates, typically computed using the annualized logarithmic relative returns (use the B2Volatility function to compute this volatility based on historical exchange rates), and has to be a positive value.

**Foreign Rate or Foreign RF**

This is the foreign risk-free rate, used in foreign exchange or foreign equity options and valuation models, and has to be a positive value.

**Foreign Value**

This is the value of a foreign firm denominated in foreign currency, used in valuing a takeover option, and this value has to be a positive number.

**Forward CY Correlation**

This variable is sometimes truncated to "ForCYCorrel." It is the linear correlation between forward rates and convenience yields, and is used in valuing commodity options. Correlations have to be between  $-1$  and  $+1$  (typically noninclusive).

**Forward Days**

This is the positive integer representing the number of days into the future where there is a corresponding forward rate that is applicable.

**Forward Price**

This is the prearranged price of a contract set today for delivery in the future, and is sometimes also used interchangeably in terms of the future price of an asset or commodity that may not be prearranged but is known with certainty or is the expected price in the future.

**Forward Rate**

This is the forward rate in a commodity option, and has to be a positive value.

**Forward Reversion Rate or For-Reversion**

This input variable is used in valuing commodity options. It computes the values of commodity-based European call and put options, where the convenience yield and forward rates are assumed to be mean-reverting and each has its own volatilities and cross-correlations, creating a complex multifactor model with interrelationships among the variables. The forward reversion rate is the rate of mean reversion of the forward rate, and is typically a small positive value; it can be determined and calibrated using Risk Simulator's statistical analysis tool.

**Forward Time**

This is the time in the future when a Forward Start option begins to become active, and this input parameter has to be a positive value greater than zero and less than the maturity of the option.

**Forward Volatility or For-Volatility**

This input variable is used in valuing commodity options. It computes the values of commodity-based European call and put options, where the convenience yield and forward rates are assumed to be mean-reverting and each has its own volatilities and cross-correlations, creating a complex multifactor model with interrelationships among the variables. The forward volatility is the annualized volatility of forward rates and prices,

and has to be a positive value, typically computed using the annualized logarithmic relative returns of historical forward prices (use the B2Volatility function to compute this volatility based on historical prices). It has to be a positive value.

### **Free Cash Flow**

This is the free cash flow available to the firm, and can be computed as the net income generated by the firm with all the modifications of noncash expense add-backs as well as capital expenditure reductions, or can be computed using the three B2RatiosCashFlow models.

### **Future Price**

This is the price of in the future of any variable that is either known in advance or forecasted. This value is not the price of a futures contract, and is typically a positive value.

### **Future Returns**

This is the returns of any variable that is either known in advance or forecasted. This value is not the returns on a futures contract, and can be positive or negative in value.

### **Futures, Futures Price, and Futures 1 or Futures 2**

This is the price of the futures contract (if there are two futures contracts, there will be a numerical value, as in the futures spread options computations), and has to be a positive value.

### **Futures Maturity**

This is the maturity of the futures contract, measured in years, and has to be a positive value.

### **Granularities**

This input parameter has to be a positive integer value and is used in the computation of finite differences in obtaining the value of an option. Great care has to be taken to calibrate this input, using alternate closed-form solutions.

### **Gross Rent**

This is the dollar or currency amount of annualized gross rent, and can be zero or a positive value; it is used in property valuation models.

### **Growth Rate**

This positive percentage value is used in various locations and signifies the annualized average growth of some variable. In the financial ratios analysis, this would be the growth rate of dividends (and this value must be less than the discount rate used in the model). In contrast, this parameter is the annualized growth rate of assets for the Merton probability of default models, and this variable is used as the growth of a population or market in the S-curve forecast computation on curve saturation rates.

### **Holding Cost**

This is the zero or positive dollar or currency cost of holding on to an additional unit of inventory, used in the economic order quantity models to determine the optimal level of inventories to hold.

**Horizon**

This is a positive value representing some time period denominated in years, and is used in forecasting future values of some variable.

**Horizon Days**

This is a positive integer value representing the number of holding days to compute a Value at Risk for, which typically is between 1 and 10 days, and calibrated to how long it will take on average for the bank or company to liquidate its assets to cover any extreme and catastrophic losses or to move out of a loss portfolio.

**Inflation**

This is the annualized rate of inflation, measured as a percentage, and is typically a positive value, although zero and negative values may occur but are rare.

**Interest Lattice**

This refers to the lattice that is developed for the underlying interest rates modeled for a yield curve and its spot volatilities over time, and is used in pricing interest-sensitive derivatives.

**Interest Paid**

This is the dollar or currency amount of interest paid per year, and is either zero or a positive value.

**Interest Rate**

This is the percentage interest paid per year, and is typically zero or a positive value.

**Interest Rates (Series)**

This is a series of annualized interest rates or discount rates in percent, in a column with multiple rows, used in computing a project's net present value or the price of a bond (given a corresponding series of cash flows).

**Interest Volatility**

This is the annualized volatility of interest rates, in percent, and has to be a positive value. See the definition of Volatility in this Glossary for details on some of the techniques used in computing volatility.

**Inventory**

This is the amount of inventories in dollars or currency, and can be determined from a company's balance sheet; it is typically a positive number but can sometimes take on a zero value.

**Invested Capital**

This is the dollar or currency amount of invested capital, and is typically a positive value, used to compute capital charge and economic capital of a project or firm.

**Investment**

This is the initial lump sum investment dollar or currency amount, used to compute the internal rate of return (IRR) of a project, and this value is a positive number (although it is used as a negative value in the model, enter the value as positive).

