

# BIBLIOGRAPHY

- Ang, A., and G. Bekaert. 2007. Stock Return Predictability: Is it There? *Review of Financial Studies* 20: 651–707.
- Berzin, C., and J. León. 2007. Estimating the Hurst Parameter. *Statistical Inference for Stochastic Processes* 10: 49–73.
- Dedecker, J., P. Doukhan, G. Lang, J. LeonR, S. Louhichi, and C. Prieur. 2007. *Weak Dependence with Examples and Applications*. New York: Springer.
- He, L.-Y., and W.-B. Qian. 2012. A Monte Carlo Simulation to the Performance of the R/S and V/S Methods- Statistical Revisit and Real World Application. *Physica A* 39: 3770–3782.
- Sommer, S., and R.M. Huggins. 1996. Variable Selection using the Wald Test and a Robust  $C_p$ . *Applied Statistics* 45: 15–29.
- Trzcinka, C. 1986. On the Number of Factors in the Arbitrage Pricing Model. *Journal of Finance* 41: 347–368.
- Westerlund, J. 2005. A Panel CUSUM Test of the Null of Cointegration. *Oxford Bulletin of Economics and Statistics* 67: 231–262.
- White, H., and J. Wooldridge. 1988. Some Invariance Principles and Central Limit Theorems for Dependent Heterogeneous Processes. *Econometric Theory* 4: 210–230.

# INDEX

## A

Aggregate market volatility, 191  
Ahn, S.C., 120, 127–129  
Aldous, D., 46  
American Stock Exchange (AMEX),  
22, 26, 39  
Ang, A., 191  
Antipersistent process, 168  
Arbitrage pricing theory (APT), 3,  
8–10  
Asset pricing models  
empirical verification for, 12, 50  
objective of, 13  
short-term forecastability with,  
16–27  
Asset returns  
portfolios of, 47  
systematic components of, 140

Asymptotic equivalence and  
reparametrization arguments,  
75–77  
Asymptotic sampling theory, 48  
Asymptotic test statistics, 73–75  
Atkinson, A.C., 255n3  
Autocorrelation-consistent estimator,  
102  
Autocorrelations, 167  
of portfolio returns, 35  
Autocovariance function, 229  
Autoregressive time series models, 31

## B

Back, K.E., 58, 62  
Bai, J., 116–125, 127, 128, 134n3,  
148, 188, 193–194

Note: Page numbers followed by ‘n’ refer to notes.

- Barber, B.M., 176  
 Barberis, N., 40  
 Barmalzan, G., 243  
 Bekaert, G., 38  
 Berenguer-Rico, V., 210  
 “Beta-pricing” model of asset returns,  
   146, 147  
 Beta-pricing regression models  
   estimation of, 96–105  
   market indices, nonlinearity, and  
     seasonal anomalies issues,  
       91–93  
   time-varying coefficients, in CAPM,  
     93–96  
 Betas, 28  
 BIC criterion, 124  
 Billings, S., 256n4  
 Black, F., 98  
 Bollerslev, T., 94, 99  
 Book-to-market ratio, 28–29, 31  
 Book-to-market stocks, 28  
 Bossaerts, P., 31–32  
 Boudoukh, J., 34–36  
 Brown, B.M., 177  
 Brownian bridge, 169–171, 173, 176,  
   211, 213–215, 225, 226, 246,  
   247, 250  
 Burnside, C., 52, 58–60
- C**
- Campbell, J.Y., 32, 33, 132, 149  
 Capital asset pricing model (CAPM),  
   3, 18, 178  
   market model and, 6–8, 17  
   in risk premium, 92  
   systematic risk in, 180  
   time-varying coefficients in, 93–96  
   T-sample rescaled-variance test on  
     forecast errors, 180–181  
 Capital market equilibrium, 132  
 CAPM, *see* Capital asset pricing model  
 Cauchy-Schwarz inequality, 216, 229  
 Center for Research in Security Prices  
   (CRSP), 22, 23, 32  
 Chamberlain, G., 8, 9, 110n5, 148,  
   151  
 Chen, N.-F., 8, 27–29  
 Chi-square test, 49–50  
 Chudik, A., 186–188  
 Clements, M.P., 10, 11  
 Cochrane-Hansen vertical distance  
   test, 60–61  
 Cochrane, J.H., 145  
 Common correlated effects (CCE)  
   estimator, 193  
   hidden non-diversifiable factor,  
     nonidentifiability of, 198–204  
 Conditional CAPM model, 19–20  
 Conditional expectation, 24  
 Conditional factor premium, 146  
 Conditional homoskedasticity, 99  
   assumption of, 68  
   theorem of asymptotic distribution  
     of factor premiums estimates,  
       68–69  
 Conditional multi-factor models, 34  
 Conditional predictive ability (CTP),  
   24, 26  
 Connor and Korajczyk’s test, 106–110  
 Connor, G., 106, 148, 189, 190, 225  
 Consumption-based asset pricing  
   models, 59  
 Continuous mapping theorem, 171,  
   226, 251  
 Conventional beta-pricing models,  
   148  
 Conventional CAPM, 6  
 Conventional model selection  
   methods, 238  
 Conventional test statistics, 139, 156,  
   248  
 Conventional *t*-statistics, 93  
 Cooper, M., 22

