

Index

- adjusted R^2 110–11, 114, 116
- adjustment parameters 352
- arbitrage 239–40, 336, 480–2
- Asian options 566
- autocorrelation 139–60, 193, 454
 - coefficients 209–11, 215, 222–3, 234–5
 - in cross-sectional data 160
 - function (acf) 209, 212, 218–29
 - in volatility 388
- autocovariances 208–9, 212–14, 218, 220–2
- autoregressive conditional heteroscedasticity (ARCH) models 386–437
- autoregressive conditional duration (ACD) 604
- autoregressive distributed lag (ADL) models 153
- autoregressive integrated moving average (ARIMA) models 206–7, 233, 256
- autoregressive moving average (ARMA) models 223–56
- autoregressive (AR) model 215–22
- autoregressive volatility (ARV) models 385–6, 573–7

- balanced panel 490, 504–5
- BDS test 382, 573, 575
- BEKK model 435, 439–40
- BHHH algorithm 398, 402
- backshift operator, *see* lag operator
- banking competition 272, 494
- Bayes theorem 599
- Bera–Jarque test 161, 163, 172
- best linear unbiased estimators (BLUE) 44, 135, 149
- between estimator 492

- biased estimator 47
- bicorrelation test 381–2, 573
- bid–ask spread 279–85, 527
- bispectrum test 382
- bivariate regression 40, 88, 90, 92, 395, 445
- block significance tests 296–7
- bootstrapping 553–7, 571–82
- Box–Jenkins approach 230
- Box–Pierce Q -statistic 209–10
- Breusch–Godfrey test 148–9, 158–9

- calendar effects 454, 457, 461
- capital asset pricing model (CAPM) 34–5, 63, 68, 70–1, 77–81, 182, 429, 436, 504
- causality tests 297–8, 307, 311, 313
- censored dependent variable 533–6, 539
- central limit theorem 164, 608
- chaos theory 599–600
- characteristic equation 216–17, 223, 233, 237, 322, 614–15
- chi-squared distribution 149, 419
- Chow test 180–9, 491, 496n
- classical linear regression model (CLRM) 58, 129, 191
- CLRM assumptions 23, 58, 173, 244, 277
 - violations of 130
- Cochrane–Orcutt procedure 150–2
- coefficient estimators 33, 81, 117, 179
 - standard errors of 46–51
- cointegrating regressions 337–43
 - Durbin–Watson (CRDW) statistic 340
- cointegrating vector 341–2, 351–75

- cointegration 335–75
 - tests 342, 356, 358, 368, 370
- commodity prices 256, 437
- common factor restrictions 152
- conditional covariance 429, 433–4, 437–9
- conditional expectations 247–8
- conditional skewness 606
- conditional kurtosis 606
- conditional variance 387–444
- conditional variance-in-mean 436
- confirmatory data analysis 331
- consistency 45
- constant term 36, 74, 89–90, 115, 131–2
- contemporaneous terms 291, 295–6
- continuously compounded returns 7–9, 40
- convergence criterion 398, 540, 580
- copulas 603
- correlation 28, 40
 - implied 429
 - positive definite matrix 434–5
- correlation coefficient 28, 107
- correlogram, *see* autocorrelation function
- cost of carry model 43, 337, 343–8
- covariance stationary process, *see* weakly stationary process
- covered interest parity (CIP) 239–40
- credit rating 194–202, 521, 527–33
- critical values 55–69, 96–8, 135, 147, 328–9
- cross-equation restrictions 293
- cross-sectional regression 197, 488, 490, 504
- cross-sectional variability 493, 499
- cumulative normal distribution 517, 525
- CUSUM and CUSUMSQ tests 187–91