## **Jump Rate**

This variable is used in a Jump Diffusion option, which is similar to a regular option with the exception that instead of assuming that the underlying asset follows a lognormal Brownian Motion process, the process here follows a Poisson Jump Diffusion process, and is used in the B2ROJumpDiffusion models. That is, stock or asset prices follow jumps, and these jumps occur several times per year (observed from history). Cumulatively, these jumps explain a certain percentage of the total volatility of the asset. The jump rate can be determined using historical data or using Risk Simulator's statistical analysis tool to calibrate the jump rate.

## **Jump Size**

Similar to the Jump Rate, the Jump Size is used to determine the size of a jump in a Jump Diffusion option model. Typically, this value is greater than 1, to indicate how much the jump is from the previous period, and is used on the B2ROJumpDiffusion models.

## **Jumps Per Year**

An alternative input to the Jump Size is the number of jumps per year, as it is easier to calibrate the total number of jumps per year based on expectations or historical data; this input is a positive integer used in the B2MertonJumpDiffusion models.

## **Known X and Known Y Values**

These are the historical or comparable data available and observable, in order to use the cubic spline model (both interpolate missing values and extrapolate and forecast beyond the sample data set), which is usually applied in yield curve and interest rate term structure construction.

## **Kurtosis**

This is the fourth moment of a distribution, measuring the distribution's peakedness and extreme values. An excess kurtosis of 0 is a normal distribution with "normal" peaks and extreme values, and this parameter can take on positive, zero, or negative values.

## **Lambda, Lambda 1, and Lambda 2**

Lambda is the mean or average value used in a Poisson (an event occurring on average during a specified time period or area) and an exponential (the average rate of occurrence) distribution, and is also used in calibrating the yield curve models. Regardless of the use, lambda has to be a positive value.

## **Last Return**

This input is used in the exponentially weighted moving average (EWMA) volatility forecast, representing the last period's return; it can be periodic or annualized, and can take on positive or negative values. If entering a periodic return, make sure to set the Periodicity input in the EWMA function to 1 to obtain a periodic volatility forecast, or the correct periodicity value to obtain the annualized volatility forecast. Conversely, if entering an annualized return, set periodicity to be equal to 1 to obtain the annualized volatility forecast.

## **Last Volatility**

This input is used in the EWMA volatility forecast, representing the last period's volatility; it can be periodic or annualized, and can take on only positive values. If entering a periodic volatility, make sure to set the Periodicity input in the EWMA function to 1 to obtain a periodic volatility forecast, or the correct periodicity value to obtain the



annualized volatility forecast. Conversely, if entering an annualized volatility, set periodicity to be equal to 1 to obtain the annualized volatility forecast.

### **Likely**

This is the most likely or mode value in a triangular distribution, and can take on any value, but has to be greater than or equal to the minimum and less than or equal to the maximum value inputs in the distribution.

### **Loan Value Ratio**

This is a positive percentage ratio of the amount of loan required to purchase a real estate investment to the value of the real estate.

### **Location**

This is the location parameter in the Pareto distribution, also used as the starting point or minimum of the distribution, and is sometimes also called the Beta parameter in the Pareto distribution; it can only take on a positive value.

### **Long Term Level**

This is the long-term level to which the underlying variable will revert in the long run; it is used in mean-reverting option models, where the underlying variable is stochastically changing but reverts to some long-term mean rate, which has to be a positive value.

### **Long Term Rate**

This is similar to the long-term level, but the parameter here is a percent interest rate, a long-term rate to which the underlying interest rate process reverts over time.

### **Lookback Length**

This input variable is used in a floating strike partial lookback option, where at expiration the payoff on the call option is being able to purchase the underlying asset at the minimum observed price from inception to the end of the lookback time. Conversely, the put will allow the option holder to sell at the maximum observed asset price from inception to the end of the lookback time.

### **Lookback Start**

This input variable is used in fixed strike lookback options, where the strike price is predetermined, such that at expiration, the payoff on the call option is the difference between the maximum observed asset price less the strike price during the time between the Lookback Start period to the maturity of the option. Conversely, the put will pay the maximum difference between the lowest observed asset price less the strike price during the time between the starting period of the lookback to the maturity of the option.

### **Lost Sales Cost**

This is the dollar or currency amount of a lost sale, typically zero or a positive value, and is used in the economic order quantity models to determine the optimal levels of inventory to hold or levels of production to have.

### **Lower Barrier**

This is the lower barrier stock price in a double barrier or graduated barrier option, where this barrier is typically lower than the existing stock price and lower than the upper barrier level; it must be a positive value.

**Lower Delta**

This is the instantaneous options delta (a Greek sensitivity measure that can be computed using the B2CallDelta or B2PutDelta functions) of the percentage change in option value given the instantaneous change in stock prices for the lower barrier stock price level. This value is typically set at zero or a positive value.

**Lower Strike**

This is the lower strike price (a positive value) in a Supershare option, which is traded or embedded in supershare funds and is related to a Down and Out, Up and Out double barrier option, where the option has value only if the stock or asset price is between the upper and lower barriers; at expiration, it provides a payoff equivalent to the stock or asset price divided by the lower strike price.

**Lower Value**

This input variable is used in the B2DT lattices for computing option adjusted spreads in debt with convertible or callable options, and represents the value that is one cell adjacent to the right and directly below the current value in a lattice. All values in a lattice and this input must be positive.

**LSL**

This is the lower specification level of a Six Sigma measured process—that is, the prespecified value that is the lowest obtainable or a value that the process should not be less than.