Cross-sectional approach, 211–223  
 Cross-sectional commonality, 237  
 Cross-sectional correlations, 128  
 Cross-sectional CUSUMs, 208, 212, 243  
 Cross-sectional detection approach, 233n22  
 Cross-sectional extended rescaled-variance test, 166, 167, 172, 178  
 Cross-sectional KPSS test, 215  
 Cross-sectional long dependence, 147, 153, 156–159, 161, 184–186, 188, 215, 228, 248  
 Cross-sectional memory condition, 140, 152, 156, 164, 167, 173, 178, 182–185  
 Cross-sectional (second-pass) regression, 10, 20, 30, 98, 102, 104, 105  
   model misspecification for, 62–70  
 Cross-sectional strong dependence, 186, 187  
 Cross-sectional weak dependence, 186, 187  
 Cross-serial correlations, 35  
 CTP, *see* Conditional predictive ability  
 CUSUMs, 204–210, 233n20

## D

Data generating mechanism, 113, 144, 146, 148  
 Data generating process, 239, 248  
 Data snooping, 27, 46  
 Deetz, M., 34  
 Discount mean square prediction error (DMSPE), 37  
 Diversifiable factor, 151  
 Diversifiable idiosyncratic risk, 152  
 Dividend-price ratio, 53

DMSPE, *see* Discount mean square prediction error  
 Dynamic selection bias, 177  
 Dynamic trading strategies, payoff for, 78

## E

Econometric model selection, 239  
   conceptual errors types in, 238  
 Eigenvalue ratio (ER) estimator, 128, 129  
 Elimination rule, model confidence set, 240, 241  
 Elton, E.J., 134n2  
 Embrechts, P., 167  
 Empirical models, 114  
 Empirical verification, 26  
 Equity premium, 31, 33, 41n3  
 Equivalence test, model confidence set, 240, 241  
 Errors-in-variables (EIV) problem, 28, 92, 93, 96, 100, 101, 148  
 Expected rates of return, 134n2  
 Explanatory models, 114  
 Explanatory variables, 131

## F

Factor loadings, 63, 66, 69–71, 87, 88, 97, 100, 104–106, 116, 117, 120, 122, 123, 125, 127, 144, 147, 149–153, 155–157, 162–165, 174, 188–191, 193, 194, 197–199, 207, 208, 215, 227–230, 247, 248, 251  
 Factor matrix, 118, 122  
 Factor models  
   factors determination in  
     approximate, 116–120  
     inferential theory for, 120–123

Factor premiums, 63, 67–70, 77, 93, 96–98, 100–105, 143, 146, 147, 157, 176, 254, 110n4  
 Fama, E.F., 4, 7, 20, 22, 26, 28, 63, 83, 91–93, 98, 176, 178–184  
 Fama-French factors, 30  
 Fama-French model, 29, 176–184, 232n15  
 Fama-French three-factor model, 232n15  
 forecast errors of, 166  
 Fama-MacBeth method, 68  
 Ferson, W.E., 19–21, 38–40, 77–81, 132  
 Financial econometrics, 13  
 First-order VAR system, 30  
 First-pass regression, 100  
 Forecastability in time series, 115  
 Forecast errors, 24, 172, 174, 177, 183  
 function of, 240  
 hidden non-diversifiable factor in, 166  
 T-sample rescaled-variance tests on, 178–181  
 Forecasting, asset returns *vs.* verification of time-series properties, 140  
 Forsythe, A.B., 256n4  
 Forward-selection sequential model search, 251, 255n3  
 Fractional Brownian motion, 167, 168, 185, 211–212, 216, 220, 221, 245  
 French, K.R., 22, 26, 28, 83, 176, 178–184