- daily range estimators 386
- daily volatility estimate 386, 424–5, 574
- damped sine wave 229
- data
 - cross-sectional 3–6, 113, 160
 - macroeconomic 2–3
 - panel 3–5, 487–509
 - qualitative/quantitative 7
 - time series 3–8
 - transformed 136–8
 - data frequencies 3, 455–7
 - data generating process (DGP) 37–8
 - data mining 104–6, 194, 554
 - data revisions 2
 - data snooping, *see* data mining
 - day-of-the-week effect 454, 457, 460–1
 - degrees of freedom 54–61, 66, 130–1
 - degrees of persistence 437, 573
 - degree of uncertainty 46, 195
 - dependent/independent variable
 - inertia of 154
 - deterministic trend 324–5, 327
 - Dickey–Fuller (DF) test 327–34, 559–63
 - augmented (ADF) 329–32
 - critical values 328, 623
 - differencing 292–3, 322, 326–7, 492, 602
 - differentiation 609–10
 - discrete choice, *see* multiple choice
 - distributed lag models 153
 - disturbance term 30, 37, 44, 47
 - double logarithmic form 39
 - dummy variables 113–15, 165–70, 181–4, 453–65
 - dummy variable trap 456, 491
 - Durbin–Watson test 143–8
 - dynamic models 153–6

 - econometric model
 - construction 9
 - evaluation 10
 - efficient estimator 33, 46
 - efficient market hypothesis 71, 326, 350, 454
 - eigenvalues 121–5, 350–1, 364, 614–15
 - eigenvectors 351, 354, 614
 - elasticities 39, 494, 497
 - empirical research project
 - choice of software 593
 - choice of topic 586–8
 - data for 591–3
 - forms of 587
 - originality 587–8
 - outline 593–7
 - purpose 585–6

- results 596
- structure 593–7
- encompassing principle 192
- encompassing regressions 116–17, 192, 424–5
- Engle–Granger test 341, 357, 365
- Engle–Ng test 408
- equilibrium correction model, *see* error correction model
 - correction model
- error correction model 337–75
- error term 44, 47, 53
 - variance of 47
- estimation techniques
 - full information maximum likelihood (FIML) 279
 - indirect least squares (ILS) 276
 - instrumental variable (IV) 276, 278
 - two-stage least squares (2SLS) 277–9, 282, 286
- estimators 33, 39, 44
 - biased/unbiased 44–7, 135
 - standard error 46–9, 83–5, 119
- EViews
 - ARCH effects 389–91
 - ARCH estimation 399–404
 - ARMA models 234–9
 - autocorrelation function 234–5
 - BDS test 382
 - Bera–Jarque test 163–4
 - Breusch–Godfrey test 158–9
 - CAPM regression 77–81
 - Chow test 188–9
 - cointegration 365–75
 - date format 15
 - dummy variables 167–70, 188–9
 - dummy variables for seasonality 461–2
 - Durbin–Watson statistic 158
 - EGARCH model 406–8
 - exponential smoothing 258–60
 - forecasting 256–8
 - forecasting from GARCH 414–17
 - GJR model 406–8
 - GARCH estimation 399–403
 - GARCH-M estimation 410–11
 - Granger causality tests 311–12
 - hedge ratio estimation 437–41
 - heteroscedasticity testing 136–8
 - information criteria 238–9
 - Johansen test 368–75
 - Ljung–Box test 234–5
 - MGARCH estimation 441–4
 - multicollinearity 174
 - Newey–West procedure 152
 - RESET test 177–8
 - returns on shares 7–8
 - simultaneous equations models 285–9
 - transformation of series 18, 77–8
 - unit root test 331–5
 - VaR estimation using bootstrapping 579–82
 - VAR estimation 308–15
 - variance decomposition 313–15
 - Wald test 76–7
 - White’s test 136–8
- exchange rate 239–41, 308, 336–7, 355–6, 466–8
- exogeneity 266, 273–5, 311–12
- expectations hypothesis 362–5
- explained sum of squares (ESS) 108, 138
- exponential growth model 175
- exponential regression model 38–9, 138
- exponential smoothing 241–3, 258–60
- exponential weighting 242
- exponentially weighted moving average (EWMA)
 - models 384–5, 432
- extreme value theory 603
- F*-test 93–8
- factor loadings 120, 123–4
- financial data 2–4, 380–3, 455
- financial modelling 164, 487
 - returns in 7
- financial options 384, 412, 565, 605
- fitted value 31–2, 38, 107–8, 132, 153, 175
- fixed effects 490–8, 500, 506–9
- forcing variable 207, 466
- forecast accuracy 245, 256, 292, 347, 420, 425
- forecast encompassing 424–5
- forecast error 251–8, 300–1, 304