**Marginal Cost**

This is the additional dollar or currency cost to the bank or credit-granting institution of approving one extra credit application, and is used to determine if a credit should be approved; this parameter is typically a positive value.

**Marginal Profit**

This is the additional dollar or currency profit to the bank or credit-granting institution of approving one extra credit application, and is used to determine if a credit should be approved; this parameter is typically a positive value.

**Market Price Risk**

This input variable is used in mean-reverting option models as well as in the CIR, Merton, and Vasicek models of risky debt, where the underlying interest rate process is also assumed to be mean-reverting. The market price of risk is also synonymous with the Sharpe ratio, or bang for the buck—that is, the expected returns of a risky asset less the risk-free rate, all divided by the standard deviation of the excess returns.

**Market Return**

This is the positive percentage of the annualized expected rate of return on the market, where a typical index such as the Standard & Poor's 500 is used as a proxy for the market.

**Market Volatility**

This input variable is the annualized volatility of a market index, used to model the probability of default for both public and private companies using an index, a group of comparables, or the market, assuming that the company's asset and debt book values are known, as well as the asset's annualized volatility. Based on this volatility and the

correlation of the company's assets to the market, we can determine the probability of default.

### **Matrix A and Matrix B (Series)**

This is simply an  $n \times m$  matrix where  $n$  and  $m$  can be any positive integer, and is used for matrix math and matrix manipulations.

### **Maturity**

This is the period until a certain contract, project, or option matures, measured in years, and has to be a positive value.

### **Maturity Bought**

This input variable is the maturity, measured in years (a positive value), of a call option that is bought in a Delta-Gamma hedge that provides a hedge against larger changes in the underlying stock or asset value. This is done by buying some equity shares and a call option, which are funded by borrowing some amount of money and selling a call option at a different strike price. The net amount is a zero sum game, making this hedge costless.

### **Maturity Extend**

This is the maturity in years, for the writer extendible option of the extended maturity, and has to be a positive value.

### **Maturity Sold**

This input variable is the maturity, measured in years, of a call option that is sold in a Delta-Gamma hedge that provides a hedge against larger changes in the underlying stock or asset value. This is done by buying some equity shares and a call option, which are funded by borrowing some amount of money and selling a call option at a different strike price. The net amount is a zero sum game, making this hedge costless.

### **Maximum or Max**

This is the maximum value of a distribution (e.g., in a discrete uniform, triangular, or uniform distribution), indicating the highest attainable value, and can be both positive or negative values, as well as integer (used in discrete uniform, triangular, or uniform distributions) or continuous (used in triangular and uniform distributions).

### **Mean**

This is the arithmetic mean used in distributions (e.g., logistic, lognormal, and normal distributions) as well as the average levels in a Six Sigma process. This value can be positive (e.g., logistic and lognormal distributions) or negative (e.g., normal distribution), and is typically positive when applied in Six Sigma.

### **Mean Reverting Rate**

This is the rate of reversion of an underlying variable (typically interest rates, inflation rates, or some other commodity prices) to a long-run level. This parameter is either zero or positive, and the higher the value, the faster the variable's value reverts to the long-run mean. Use Risk Simulator's statistical analysis tool to determine this rate based on historical data.

### **Measurement Range (Series)**

In each sampling group in a Six Sigma process, several measurements are taken, and the range (maximum value less the minimum value) is determined. This experiment is

replicated multiple times through various sampling groups. The measurement range is hence a series of values (one value for each statistical sampling or experiment subgroup) arranged in a column with multiple rows, where each row represents a group. The range has to be a positive value and is typically a positive integer, and the results are used to determine the central line, as well as upper and lower control limits for quality control charts in Six Sigma.

### **Minimum or Min**

This is the minimum value of a distribution (e.g., in a discrete uniform, triangular, or uniform distribution), indicating the lowest attainable value, and can be both positive or negative values, as well as integer (used in discrete uniform, triangular, or uniform distributions) or continuous (used in triangular and uniform distributions).

### **MV Debt**

This is the market value of risky debt, and can be priced using the Asset-Equity Parity models using book values of debt and equity, and applying the equity volatility in the market. Typically, this value is different from the book value of debt, depending on the market volatility and internal asset values, but is always zero or a positive value.

### **MV Equity**

This is the total market value of equity, computed by multiplying the number of outstanding shares by the market price of a share of the company's stock, and is a positive value.

### **MV Preferred Equity**

This is the total market value of preferred equity, computed by multiplying the number of outstanding shares by the market price of a share of the company's preferred stock, and is a positive value.

### **Net Fixed Asset**

This is the total net fixed assets (gross fixed long-term assets less any accumulated depreciation levels), and is a positive value, obtained from a company's balance sheet.

### **Net Income**

This is the net income after taxes, in dollar or currency amounts, and can be either positive or negative.

### **New Debt Issue**

This is the amount of new debt issued to raise additional capital, and is either zero or positive.

### **Nominal CF**

This is the nominal cash flow amounts, including inflation, and can be negative or positive. Nominal cash flow is the real cash flow levels plus inflation adjustments.

### **Nominal Rate**

This is the quoted or nominal interest rate, which is equivalent to the real rate of interest plus the inflation rate, and as such is typically higher than either the real interest rate or the inflation rate, and must be a positive value.

**Nonpayment Probability**

This is the probability that a debt holder will be unable to make a payment and will default for one time. Sometimes the probability of default can be used, but in most cases the single nonpayment probability is higher than the complete default probability.

