

Subject Index

- Absolute VaR, 304
American option, 79
Antithetic variables, 56
Arrays and matrices, 13
 dynamic array, 13
 multidimensional array, 13
 one-dimensional array, 13
 two-dimensional array, 13
Arrow-Debreu price, 132
Asset path simulation functions, 30
At-the-money (ATM) straddle, 152

Back-testing, 339
Basket default swap, 280
Bayesian framework, 171
 Bayes' Theorem, 172
 conjugate prior, 171
 Gibbs sampling, 173
 posterior, 171
Bermudan swaption, 249, 372
 co-terminal Bermudan swaption, 250
 fixed-maturity Bermudan swaption, 250
BGM model, 221

Binomial tree, 348
Black formula, 201
Black forward rate volatility, 223
Black-Scholes equation, 43
Black-Scholes formula, 48
Black swap rate volatility, 225
Bootstrapping, 321
Brownian motion, 36
 exponential martingale, 36
 Markov property, 36
 martingale property, 36
 multidimensional Brownian motion, 38
 quadratic variation, 36

Calibration, 55
Call period, 289
Callable equity-linked note, 163
Caplet, 222
Cholesky decomposition, 109, 144, 146,
 380
CIR process, 41
Clamped cubic spline, 180
Clean price, 183

408 SUBJECT INDEX

- Coherent risk measure, 332
 - component VaR, 336
 - conditional value-at-risk (CVaR), 333
 - incremental VaR, 336
 - marginal VaR, 336
 - monotonicity, 332
 - positive homogeneity, 332
 - sub-additivity, 332
 - translation invariance, 333
- Collateralized debt obligation (CDO), 266
 - lower attachment point, 266
 - upper attachment point, 266
- Collateralized exposure, 289
- Component VaR, 336
- Conditional statements, 14
 - if-then-else statement, 14
 - multi-lined form, 14
 - single-lined form, 14
 - select-case statement, 15
- Conditional value-at-risk (CVaR), 333
- Const* statement, 10
- Contract-level exposure, 287
- Control variates, 58
- Copula, 273
 - t*-copula, 276
 - dependence structure, 273
 - Gaussian copula, 274
 - marginal behavior, 273
 - Sklar's theorem, 273
- Counterparty credit risk, 286
- Counterparty-level exposure, 288
 - call period, 289
 - collateralized exposure, 289
 - contract-level exposure, 287
 - cure period, 289
 - default unwind date, 289
 - margin agreement, 289
 - margin period of risk, 289
 - netting agreement, 288
 - non-collateralized exposure, 289
- Credit derivatives
 - basket default swap, 280
 - collateralized debt obligation (CDO), 266
 - default correlation, 261
 - first-to-default swap, 280
 - Merton model, 256
 - Vasicek single-factor model, 260
 - Credit value adjustment (CVA), 290
 - right-way risk, 298
 - sensitivity to credit spreads, 292
 - sensitivity to underlying market variables, 292
 - term structure of credit spreads, 291
 - unconditional risk-neutral probability of default, 291
 - wrong-way risk, 298
- Cubic spline discount function, 185
- Cubic spline interpolation, 179
- Cure period, 289
- Currency-translated options, 116
- Dampened Fourier transform, 136
- Data input and output, 14
- Declaration of Constants, 10
- Declaration of Variables, 8
 - date data type, 9
 - numeric data type, 9
 - Boolean, 9
 - byte, 9
 - decimal, 9
 - double, 9
 - integer, 9
 - long, 9
 - single, 9
 - string data type, 9
 - variant data type, 9
 - empty, 9
 - error code, 9
 - null, 9
- Default correlation, 261
- Default leg, 280
- Default unwind date, 289
- Delta hedging, 345
- Delta-gamma approximation, 317
- Delta-normal approximation, 314
- Differential evolution (DE), 139
- Digital call option, 374
- Dirty price, 183
- Discontinuous payoffs, 374
- Discounted loss, 290
- Downhill Simplex, 139
- Early redemption request, 94
- Empirical martingale correction, 149
- Empirical martingale simulation (EMS), 87

- Equity linked note (ELN), 72
- Euler discretization, 361
- Euler scheme, 42, 144
- Exposure at default, 262
- Extended Vasicek model, 195