- forecasting
 - autoregressive process 250–1
 - ARMA models 248–9
 - in-sample/out-of-sample 245–6
 - moving average process 249–50, 253
 - one-step-ahead/multi-step-ahead 245–6, 256–8
 - structural 244
 - time-series 244
- forward rate unbiasedness (FRU) 240
- fractionally integrated models 602
- functional form, misspecification of, *see* RESET test
- GJR model 405–7, 409–10, 420
- generalised autoregressive conditional
 - heteroscedasticity (GARCH) models 392–444
 - exponential (EGARCH) 406, 420–7, 573–8
 - factor 434
 - integrated (IGARCH) 394, 602
 - in-mean (GARCH-M) 410–11, 421, 436
 - orthogonal 434
- generalised error distribution (GED) 406
- general-to-specific methodology 191–4
- generalised least squares (GLS) 136, 150–1, 498–500
- generalised unrestricted model (GUM) 193
- gilt–equity yield ratio (GEYR) 469–73
- Goldfeld-Quandt test for heteroscedasticity 133
- goodness of fit 106–12
- Granger representation theorem 339
- Hamilton's filter 464
- Hausman test 273–4, 279, 500–2, 509
- Heckman procedure 530, 537
- hedge ratios 40–2, 430–1, 437–40
- hedonic pricing models 112–14
- heteroscedasticity 132–53
 - conditional 396, 420
- historical covariance 431
- homoscedasticity 132, 135–7, 386
- hypothesis testing 52–67
 - confidence interval 59–62
 - error classification 64–5
 - Lagrange multiplier (LM) test 130, 134–5, 158
 - likelihood ratio (LR) test 293–4, 417, 419
 - significance level 55–65, 74–5
 - test of significance approach 56–63
 - under maximum likelihood 417–19
 - Wald test 417–19
- identification 230–2, 269–72, 292
 - order condition 270–1
 - rank condition 270–1
- implied covariance 431
- implied volatility models 384, 420–7
- impulse responses 298–301, 307, 312–14
- independence of irrelevant alternatives 524–5
- information criteria 232–3, 235–9, 294–5
 - adjusted R^2 110–11, 233
 - Akaike's (AIC) 232–3, 235–9, 294–5
 - Hannan–Quinn (HQIC) 232–3, 235–9, 294–5
 - Schwartz's Bayesian (SBIC) 232–3, 235–9, 294–5
- intercept 29, 33, 36, 90, 131–2
- interest rates 122–4
 - term structure of 362–5
- invertibility 223–4
- Jensen's alpha 67–70
- Johansen test 350–6
- jumps 605
- KPSS test 331, 333, 335
- kurtosis 161, 163–5, 606
- lag lengths 152, 209, 216–17, 292–4, 304, 309
- lag operator 211–12, 216–17, 326–7
- lagged regressors 157
- lagged value 139–40, 154–7, 234, 242
- Lagrange multiplier (LM) test 130, 134–5, 417–18
- lags, number of 149, 157, 294–5, 329
- large sample property 45
- laws of logs 39, 608–9
- lead–lag relationships 343
- least squares dummy variables (LSDV) 491–4
- leptokurtosis 380, 399, 404, 603, 605
- leverage effects 380, 404–5, 408
- likelihood function 236, 395–9, 418, 435, 446
- likelihood ratio (LR) test 294, 417–19