**G**

Gallant, R., 77, 79  
 Generalized method of moments (GMM), 58, 77

German stock market, 34  
 Giacomini, R., 24  
 Giraitis, L., 167, 169, 170, 172, 177, 210  
 GLS estimator, 66  
 GMM, *see* Generalized method of moments  
 Gonzalo, J., 210  
 Goyal, A., 30–33, 53, 190  
 Granger, C.W.J., 21  
 Grinblatt, M., 8, 140  
 Grouped portfolios, 7, 48, 50–51  
 Grow ratio (GR) estimator, 128, 129  
 Gulen, H., 22

**H**

Hahn-Banach theorem, 8  
 Hansen, B., 115, 238, 239  
 Hansen, L.P., 141  
 Hansen-Jagannathan variance bound tests, 58–62  
 Hansen, L.P., 52–55, 57, 62, 77, 81, 83, 131  
 Hansen, P.R., 166, 241, 242, 249, 255n1  
 Harvey, C.R., 19, 20  
 He, J., 28  
 Hendry, D.F., 10, 11  
 Hermite expansion, 221  
 Heteroskedasticity, 83  
 Heteroskedasticity-and-autocorrelation-consistent, 60  
 Hidden factors, 152, 154, 155, 191, 246  
 cross-sectional approach, 211–223  
 in idiosyncratic risks, 155–156  
 intensity of non-diversifiability, 204–231  
 loadings, 151  
 sum of CUSUMs, 204–210

- two-dimensional lattice-process setting for idiosyncratic risk, 223–231
- Hidden non-diversifiable factor, 156, 159, 162, 163, 166, 182, 186, 188, 190
  - in idiosyncratic risks, 176, 178, 184
  - nonidentifiability of CCE estimator, 198–204
- Hilbert space of (real) squared-integrable random variables, 141, 142
- Hillion, P., 31–32
- Hodrick, R.J., 38
- Horenstein, A.R., 120, 127–129
- Hurst exponent, 167, 185, 204–205, 213, 215
  - of fractional Brownian motion, 212, 221
- Hypothesis testing
  - model confidence set, 239–243
  - model selection with, 238–239
- I**
- ICAPM, *see* Intertemporal Capital Asset Pricing Model
- Idiosyncratic errors, 128
- Idiosyncratic risks, 97, 102, 105, 118, 134n5, 154–155, 168, 175
  - assumption for, 99
  - cross-sectional dependence of, 107
  - cross-sectional mean square of, 106
  - cross-sectional memories for, 178, 192
  - CUSUMs of, 152, 185
  - of fitted asset pricing model, 182
  - hidden factor in, 155–156
  - hidden non-diversifiable factor in, 176, 178, 184
  - inter-temporal and cross-sectional dependence in, 226
  - non-diversifiable factor in, 172
  - time-series properties of, 99
  - two-dimensional lattice-process setting for, 223–231
- Industrial production growth rate, 41n2
- Inferential theory for factor models, 120–123
- Ingersoll, J., 110n5
- In-sample observations, of historical data, 12
- In-sample predictability, 22
- Instrumental variables, 26
- Intertemporal Capital Asset Pricing Model (ICAPM), 29
- Inter-temporal dependence, 128
- J**
- Jagannathan, R., 62, 63, 67, 68, 70, 75, 77, 86, 131, 132, 141, 165
- Jeng, J.-L., 152, 166, 176, 232n15, 251
- Jensen, M.C., 98
- Johnson, B. McK., 245, 247
- K**
- Kan, R., 53, 62, 70–72, 75, 81–85, 87–89, 162, 165
- Khan, J.A., 243, 249
- Kiefer, J., 215
- Killeen, T., 245, 247
- Kirby, C., 23
- Koopmans, T.C., 4
- Korajczyk, A.E., 38–40