- Factor sensitivity, 261
- Fast Fourier transform, 137
- Filtration switching formula, 299
- Finite difference approximation, 350
 - central difference estimator, 352
 - central difference scheme, 351
 - forward difference estimator, 351
 - forward difference scheme, 351
- First passage time, 259
- First-to-default swap, 280
- Floorlet, 222, 224
- Fokker-Plank equation, 124
- Forward measure, 241
- Forward rate, 192
- Forward rate curve, 192
- Forward swap rate, 225
- Fourier inversion operator, 137
- Function procedure, 19
- FX accumulator, 95
 - CITIC Pacific Limited, 95
 - sensitivity analysis, 103
 - valuation, 97
 - with target redemption, 100
 - with target redemption and barrier rate, 101
 - without knock-out feature, 99

- Gamma neutral, 345
- GARCH option pricing model, 156
 - bumping, 162
 - estimation, 157
 - generalized autoregressive conditional, heteroskedastic (GARCH), 156
 - Ljung-Box test, 159
 - locally risk-neutral valuation relationship (LRNVR), 161
 - long-run average variance, 157
 - maximum likelihood estimation (MLE), 157
 - mean reversion level, 157
 - risk-neutral process, 161
 - standardized residuals, 159
 - stationarity, 157
 - variance targeting, 159
 - volatility clustering, 157
- Gaussian copula, 274
- Generalized error distribution, 307
- Geometric Brownian motion (GBM), 73
- Girsanov's theorem, 48
- Greeks
 - binomial tree, 348
 - closed-form solutions, 346
 - delta, 343
 - delta hedging, 345
 - discontinuous payoffs, 374
 - finite difference approximation, 350
 - gamma, 344
 - gamma neutral, 345
 - Greeks of a portfolio, 344
 - likelihood ratio method, 355
 - option elasticity, 345
 - pathwise derivative estimates, 360
 - psi, 345
 - rho, 344
 - speed, 345
 - theta, 344
 - vanna, 345
 - Vega, 344
 - Vomma, 345

- Hazard rate, 279
- Heston model, 136
 - calibration, 139
 - correlation between the stock and variance, 141
 - implementation, 138
 - initial variance, 141
 - long-term average variance, 141
 - mean-reverting speed, 141
 - parameter bounds, 141
 - parameter constraint, 141
 - quadratic-exponential discretization scheme, 143
 - volatility of variance, 141
- Historical simulation, 319
- Historical volatility, 51
- Holding period adjustment, 312
- Hull and White's formula, 226
- Hull-White model, 194
 - calibration, 197
 - mean-reverting speed, 195
 - volatility, 195

410 SUBJECT INDEX

- Implied binomial tree, 130
- Implied volatility, 51
- Importance sampling, 65
- Incremental VaR, 336
- Intensity process, 279
- Interest rate range accrual note, 207
- Interest rate swap, 224
- inverse Fourier transform, 137, 166
- Itô's process, 39
 - discretization methods, 41
 - Euler scheme, 42
 - Milstein scheme, 42
 - Ito's lemma, 40
 - SDE, 39
 - stochastic differential equation, 39
- Jump-diffusion model
 - Bayesian framework, 171
 - Gibbs sampling, 173
 - simulation, 167
- Kolmogorov equation, 124
- Levenberg-Marquardt, 139
- LIBOR market model, 219
 - Black forward rate volatility, 223
 - Black swap rate volatility, 225
 - caplet, 222
 - floorlet, 222
 - forward measure, 241
 - Hull and White's formula, 226
 - predictor-corrector method, 242
 - Rebonato's formula, 226
- Life insurance contract, 105
 - bonus payment, 106
 - expected future life, 107
 - linear smoothing scheme, 106
 - mortality table, 107
 - reserve, 106
 - smoothing mechanism, 106
- Likelihood ratio method, 355
 - likelihood ratio method estimator, 356
 - score, 356
 - score function, 356
- Ljung-Box test, 159
- Local volatility model, 122
 - estimation, 123
 - implied binomial tree, 130
 - simulation, 123
- Loops, 16
 - Do loop, 16
 - Do Until loop, 17
 - Do While loop, 17
 - For-Next loop, 16
- Loss given default, 262
- Lower attachment point, 266
- Malliavin calculus, 374
- Margin agreement, 289
- Margin period of risk, 289
- Marginal VaR, 336
- Mark to market (MTM), 53
- Martingale, 34
 - continuous martingale, 35
 - discrete martingale, 35
- Memoryless property, 162
- Merton model, 256
 - probability of default, 257
- Milstein scheme, 42
- Moody's KMV, 258
- Multi-asset instruments, 108
 - Cholesky decomposition, 109
 - multi-asset range accrual equity linked note, 112
 - multidimensional geometric Brownian motion, 108
 - multivariate normal random vector, 109
- Multi-asset range accrual equity linked note, 112
- Multivariable declaration, 10
- Multidimensional geometric Brownian motion, 108
- Multiple linear regression, 23
- Natural cubic spline, 180
- Nelson-Siegel model, 182
- Netting agreement, 288
- Non-collateralized exposure, 289
- Operators, 11
 - assignment operators, 11
 - equal sign, 11
 - comparative operators, 11
 - equal to, 11
 - greater than, 11
 - greater than or equal to, 11
 - less than, 11
 - less than or equal to, 11
 - not equal to, 11