**NOPAT**

Net operating profits after taxes (NOPAT) is typically computed as net revenues less any operating expenses and less applicable taxes, making this value typically higher than net income, which accounts for other items such as depreciation and interest payments. This parameter can be positive or negative.

**Notes or Notes Payable**

The amount in dollars or currency for notes payable, a form of short-term current liability, is typically zero or a positive value.

**Notional**

This is a positive dollar amount indicating the underlying contractual amount (e.g., in a swap).

**Observed Max**

This is the observed maximum stock price in the past for a lookback Asian option, and this parameter has to be a positive amount and larger than the observed minimum value.

**Observed Min**

This is the observed minimum stock price in the past for a lookback Asian option, and this parameter has to be a positive amount and smaller than the observed maximum value.

**Old Value**

This is the previous period's value or old value, used in computing the S-curve forecast, and must be a positive value.

**Operating Expenses**

The dollar or currency amount of total operating expenses (other than direct expenses or cost of goods sold, but including items like sales and general administrative expenses) has to be a positive value.

**Option Maturity**

This is the maturity of an option measured in years, and has to be a positive value; the longer the maturity, holding everything else constant, the higher the value of the option.

**Option Strike**

This is the contractual strike price of an option measured in dollars or currency levels, and has to be a positive value. Holding everything else constant, a higher strike price means a lower call option value and a higher put option value.

**Option Value**

This is the value of an option, and has to be either zero or a positive value. The option value is never negative, and can be computed through a variety of methods including closed-form models (e.g., Black-Scholes and American approximation models); lattices

(binomial, trinomial, quadrinomial, and pentanomial lattices); simulation; and analytical techniques (variance reduction, finite differences, and iterative processes).

### **Other Assets**

The value of any short-term indirect or intangible assets is usually a zero or positive value.

### **Payables**

The amount in dollars or currency values for accounts payable, a form of short-term current liability, is typically zero or a positive value.

### **Payment Probability**

This is used to compute the cost of rejecting a good credit by accounting for the chances that payment will be received each time when it is due, and is a positive percentage value between 0% and 100%.

### **Percentile**

This parameter has to be a positive value between 0% and 100%, and is used in Value at Risk computations and implied volatility computations. In VaR analysis, this value is typically 95%, 99%, or 99.9%, whereas it has to be lower than 50% for the worst-case scenario volatility model and higher than 50% for the best-case scenario volatility model.

### **Periodicity**

Periodicity in the context of barrier options means how often during the life of the option the asset or stock value will be monitored to see if it breaches a barrier. As an example, entering 1 means annual monitoring, 12 implies monthly monitoring, 52 for weekly, 252 for daily trading, 365 for daily calendar, and 1,000,000 for continuous monitoring. In the application of GARCH volatility forecasts, if weekly stock price data is used, enter 52 for periodicity (250 for number of trading days per year if daily data is used, and 12 for monthly data). Regardless of the application, this parameter is a positive integer.

### **Periodic Rate**

This is the interest rate per period, and is used to compute the implied rate of return on an annuity; this value has to be a positive percent.

### **Periods**

This refers to a positive integer value representing the number of payment periods in an annuity, and is used to compute the equivalent annuity payment based on the periodic rate.

### **Population**

This is used in the hypergeometric discrete distribution, indicating the population size. Clearly this positive integer value has to be larger than the population successes and is at least 2. The total number of items or elements or the population size is a fixed number, a finite population; the population size must be less than or equal to 1,750, the sample size (the number of trials) represents a portion of the population, and the known initial probability of success in the population changes after each trial.

### **Population Success or Pop Success**

This is used in the hypergeometric discrete distribution, indicating the number of successes of a trait in a population. Clearly this positive integer value has to be smaller than the population size. The hypergeometric distribution is a distribution where the

actual trials change the probability for each subsequent trial and are called *trials without replacement*. For example, suppose a box of manufactured parts is known to contain some defective parts. You choose a part from the box, find it is defective, and remove the part from the box. If you choose another part from the box, the probability that it is defective is somewhat lower than for the first part because you have removed a defective part. If you had replaced the defective part, the probabilities would have remained the same, and the process would have satisfied the conditions for a binomial distribution. The total number of items or elements (the population size) is a fixed number, a finite population; the population size must be less than or equal to 1,750, the sample size (the number of trials) represents a portion of the population, and the known initial probability of success in the population changes after each trial.

### **PPE**

This is the dollar or currency value of plant, property, and equipment values, and is either zero or positive.

### **Preferred Dividend**

This is the dollar or currency amount of total dividends paid to preferred stocks (dividends per share multiplied by the number of outstanding shares), and is a positive value.

### **Preferred Stock**

This is the price of a preferred stock per share multiplied by the number of preferred shares outstanding, and has to be a positive value.

### **Previous Value**

This is the value of some variable in the previous period, used in forecasting time-series data. This has to be a positive value.

### **Price and CY Correlation**

This is the correlation between bond price returns and convenience yields, used in the computation of commodity options, and can take on any value between  $-1$  and  $+1$ , inclusive.

### **Price and Forward Correlation**

This is the correlation between bond price returns and future price returns, used in the computation of commodity options, and can take on any value between  $-1$  and  $+1$ , inclusive.

### **Price Improvement**

This is a percentage value of the price of a real estate property that went to improvements, and is used to compute the depreciation on the property.

### **Price Lattice**

This is the price lattice of an interest-based derivative (e.g., bond option) where the underlying is the term structure of interest rates with its own volatilities.

### **Principal Repaid**

This is the dollar or currency amount indicating the value of principal of debt repaid, and is used to compute the adjusted cash flow to equity of a levered firm.

