Index

$D(u_n)$ condition, 378, 379

ACD model, 255
  exponential, 256
  generalized Gamma, 257
  threshold, 264
  Weibull, 256
Activation function, *see* Neural network, 200
Airline model, 84
Akaike information criterion (AIC), 48, 406
Arbitrage, 443
ARCH effect, 114
ARCH model, 115
  estimation, 120
    t distribution, 121
    GED innovation, 122
    normal, 120
Arranged autoregression, 212
Augmented Dickey–Fuller test, 77
Autocorrelation function (ACF), 31
Autocovariance, 30
Autoregressive integrated moving-average (ARIMA) model, 76
Autoregressive model, 37
  estimation, 49
  forecasting, 54
  order, 47
  stationarity, 46
Autoregressive moving-average (ARMA) model, 64
  forecasting, 68

Back propagation
  neural network, 203
Back-shift operator, 41
Bartlett's formula, 32
Bayesian information criterion (BIC), 48
Bid–ask bounce, 236
Bid–ask spread, 236
Bilinear model, 177
Black–Scholes
  differential equation, 299
Black–Scholes formula
  European call option, 301, 109
  European put option, 302
Brownian motion, 290
  geometric, 294
  standard, 289
Business cycle, 42

Canonical correlation analysis, 437
Characteristic equation, 46
Characteristic root, 42, 46
CHARMA model, 150
Cholesky decomposition, 400, 458, 517
Cointegration, 91, 428
Cointegration test
  maximum eigenvalue, 437
  trace, 437
Common factor, 543
Common trend, 430
Companion matrix, 404
Compounding, 4
Conditional distribution, 8

Analysis of Financial Time Series, Third Edition, By Ruey S. Tsay

Copyright © 2010 John Wiley & Sons, Inc.

Conditional forecast, 55
Conditional heteroscedasticity, 97
  HAC covariance estimator, 98
Conditional-likelihood method, 61
Conjugate prior, *see* Distribution, 618
Correlation
  coefficient, 30
  constant, 522
  time-varying, 525
Cost-of-carry model, 443
Covariance matrix, 390
Cross-correlation matrix, 390, 391
Cross-validation, 193
CVaR
  Conditional value at risk, 328

Data
  3M stock return, 21, 67, 74, 185
  Bank of America stock return, 485
  BHP daily price, 449
  Cisco stock return, 296, 538, 546
  Citi-Group stock return, 21
  Civilian employment number, 475
  Consumer price index, 475
  equal-weighted index, 21, 60, 61, 102, 178, 213
  GE stock return, 663
  Hewlett-Packard stock return, 485
  Hong Kong market index, 507
  IBM stock return, 21, 33, 145, 154, 155, 182, 203, 213, 295, 330, 334, 338, 340, 348, 355, 364, 393, 485, 524, 544, 645
  IBM transactions, 238, 241, 246, 250, 262, 268
  Intel stock return, 21, 111, 123, 339, 485, 538, 546
  J.P. Morgan Chase stock return, 485
  Japan market index, 507
  Johnson & Johnson's earnings, 81
  Mark/dollar exchange rate, 116
  Microsoft sock return, 21
  SP 500 excess return, 134, 151
  SP 500 index futures, 443, 445
  SP 500 index return, 154, 158, 160, 393, 524, 538, 544, 640, 645, 658
  SP 500 spot price, 445
  U.S. 3-month Treasury bill rate, 196
  U.S. government bond, 23, 395, 494
  U.S. interest rate, 23, 90, 627, 635
  U.S. monthly unemployment rate, 181
  U.S. real GNP, 42, 188
  U.S. unemployment rate, 218
  Vale daily price, 449
  value-weighted index, 21, 145
  value-weighted index, 34, 47, 102, 213
Data augmentation, 615
Decomposition model, 248
Descriptive statistics, 21
Diagonal VEC model, 510
Dickey–Fuller test, 77
Differencing 76
  seasonal, 84
Distribution
  beta, 620
  double exponential, 312
  Frechet family, 344
  gamma, 277, 619
  generalized error, 122
  generalized extreme value, 343
  Generalized gamma, 278
  generalized Pareto, 361, 373
  inverted chi-squared, 621
  Laplacian, 312
  multivariate t, 548
  multivariate normal, 460, 619
  negative binomial, 620
  Poisson, 620
  posterior, 618
  prior, 618
    conjugate, 618
  skew-Student-t, 122
  Weibull, 278
Diurnal pattern, 238
Donsker's theorem, 290
Duration
  between trades, 239
  model, 253
Durbin-Watson statistic, 97
Dynamic conditional correlation model, 531

EGARCH model, 143
  forecasting, 147
Eigenvalue, 457
Eigenvector, 457
EM algorithm, 614
Error correction model, 431
Estimation
  extreme value parameter, 345
Exact-likelihood method, 61
Exceedance, 359
Exceeding times, 359
Excess return, 5
Expected shortfall, 333
Extended autocorrelation function, 66
Extremal index, 377, 380
Extreme value theory, 342

Factor analysis, 489
Factor mimicking portfolio, 482

Factor model
  common factor, 468
  estimation, 491
  factor loading, 468
  specific factor, 468
Factor rotation
  varimax, 492
Filtering, 561
Forecast
  horizon, 54
  origin, 54
Forecast updating formula, 581
Forecasting
  MCMC method, 666
Forward filtering and backward sampling, 655
Fractional differencing, 101

GARCH model, 131
  Cholesky decomposition, 528
  multivariate, 521
    diagonal, 523
  time-varying correlation, 526
GARCH-M model, 142, 660
Generalized least squares, 478
Generalized Pareto Distribution, 361
Geometric ergodicity, 179
Gibbs sampling, 615
Global minimum variance portfolio, 473
Griddy Gibbs, 623