- Logical operators, 11
 - And, 11
 - Eqv, 11
 - Imp, 11
 - Not, 11
 - Or, 11
 - Xor, 11
- Mathematical operators, 11
 - addition, 11
 - division, 11
 - exponentiation, 11
 - multiplication, 11
 - subtraction, 11
- Option elasticity, 345
- Outstanding notional amount, 267
- Over-the-counter OTC, 89
- Parametric VaR, 305
 - heavy-tailed distribution, 307
 - t -distribution, 311
 - generalized error distribution, 307
 - holding period adjustment, 312
 - multiple assets, 306
 - normal VaR, 305
- Pathwise derivative estimates, 360
- Payer swaption, 225
- Portfolio loss distribution, 261
- Portfolio Replication, 72
- Predictor-corrector method, 242
- Premium leg, 280
- Probability of default, 257
- Proxy approach, 260
- Pseudo-random, 25
- Random number generation, 25
 - acceptance-rejection method, 26
 - Box-Muller transform, 27
 - inverse transform, 25
 - randomize, 25
 - rnd, 25
- Range accrual note (RAN), 89
 - European, 89
- Rebonato's formula, 226
- Receiver swaption, 225
- Regression spline, 192
- Relative VaR, 304
- Right-way risk, 298
- Risk measure, 304
- Risk-neutral probability, 35
- Risk-neutral valuation, 258
- Risk reversal (RR), 152
- Short rate, 195
- Sklar's theorem, 273
- Stratified sampling, 61
- Sub procedure, 19
- Survival function, 279
- Swap market model, 219
- Swaption formula, 224
- t -copula, 276
- t -distribution, 311
- Target redemption note, 206
- Term structure of credit spreads, 291
- Tranche, 266
- Tranche premium, 267
- UDTs, 28
- Unconditional risk-neutral probability of default, 291
- Upper attachment point, 266
- User-defined data types, 11
- Value at Risk, VaR, 54, 304
 - absolute VaR, 304
 - bootstrapping, 321
 - historical simulation, 319
 - Monte Carlo simulation, 323
 - parametric VaR, 305
 - percentile, 304
 - quantile, 304
 - relative VaR, 304
 - risk measure, 304
- Value-at-Risk
 - Gibbs sampling, 327
- Variance reduction techniques, 55
 - antithetic variables, 56
 - control variates, 58
 - importance sampling, 65
 - stratified sampling, 61
- Vasicek, 260
- Vasicek single-factor model, 260
 - exposure at default, 262
 - factor sensitivity, 261
 - loss given default, 262
 - portfolio loss distribution, 261

412 *SUBJECT INDEX*

- VBA, 1
- VBA Built-in Functions, 22
 - Abs, 23
 - Atn, 23
 - Cos, 23
 - Exp, 23
 - Int, 23
 - Log, 23
 - MInverse, 25
 - MMult, 25
 - Sgn, 23
 - Sin, 23
 - Sqr, 23
 - Tan, 23
 - Transpose, 25
 - UBound, 25
 - Round, 23
- VBA
 - command button, 5
 - comment, 5
 - macro, 2
 - macro recorder, 3
 - module, 2
 - project, 2
- Visual Basic Editor, 2
- Visual Basic for Application, 1
- Vega-weighted butterfly, 152
- Vibrato Monte Carlo simulation, 376
- Volatility, 50
- Volatility clustering, 53
- Volatility smile, 52
- Volatility surface, 52
- Volatility
 - historical volatility, 51
 - implied volatility, 51
 - volatility clustering, 53
 - volatility smile, 52
 - volatility surface, 52
- Wrong-way risk, 298
- Yield curve, 179
 - clamped cubic spline, 180
 - clean price, 183
 - cubic spline discount function, 185
 - cubic spline interpolation, 179
 - dirty price, 183
 - natural cubic spline, 180
 - Nelson-Siegel model, 182
 - zero rate, 179
- Zero rate, 179