**Probability**

This is a probability value between 0% and 100% and used in the inverse cumulative distribution function (ICDF) of any distribution, where given a probability level and the relevant distributional parameters, will return the  $X$  value of the distribution. For instance, in tossing a coin two times, using the binomial distribution (trials is set to 2 and the probability of success, in this case, obtaining heads in the coin toss, is set to 50%), the ICDF of a 25% probability parameter will return an  $X$  value of 0. That is, the probability of getting no heads ( $X$  of zero) is exactly 25%.

**Profit Margin**

This is the percentage of net income to total sales, and is typically a positive value, although zero and negative values are possible.

**Proportion**

This is the proportion of defects in a Six Sigma model to determine the requisite sample size to obtain in order to reach the desired Type I and Type II errors, and this value is between 0 and 1, inclusive.

**Put Maturity**

This is the maturity of the put option, measured in years, and this parameter is a positive value.

**Put Strike**

This is the contractual strike price for the put option, and has to be a positive value. Sometimes this variable has different suffixes (e.g., Put Strike Sell Low, Put Strike Buy High, and so forth, whenever there might be more than one put option in the portfolio of option strategies, and these suffixes represent whether this particular put is bought or sold, and whether the strike price is higher or lower than the other put option).

**Put Value**

This is the fair market value of the put option, and sometimes the theoretical price of a put option is used in its place when market information is unavailable. This parameter requires a positive input. Sometimes this variable has different suffixes (e.g., Put Value Sell Low, Put Value Buy High, and so forth, whenever there might be more than one put option in the portfolio of option strategies, and these suffixes represent whether this particular put is bought or sold, and whether the premium paid for this put option or the option value is higher or lower than the other put option).

**PV Asset or Present Value of the Asset**

This is the ubiquitous input in all real options models, and is the sum of the present values of all net benefits from a real options project or its underlying asset. Sometimes the net present value is used as a proxy, but typically the implementation cost is separated from the PV Asset value, such that PV Asset less any implementation cost, if executed immediately, equals the net present value of the project. The PV Asset input has to be a positive value.

**Quantities (Series)**

This is a series of positive integers indicating the number of a specific class of options in a portfolio in order to compute the Value at Risk of a portfolio of options, and these values are typically arranged in a column with multiple rows.



**Quantity 1 and Quantity 2**

These are positive integers indicating the amount of the first asset that is exchanged for the second asset in an asset exchange option with two correlated underlying assets.

**Random**

This value replaces the Probability value when used to obtain the inverse cumulative distribution function (ICDF) of a probability distribution for the purposes of running a simulation. This variable is between 0 and 1, inclusive, and is from a continuous uniform distribution. By choosing a random value between 0 and 1 with equal probability of any continuous value between these two numbers, we obtain a probability value between 0% and 100%, and when mapped against the ICDF of a specific distribution, it will return the relevant  $X$  value from that distribution. Then, when repeated multiple times, it will yield a simulation of multiple trials or outcomes from that specific distribution.

**Rate of Return**

This is the annualized percentage required rate of return on equity, used to compute the price to earnings ratio.

**Real Cash Flow**

This is the real cash flow level after adjusting and deducting inflation rates. Specifically, the real cash flow plus inflation is the nominal cash flow.

**Real Rate**

This is the real rate of return or real interest rate after inflation adjustments; in other words, the real rate of return plus the inflation rate is the nominal rate of return.

**Receivables**

The dollar or currency amount of accounts receivable, a short-term or current asset from the balance sheet, is usually a positive value or zero.

**Recovery Period**

This is the recovery period in determining the depreciation of real estate investments, in number of years.

**Recovery Rate**

This is the rate of recovery to determine the credit risk shortfall—that is, the percentage of credit that defaults and the proportion that is recoverable.

**Remaining Time**

This is the amount of time remaining in years in an Asian option model.

**Return on Asset**

This is the return on a project or an asset, computed by taking net income after taxes and divided it by total assets, and this parameter value can be positive or negative.

**Returns (Series)**

These are the percentage returns on various assets in a portfolio, arranged in a column with multiple rows; they can be both negative and positive, and are used to compute the portfolio's weighted average returns.

**Revenues**

This is the dollar or currency amount of net revenues per year.

**Risk-free Rate and Risk-free 0**

This is the annualized risk-free rate of government securities comparable in maturity to the underlying asset under analysis (e.g., the risk-free rate with the same maturity as the option), and has to be positive. Risk-free 0 is the default variable for a changing risk-free rate option model, where if the risk-free series is left blank, this single rate is used throughout the maturity of the option.

**ROIC**

This is the return on invested capital (ROIC), and can be computed using the B2RatiosROIC function, using net operating profit after taxes, working capital, and assets used. This value can be negative or positive.

**Row**

This is the row number in a lattice, and starts from 0 at the top or first row.

**Sales**

This is the annual total sales of the company in dollar or currency values and is a positive number. Sales Growth is a related variable that looks at the difference of sales between two periods in percentage, versus Sales Increase, which is the difference in sales but denominated in currency amounts.

**Salvage**

This is the positive salvage value in dollars or currency value when an option is abandoned; the holder of the abandonment option will receive this amount.

**Sample Size**

This is the positive integer value of sample size in each subgroup used in the computation of a Six Sigma quality control chart and computation of control limits.

**Savings**

The positive dollar or currency value of savings when the option to contract is executed—that is, the amount of money saved.

**Second Variable**

This is the second underlying variable used in a pentanomial lattice, where the underlying asset lattice is the product of the first and second variables; this input parameter has to be positive.