- LIMDEP 12, 26
- linear models 176, 178, 339, 452
- linear probability model 512–13, 518–19, 522, 538
- linearity 38–9
- Ljung–Box test 210–11, 234–5
- log-likelihood function (LLF) 394–8, 417–19, 446, 518–19
- log-return formulation 8, 18
- logit model 514–17, 519
 - comparison with probit 518–19
 - estimation of 544–5
 - measuring goodness of fit 519–21
 - parameter interpretation 519
- long-memory models 601
- long-run static solution 156–7
- loss function, *see* residual sum of squares
- Lyapunov exponent 600

- macroeconomic indicators 207
- marginal distribution 603
- marginal effects 519, 534, 542–3
- market microstructure 154, 186, 272, 280, 452
- market reaction 71, 200–2, 477
- market returns 104, 303–4, 421, 429
- market risk premium 34–5, 73, 454, 504
- market timing 348–9
- Markov switching regime 464–73
- Marquardt algorithm 398, 402
- matrices 611–14
 - eigenvalues of 614–15
- matrix notation 90–2, 118
- maximum likelihood 231, 279, 395–8, 445–8
- measurement error 2–3, 492n
- minimum capital risk requirement (MCRR), *see* value-at-risk
- misspecification error 156
- misspecification tests 14, 130
- misspecified dynamics 153
- model construction 9, 233
- model interpretation 9, 35–6, 39, 113
- moving average process 211–15, 225, 249–50
- multicollinearity
 - near 120, 171–3
 - perfect 171
- multimodalities 397
- multinomial logit 522–7
- multinomial probit 522–7
- multiple choice 522–5
- multiple linear regression 88–91
- multivariate GARCH models 429, 431–44

- neural network models 600–1
- Newey–West estimator 152–3
- news impact curves 409–10
- Newton–Raphson procedure 384, 421
- non-linear least squares (NLS) procedure 475–6, 518
- non-linear models 175, 380–2, 417
- non-linear restrictions 417
- non-negativity 389, 392–3, 404–6
- non-nested models 115–16
- non-normality 53, 163–4, 167, 193, 399
- non-stationarity 318–33
 - deterministic 322–5, 327
 - random walk with drift 322, 324, 326, 478
 - stochastic 322–3
 - testing for 327–35
 - trend-stationary process 321–3
 - unit root 318–31

- observation frequencies 4, 8–9, 207, 455
- observations
 - daily closing 358
 - number of 40, 69, 105
- options price 280, 412, 570–1
- order of integration 330, 335, 363
- ordered response variable 527–8
 - ordered logit 528
 - ordered probit 528
- ordinal scale 6
- ordinary least squares (OLS)
 - coefficient estimator 33, 36, 44–6, 83–5
 - intercept 29, 33
 - multiple regression 91
 - slope 29, 33–4
 - standard error estimator 46–50
 - time series regression 67, 110, 113
- out-of-sample 106, 245, 251, 253, 257

- outliers 164–8, 188, 193, 254
- overfitting 231, 393
- overreaction effect 71–4
- oversized tests 329

- p*-value, *see* hypothesis testing: significance level
- panel data analysis 5, 487–509
- parameters
 - estimations 30–9, 91
 - stability tests 180–90
- parsimonious encompassing 192
- parsimonious model 231, 394
- partial autocorrelation function (pacf) 222–30
- partial regression coefficient 89
- pecking order hypothesis 515–17, 525–6
- penalty term 116, 232, 236, 238, 370
- period effects, *see* time fixed effects
- piecewise linear model 453, 462–3
- Phillips–Perron tests 330, 333
- pooled sample 174, 492, 508, 529
- population
 - coefficient 81, 345
 - disturbances 47, 134, 139
- population regression function (PRF) 37–8, 54
- population values 51, 105
- portfolios
 - forming 72
 - winner/loser 71–4
- portmanteau tests 381
- position risk requirement, *see* value-at-risk
- prediction, *see* forecasting
- predictive failure test 181–6, 189
- precision 6, 20, 46, 171, 230
- principal components analysis (PCA) 120–6, 172
- probabilities 465–7, 512–17, 523–4
- probability density function (pdf) 445, 607
- probability distribution 28, 46, 53, 266, 548
- probit model 517–18
 - comparison with logit 518
 - estimation of 518, 544–5
 - measuring goodness of fit 519–21
 - parameter interpretation 519
- property returns 302–8
- pseudo R^2 521, 540
- pseudo-random numbers 558
- purchasing power parity (PPP) 337, 355–6, 466