Half-life, 56
Hazard function, 279
Hh function, 318
Hill estimator, 348
Hyperparameter, 625

Identifiability, 422
IGARCH model, 140, 329
Implied volatility, 110
Impulse response function, 71, 413
Innovation, 36
Inverted yield curve, 91
Invertibility, 60, 431
Invertible ARMA model, 70
Ito process, 292
Ito's lemma, 294
  multivariate, 310

Joint distribution function, 7
Jump diffusion, 311

Kalman filter, 563, 593
Kalman gain, 563, 593
Kernel, 190
  bandwidth, 192
  Epanechnikov, 191
  Gaussian, 191
Kernel regression, 190
Kurtosis, 9
  excess, 9

Lag operator, 41
Lead–lag relationship, 391
Leptokurtic, 9
Leverage effect, 111, 144, 650
Likelihood function, 19
Linear time series, 36
Liquidity, 235
Ljung–Box statistic, 114, 32
  multivariate, 397
Local linear regression, 195
Local trend model, 558
Log return, 5
Logit model, 267
Long position, 6
Long-memory
  stochastic volatility, 154
  time series, 101

Marginal distribution, 7
Market model, 470
Markov process, 613
Markov property, 37
Markov switching model, 187, 660
Martingale difference, 132
Maximum-likelihood estimate
  exact, 420
MCMC method, 199
Mean equation, 113
Mean excess function, 362
Mean excess plot, 362
Mean residual life plot, 363
Mean reversion, 56, 71
  half-life, 56
Metropolis algorithm, 622
Metropolis–Hasting algorithm, 623
Missing value, 600, 628
Model checking, 51
Moment
  of a random variable, 8
Moving-average model, 57

Nadaraya–Watson estimator, 191
Neural network, 199
  activation function, 200
  feed-forward, 200

Neural network (*Continued*)
skip layer, 202
Neuron, *see* Neural network, 200
Node, *see* Neural network, 200
Nonlinearity test, 205
BDS, 208
bispectral, 207
F test, 211
Keenan, 210
RESET, 209
Tar-F, 213
Nonstationarity
unit-root, 72
Nonsynchronous trading, 232
Nuisance parameter, 211

Options
American, 288
at-the-money, 288
European call, 109
in-the-money, 288
out-of-the-money, 288
stock, 288
strike price, 109, 288
Order statistics, 339
Ordered probit model, 245
Orthogonal factor model, 489
Outlier
additive, 628
detection, 632
OX command
garchOxFit, 130

Pairs trading, 446
Parametric bootstrap, 215
Partial autoregressive function (PACF), 46
PCD model, 265
Peaks over Thresholds, 359
π weight, 70
Pickands estimator, 348
Platykurtic, 9
Poisson process, 311
inhomogeneous, 371
intensity function, 363
Portmanteau test 32, *see* Ljung–Box statistic, 397
Positive-definite matrix, 458
Prediction, 561
Present value, 5
Principal component analysis, 483, 543
ψ weight, 36
Put–call parity, 302

Quantile, 8
definition, 327

R command
ar, 49
exindex, 384
factanal, 495
garchFit, 127
gev, 351
glm, 252
gpd, 367
hill, 351
lowess, 196
meplot, 363
nnet, 223
optim, 186
pot, 366
princomp, 488
qt, 335
quantile, 341
read.table, 24
riskmeasures, 370
ts, 24
R package, 24
R-square, 54
Adjusted, 54
Random coefficient (RCA) model, 153
Random walk, 72
with drift, 73
Realized volatility, 559, 162
Reduced–form model, 399
Regression
with time series errors, 90
Return level, 358
stress period, 358
RiskMetrics, 328

S-Plus command
archTest, 115
autocorTest, 115
coint, 439
ewma1, 331
garch, 124
mfactor, 500
mgarch, 507
OLS, 97
tslag, 97
VAR, 414
VECM, 439
Sample autocorrelation, 31
Scree plot, 488
Seasonal adjustment, 82
Seasonal model, 81
multiplicative, 84

Shape parameter
of a distribution, 343
Shock, 36, 55, 113
Short position, 6
Simple return, 3
Skewness, 9
Smoothed disturbance, 597
Smoothing, 189, 561
Square root of time rule, 330
Standard Brownian motion, 77
State-space model, 576
nonlinear, 199
Stationarity, 30
weak, 390
Statistical arbitrage, 446
Steady state, 594
Stochastic diffusion equation, 292
Stochastic volatility model, 153, 637
multivariate, 643
Structural equation, 400
Structural form, 400
Structural Time Series, 590
Structural time series model, 558
Student-*t* distribution
standardized, 121
Survival function, 363

Tail index, 343
TGARCH model, 149
general form, 182
Threshold, 180
Threshold autoregressive model
multivariate, 444
self-exciting, 180
smooth, 184
Threshold cointegration, 444
Time plot, 19
Transactions data, 237
Trend stationary model, 75

Unit-root test, 76
Unit-root time series, 72
Unobserved component model, 590

Value at risk, 326, 546
VaR
econometric approach, 333
homogeneous Poisson process, 365
inhomogeneous Poisson process, 371
RiskMetrics, 329
traditional extreme value, 353
Vector AR model, 399
Vector ARMA model, 422
marginal models, 427
Vector MA model, 417
VIX Volatility Index, 110
Volatility, 109
Volatility equation, 113
Volatility model
factor, 543
Volatility smile, 311

Weighted least squares, 477
White noise, 36
Wiener process, 289
generalized, 291

Yule–Walker equation
multivariate, 404