**Service Rate**

This parameter measures the average rate of service per period (typically per day or per hour)—that is, on average, how many people will be serviced in a queue in a period (e.g., per hour or per day). This value has to be positive.

**Shape**

This is the second input assumption in the Pareto distribution, determining the shape of the distribution, and is a positive value.

**Share Price or Equity Price**

This is the current share or stock price per share at the time of valuation, used in a variety of options models, and has to be a positive dollar or currency value.

**Shares**

This is the number of outstanding shares of a stock, and is a positive integer.

**Sigma**

This is the variation or standard deviation measure of variation within a process and is used in Six Sigma quality control models. This parameter has to be a positive value.

**Sigma Service Rate**

This is the variation or standard deviation measure of variation within the service rate used in Six Sigma process and quality control models. This value has to be a positive value.

**Single Interest**

This is the interest rate used in computing a bond's convexity and duration models, the second- and first-level sensitivities, respectively. This input parameter has to be a positive value.

**Single Period**

This is the period in years or months that is used to interpolate the missing value within a range of values, applied in the B2LinerInterpolation model (used together with the Time Periods series and corresponding Values series).

**Skewness**

This is the third moment or measure of skew in a distribution. This input parameter is used in an Alternate Distribution option model, where the underlying distribution of the asset returns is assumed to be skewed and has some kurtosis. This value can be either positive or negative.

**S Max**

This is the observed maximum stock price in the past in an extreme spread option, where such options have their maturities divided into two segments, starting from time zero to the First Time Period (first segment) and from the First Time Period to Maturity (second segment). An extreme spread call option pays the difference between the maximum asset value from the second segment and the maximum value of the first segment. Conversely, the put pays the difference between the minimum of the second segment's asset value and the minimum of the first segment's asset value. A reverse call pays the minimum from the first segment less the minimum of the second segment, whereas a reverse put pays the maximum of the first segment less the maximum of the second segment. This variable is the observed maximum stock value in the observable past.

**S Min**

This is the observed minimum stock price in the past in an extreme spread option, similar to the S Max variable as described previously.

**Spot FX Rate**

This is the input in a currency option, which is the current or spot exchange rate, computed by the ratio of the domestic currency to the foreign currency; it has to be a positive value.

**Spot Price**

The spot price is the same as the existing or current stock price, and is a positive value. We use this definition to differentiate between the spot and average or future price levels, and this parameter has to be positive.

**Spot Rate, Spot Rate 1, and Spot Rate 2**

This is the input in an exotic currency forward option, which is the current or spot interest rate, and has to be a positive value.

**Spot Volatility**

This is the commodity option's spot price return's annualized volatility, as measured by the zero bond price level, and this value has to be positive.

**Spread**

Certain types of debt come with an option-embedded provision; for instance, a bond might be callable if the market price exceeds a certain value (when prevailing interest rates drop, making it more profitable for the issuing company to call the debt and reissue new bonds at the lower rate) or prepayment allowance of mortgages or lines of credit and debt. This input is the option adjusted spread (i.e., the additional premium that should be charged on the option provision). This value is computed using an optimization or internal search algorithm.

**Standard Deviation**

The standard deviation or sigma is the second moment of a distribution, and can be defined as the average dispersion of all values about the central mean; it is an input into the normal distribution. The higher the sigma level, the wider the spread and the higher the risk or uncertainty. When applying it as a normal distribution's parameter, it is the standard deviation of the population and has to be a positive value (there is no point in using a normal distribution with a sigma of zero, which is nothing but a single point estimate, where all points in the distribution fall exactly at the mean, generating a vertical line).

**Standard Deviation of Demand**

This is the measure of the variability of demand as used in the determination of economic order quantity, and this value is either zero or positive.

**Standard Deviation of Lead Time**

This is the measure of the variability of lead time it takes to obtain the inventory or product after it is ordered, as used in the determination of economic order quantity, and this value is either zero or positive.

**Starting Plot**

This variable is used in the options trading strategies (e.g., straddles, strangles, bull spreads, and so forth), representing the first value to plot for the terminal stock price (the x-axis on an option payoff chart); it has to be lower than the Ending Plot value, and is a positive input.

**Steps**

This is a positive integer value (typically at least 5) denoting the total number of steps in a lattice, where the higher the number of steps, the higher the level of precision but the longer the computational time.

**Stock**

This is the current stock price per share at the time of valuation, used in a variety of options models, and has to be a positive dollar or currency value.

**Stock Index**

This is the stock index level, and must be a positive value, measured at the time of valuation; it is used in index options computations.

**Stock Prices (Series)**

This is a list of stock prices over time in a series as used in the GARCH volatility model (B2GARCH) or computation of the Sharpe ratio (B2SharpeRatio), listed in chronological order (e.g., Jan, Feb, Mar, and so forth) in a single column with multiple rows, versus stock prices at valuation dates for various options in a portfolio, when used to compute the portfolio's Value at Risk (B2VarOptions).

**Stock Volatility**

This is the same as Equity Volatility or simply Volatility described in this Glossary (and used interchangeably), but this definition is used when multiple volatilities are required in the model, in order to reduce any confusion.

**Strike, Strike 1, and Strike 2**

The strike price in an option is the contractually prespecified price in advance at which the underlying asset (typically a stock) can be bought (call) or sold (put). Holding everything else constant, a higher (lower) strike price means a lower (higher) call option value and a higher (lower) put option value. This input parameter has to be a positive value, and in some rare cases it can be set to zero for a costless strike option. Strike 1 and Strike 2 are used when referring to exotic option inputs with two underlying assets (e.g., exchange options or a 3D binomial model).