- qualitative variables, *see* dummy variables
- Quandt likelihood ratio test 186–7
- quantile regression 603–4
- quasi-demeaned data, *see* random effects
- quasi-maximum likelihood (QML) 399, 402

- R^2 106–12
- $R\text{-bar}^2$ 110–11
- random draws 549–58, 563–4, 572
- random effects 498–503, 505–9
- random number generation 557–8, 567
- random walk 217, 247, 254, 320, 324, 326–7
- ratings 194–202, 527–33
 - announcements 195, 200–2
- rational expectations 326
- random number re-usage 552–3
- reality check test 555
- recursive forecasting model 246
- recursive least squares 187
- redundant fixed effects test 506–8
- regime switching 451, 453, 464, 471, 476, 484
- regression analysis 27, 35, 56, 157, 549
- rejection region 56–62, 105, 147, 547
- relationship between variables 244, 338, 381, 608
- renormalisation 354
- re-sampling
 - from data 556, 581
 - from residuals 556
- RESET test 174–8, 193, 382
- residual diagnostics 231
- residual sum of squares (RSS) 33, 91, 107–8
- residual term 38
- restricted/unrestricted model 94, 193, 293, 354, 419
- restricted/unrestricted regressions 94–8, 102, 111
- restrictions, number of 94, 96–7, 112, 130, 135, 187
- risk management 434, 441, 571, 587, 602–5
- risk measurement 385, 546, 571
- risk premium 34–5, 73, 363, 410, 454, 504, 506
- risk-return relationship 37, 460

- riskless arbitrage opportunities 239–40, 344, 350, 460, 477, 481–2
- rolling window 246
- sample 35–9
- sample regression function (SRF) 38, 107
- sample selection bias 530
- sample size 45, 59, 65, 105
- sampling error 105, 549–51, 567
- scatter plot 19, 29, 31, 34–5
- seasonality 156, 167, 259, 455–61
- second moment models 605
- seemingly unrelated regression (SUR) 489–90
- self-selection bias, *see* sample selection bias
- sensitive dependence on initial conditions (SDIC) 600
- Sharpe ratio 472
- shocks 299–301, 308, 318–21, 404–10
- short-selling 482
- shuffle diagnostic 554
- significance level 55–65, 74–5, 106
- sign predictions 255
- sign and size bias tests 408–9
- simple bivariate regression model 40, 88–92
- simple returns 7–8, 40
- simulation experiments 559
 - disadvantages 558–9
- simulation methods
 - Monte Carlo 547–53, 558–60
- simultaneous equations 267–79, 285, 291–2
- size of test, *see* significance level
- skewness 161, 163
- slippage time 348–9
- slope 29, 33–4, 36, 40, 42, 49, 52
- small sample problems 99, 210, 331
- software packages, (*see also* *EViews*)
 - LIMDEP 12, 26
 - RATS/WinRATS 12, 26
- sovereign credit ratings 194–202, 530
- sovereign yield spreads 198
- spatial lag 160
- specific-to-general modelling 191–2
- spline techniques 462
- spot/futures markets 40–3, 337, 343–50, 365
- spot return forecasts 347–8
- spurious regressions 319
- squared daily returns 386, 424
- squared residuals 32–3, 134, 136, 188, 389–91
- stable distributions 603
- standard deviations 18, 46, 55, 383, 399–402
- standard errors 46–54, 58–9, 83–5, 92–4, 119
- stationarity
 - difference 323
 - stochastic 322–3
 - testing for 216, 327–31
 - weak 208, 318
- statistical decision rule 53
- statistical inference 51, 53, 338, 435
- stochastic regressors 148, 160
- stochastic trend model 322–5
- stochastic volatility (SV) model 385, 427–8, 432
- stock index 343–9, 420, 437–8, 480–1
 - futures markets 344, 438, 480–1
 - log of 343–6, 365
- stock return 4–5, 71, 74, 88, 102, 285–9, 420, 437
 - predictability 302
- strictly stationary process 207–8
- structural break 186–7, 240, 451, 466–7, 496, 547
- structural change 185–6, 453
- structural equations 267–71, 277–9, 286, 288, 480
- structural models 206–7, 247, 256, 290–2
- Student's *t* distribution 54–6, 61–6, 320, 323, 328
- switching models 451–84
- switching portfolio 472
- t*-test 59, 65, 67, 76, 96, 98, 418
- t*-ratio 65–70, 80, 99, 320
- Theil's *U*-statistic 254, 257
- threshold autoregressive (TAR) models 473–9, 482–3
 - self-exciting (SETAR) 474, 477–9, 482–3
 - smooth transition (STAR) 474
- tick size 281–3, 463
 - limits 463
- time fixed effects 493–4, 506
- time series models 162, 206–7, 239, 247, 384, 391
 - univariate 206, 290–1
- time series regressions 67, 110, 113, 160, 488, 504