**Strike Bought**

This is the positive dollar or currency strike price of an option (usually a call) purchased in a Delta-Gamma hedge that provides a hedge against larger changes in the underlying stock or asset value. This is done by buying some equity shares and a call option, which are funded by borrowing some amount of money and selling a call option at a different strike price. The net amount is a zero sum game, making this hedge costless.

**Strike Extend**

This is the positive value of the new strike price in a writer extendible option, which is an insurance policy in case the option becomes worthless at maturity. Specifically, the call or put option can be automatically extended beyond the initial maturity date to an extended date with a new extended strike price, assuming that at maturity the option is out of the money and worthless. This extendibility provides a safety net of time for the holder of the option.

**Strike FX Rate**

This is the positive dollar or currency value of the contractual strike price denominated in exchange rates (domestic currency to foreign currency) for a foreign exchange option.

**Strike Rate**

This is the positive percentage value of the contractual strike price in a swaption (option to swap) or a futures option.

**Strike Sold**

This is the positive dollar or currency strike price of an option (usually a call) sold in a Delta-Gamma hedge that provides a hedge against larger changes in the underlying stock or asset value. This is done by buying some equity shares and a call option, which are funded by borrowing some amount of money and selling a call option at a different strike price. The net amount is a zero sum game, making this hedge costless.

**Successes**

This is the number of successes in the negative binomial distribution, which is useful for modeling the distribution of the number of additional trials required on top of the number of successful occurrences required. For instance, in order to close a total of 10 sales opportunities, how many extra sales calls would you need to make above 10 calls, given some probability of success in each call? The x-axis of the distribution shows the number of additional calls required or the number of failed calls. The number of trials is not fixed; the trials continue until the required number of successes, and the probability of success is the same from trial to trial. The successes input parameter has to be a positive integer less than 8,000.

**Success Probability**

This is a probability percent, between 0% and 100%, inclusive, for the probability of an event occurring, and is used in various discrete probability distributions such as the binomial distribution.

**Tails**

This is the number of tails in a distribution for hypothesis testing as applied in Six Sigma models to determine the adequate sample size for specific Type I and Type II errors. This parameter can only be either 1 or 2.

**Tax Rate**

This is the corporate tax rate in percent and has to be a positive value.

**Tenure**

This is the maturity of a swaption (option to swap).

**This Category**

This is the category index number (a positive integer—1, 2, 3, and so forth), to compute the relative width of the credit rating table.

**Time, Time 1, and Time 2**

The Time variable is in years (positive value) to indicate the specific time period to forecast the interest rate level using various yield curve models, whereas Time 1 and Time 2 are the years for different spot rates, in order to impute the forward rate between these two periods.

**Time Interval or DT**

This is the positive time step input used in a time switch option, where the holder of the option receives the Accumulated Amount  $\times$  Time Steps each time the asset price

exceeds the strike price for a call option (or falls below the strike price for a put option). The time step is how often the asset price is checked as to whether the strike threshold has been breached (typically, for a one-year option with 252 trading days, set DT as 1/252).

### **Time Periods (Series)**

This is a series of positive time periods in years, arranged in a column with multiple rows, concurrent with another column of values, so that any missing values within the range of the time periods can be interpolated using the B2LinearInterpolation model. The time periods do not have to be linearly and sequentially increasing.

### **Timing (Series)**

This is a series of positive time periods in years, arranged in a column with multiple rows, concurrent with another column of cash flows, so that the present value or price of the bond or some other present value computations can be done. Typically, the timing in years is linearly increasing.

### **Total Asset**

This is the total assets in a company, including all short-term and long-term assets, and can be determined from the company's balance sheets. Typically, this parameter is a positive value, and is used in financial ratios analysis.

### **Total Capital**

This is the total dollar or currency amount of capital invested in order to compute the economic value added in a project.

### **Total Category**

This is a positive integer value in determining the number of credit rating categories required (e.g., AAA, AA, A, and so forth). Typically, this value is between 3 and 12.

### **Total Debt**

This is the total debt in a company, including all short-term and long-term debt, and can be determined from the company's balance sheets. Typically, this parameter is zero or a positive value, and is used in financial ratios analysis.

### **Total Equity or Equity Value**

This is the total common equity in a company, and can be determined from the company's balance sheets. Typically, this parameter is zero or a positive value.

### **Total Liability**

This is the total liabilities in a company, including all short-term and long-term liabilities, and can be determined from the company's balance sheets. Typically, this parameter is zero or a positive value, and is used in financial ratios analysis.

### **Trading Ratio**

This is the number of trading days left until maturity divided by the number of trading days in a year (typically around 250 days), and is used to compute the plain-vanilla option value after adjusting for the number of trading days left; it is typically a positive value.

**Trials**

This value is used in several places. For a probability distribution, it denotes the number of trials or events (e.g., in a binomial distribution where a coin is tossed 10 times, the number of trials in this case is 10) or denotes the number of simulation trials and iterations to complete in order to compute the value of an option using the simulation approach. Regardless, this parameter has to be a positive integer.

**Units**

This is the positive integer value denoting the number of units sampled in a Six Sigma quality control study, to determine the number of defects and proportion of defects.

**Units Fulfilled**

This zero or positive integer input variable is used in the Time Switch option model, where in such an option, the holder receives the Accumulated Amount  $\times$  Time Steps each time the asset price exceeds the strike price for a call option within the maturity period (or falls below the strike price for a put option). Sometimes the option has already accumulated past amounts (or as agreed to in the option as a minimum guaranteed payment) as measured by the number of time units fulfilled (which is typically set at zero).

**Unlevered Cost of Equity**

This is the cost of equity in an unlevered firm with no debt, and has to be a positive value, used to compute the weighted average cost of capital for a company.

**Up**

This is the up step size used in an asymmetrical state option pricing model, and needs to be a value greater than 1.

**Upper Barrier**

This is the upper barrier stock price in a double barrier or graduated barrier option, where this barrier is typically higher than the existing stock price and higher than the lower barrier level; it must be a positive value.

**Upper Delta**

This is the instantaneous options delta (a Greek sensitivity measure that can be computed using the B2CallDelta or B2PutDelta functions) of the percentage change in option value given the instantaneous change in stock prices, for the upper barrier stock price level. This value is typically set at zero or a positive value.

**Upper Strike**

This is the upper strike price (a positive value) in a Supershare option, which is traded or embedded in supershare funds, and is related to a Down and Out, Up and Out double barrier option, where the option has value only if the stock or asset price is between the upper and lower barriers, and at expiration provides a payoff equivalent to the stock or asset price divided by the lower strike price.

**Upper Value**

This input variable is used in the B2DT lattices for computing option adjusted spreads in debt with convertible or callable options, and represents the value that is one cell adjacent to the right and directly above the current value in a lattice. All values in a lattice and this input must be positive.



## **USL**

This is the upper specification level of a Six Sigma measured process—that is, the prespecified value that is the highest obtainable value or a value that the process should not exceed.

## **Vacancy Factor and Collection Factor**

This is the percentage (between 0% and 100%) where the ratio of vacancies or noncollectable rent occurs as a percentage of 100% occupancy, and is used in the valuation of real estate properties.

## **Values (Series)**

This is a series of values or numbers, either negative or positive values, arranged in a column with multiple rows, to be used in concert with the Time Period variable, where any missing values can be interpolated and internally fitted to a linear model. As an example, suppose the following series of time periods and values exist (Time 1 = 10, Time 2 = 20, Time 5 = 50); we can then use the B2LinearInterpolation model to determine the missing value(s).

## **Vesting Year**

This is the number of years or partial years in which the option is still in the vesting period and cannot be executed. This vesting year period can range from zero to the maturity of the option (the latter being a no-vesting American option, whereas the latter reverts to a European option), and if the value is somewhere in between, it becomes a Bermudan option with blackout and vesting periods.

## **Volatilities (Series)**

This is a series of annualized volatilities (see the definition of Volatilities for more details) arranged in a row with multiple columns going across, for use in the valuation of risky debt and callable bonds or bond spreads. Each value in the series must be positive.

## **Volatility**

This is the annualized volatility of equity or stock prices; it has to be a positive value, and can be computed in various ways—for example, exponentially weighted moving average (EWMA), generalized autoregressive conditional heteroskedasticity (GARCH), logarithmic relative returns, and so forth. Review the volatility examples and models in the Modeling Toolkit to obtain details on these methodologies.

## **Volatility 0, 1, 2**

These volatility variables are computed exactly as discussed in the Volatility definition, but the difference is that for Volatility 0, this is the default volatility used in a customized option model with changing volatilities (that is, if the changing volatilities input is left empty, this Volatility 0 will be used as the single repeated volatility in the model), whereas Volatility 1 and 2 are the volatilities for the first underlying asset and the second underlying asset in a multiple asset option model. These values have to be positive values.

## **Volatility FX or Volatility Foreign Exchange Rate**

This is the annualized volatility of foreign exchange rates (see the Volatility definition for the various methods applicable in valuing this parameter), and this value has to be positive.

**Volatility Ratio**

This variable is used in the Merton Jump Diffusion models, where this ratio is the percentage of volatility that can be explained by the jumps, and is typically a positive value not exceeding 1.

**WACC**

The weighted average cost of capital (WACC) is the average cost of capital from common equity, debt (after tax), and preferred equity, all weighted by the amount obtained from each source. It has to be a positive value, and when used in perpetual firm continuity values with growth rates, WACC has to be greater than the growth rate parameter.

**Warrants**

This is the positive integer number indicative of the total number of warrants issued by the company.

**Working Capital**

This is also known as the net working capital of a company and can be determined using the company's balance sheet, and is typically a positive dollar or currency value (while zero is a rare but possible occurrence).

**Worst Case**

This is the worst-case scenario's dollar or currency value of a project or asset within a one-year time frame, and is used in the implied volatility (volatility to probability) estimation. When used together with the Best Case and Expected Value input parameters, this worst case value has to be less than these two latter inputs.

**X**

This is the ubiquitous random variable  $X$ , and is used in multiple locations. When used in probability distributions, it denotes the  $X$  value on the x-axis of the probability distribution or the specific outcome of a distribution (e.g., in tossing a coin 10 times, where the probability of getting heads is 50%, we can compute the exact probability of getting exactly four heads, and in this case,  $X = 4$ ).  $X$  is typically a positive value (continuous values in continuous distributions, and discrete positive values, including zero, for discrete probability distributions).

**Z1 and Z2**

These are the standard normal z-scores used in a bivariate normal distribution. These values can be either negative or positive.

**Zero Bond Price**

This is the price of a zero coupon bond, used in the valuation of callable and risky debt and for pricing commodity options, and this parameter has to be a positive value.

**Zero Yields**

This is the yield of a zero coupon bond, used in the valuation of callable and risky debt, and this parameter has to be a positive value.