- time-varying covariances 436–7
- time-varying stock market risk premiums 454
- tobit regression 534–7
- total sum of squares (TSS) 108, 111–12, 131, 521
- trading rules 347, 349, 421, 469, 472, 554–5
- trading strategies 255, 347–8, 429, 454, 482
- transaction costs 481–2
- transition probabilities 465
- truncated dependent variable 533, 535–6

- unbalanced panel 490
- unbiasedness 45, 240, 269, 276, 489n
- unconditional density model 577
- uncovered interest parity (UIP) 239–41
- uniform distribution 557
- unit root process 322, 327–8, 466–7
- unit roots, testing for 327–35
- unparameterised seasonality 156

- value-at-risk (VaR) 383, 571–6, 603–4
 - Monte Carlo approach 572
- variables
 - binary choice 539
 - dummy 113, 115, 165–70, 183–4, 455–65
 - exogenous 268, 270–1, 273, 298
 - explanatory 28, 30, 66, 88–90, 106
 - irrelevant 179, 193, 278
 - macroeconomic 100, 195, 200, 302
 - omission of 155, 178–9
 - ordering of 301
 - random 44, 47, 53, 96, 498
 - slope dummy 408, 458–60
 - state-determining 473, 482
- variance–covariance matrix 92–3, 119, 152, 293–5, 399
 - conditional 432, 434, 438
 - variance decompositions 298–301, 306–7, 313
 - variance forecasts 394, 414, 416–17
 - variance operator 430, 608
 - variance reduction techniques 549–52
 - antithetic variate 549–51
 - control variates 551–2
 - quasi-random sequences 550
 - VECH model 432–6, 442–4
 - diagonal 432, 434, 436, 444
 - vector autoregressive (VAR) models 290–315
 - vector autoregressive moving average (VARMA) models 290
 - vector error correction model (VECM) 350–2, 373–4, 480
 - vector moving average (VMA) model 299
 - volatility
 - asymmetries in 404–9, 427, 439
 - clustering 380, 386, 394, 404
 - feedback hypothesis 404, 408
 - forecasting 383–5, 411, 420–6
 - historical 383–4, 427
 - implied 384, 420–7, 431, 567, 569, 571
 - response to shocks 404, 408, 440
 - Wald test 130, 417–19
 - weakly stationary process 208, 318
 - weighted least squares (WLS) 136
 - white noise process 209, 211–12, 247, 324–6
 - error term 223
 - White's correction 152
 - White's test 134–5, 137–8, 152
 - within transformation 491–4, 500
 - Wold's decomposition theorem 217–18, 220
 - yield curves 303, 364, 375, 462
 - Yule–Walker equations 218, 222