Korajczyk, R., 106, 148, 189, 190, 225  
 KPSS test statistics, 153

## L

Lawrenz, J., 53  
 Lehmann, E.L., 114, 134n1  
 Lettau, M., 33  
 Lewellen, J., 10, 104, 105  
 Li, H., 176  
 Li, Y., 177  
 Linear asset pricing models, 85  
 Linear factor pricing models, 8–10  
 Linear risk-return relation, 97  
 Liu, W., 166, 176, 232n15  
 Lo, A.W., 27, 46–51  
 Long-run investment profitability, 40  
 Long-term returns, stock return predictability using, 38–41  
 Lower variance bound test, 52–58  
 Ludvigson, S., 33  
 Lyon, J.D., 176

## M

Maag, U.R., 172, 177–179  
 MacBeth, J.D., 4, 7, 20, 28, 63, 91–93, 98  
 MacKinlay, A.C., 27, 46–51  
 Maejima, M., 167  
 Market indices, 26  
   beta-pricing regression models, 91–93  
 Market model and CAPM, 6–8, 17  
 Mayer, W.J., 177  
 MCS  
   algorithm, 241, 249  
   procedures, 241–243, 249, 251, 252, 255n1

Mean-squared forecast error (MSFE), 24, 25, 37  
 Mean square error, 24  
 Minimum-variance portfolio, 82  
 Model confidence set, 239–243  
 Model searching, 149  
   empirical applications with backward elimination in, 176–185  
   specification test in, 167  
 Model search scheme, 63  
 Model selection criteria, with statistical inferences  
   applications of, 113–116  
   eigenvalue ratio test, 127–129  
   essentiality of factors, 129–133  
   factors determination in  
     approximate factor models, 116–120  
     inferential theory for factor models, 120–123  
     variable selection, 124–127  
 Model specification tests, 139  
   for asset returns and factor premiums, 105  
 Model specification tests, statistical inferences  
   beta-pricing regression models modification, 91–105  
   stochastic discount factor, 52–91  
 Moody's BAA and AAA rated corporate bond yields, 26  
 Moody's Composite Average of Yields on Corporate Bonds, 26  
 MSFE, *see* Mean-squared forecast error  
 Multi-beta models, 132, 133  
 Multi-factor asset pricing models, 3  
 Multifactor models, 26  
 Multiple correlation coefficient, 82, 83

Multivariate GARCH, 94–96  
 Multivariate regressions, 63

## N

Najafabadi, A.T.P., 243  
 NASDAQ, 22, 26  
 Nested model, 88–89  
 Newbold, P., 21  
 New York Stock Exchange (NYSE),  
 18–19, 22, 26, 39, 95  
 Ng, K.K., 28  
 Ng, S., 116–120, 124, 125, 127, 128,  
 134n3, 148, 194  
 Noisy factor, 72  
 Non-diversifiability, 113  
 intensity of, 219–223  
 Non-diversifiable factor, 151, 161,  
 182–183  
 in idiosyncratic risks, 172  
 Non-diversifiable hidden factor, 171,  
 232n15, 246, 247  
 Nonlinearity, beta-pricing regression  
 models, 91–93  
 Nonlinear regression, 83  
 Non-nested models, 89–91, 243  
 Nourdin, I., 222  
 Null hypothesis, 50, 53, 62, 67, 69,  
 86, 89, 101, 110n8, 125, 173,  
 175, 181, 183, 226, 241  
 of short-term cross-sectional  
 memory, 205

## O

Onatski, A., 106  
 One-factor model for return process,  
 75  
 Optimal H-J Bound, proposition of,  
 80–81  
 Orthogonalization schemes, 192,  
 256n4

Out-of-sample observations, of  
 historical data, 12  
 Out-of-sample performance  
 of asset allocation strategies, 34  
 measure, 22  
 Out-of-sample time horizons, 32  
 Ouyssse, R., 124–127, 252

## P

Panel-time-series form, 117  
 Parametric vision, conceptual errors,  
 238  
 Pesaran, M.H., 233n18  
 Pesaran, R., 198–200, 204  
 Petkova, R., 29, 30, 149  
 Pettit, R.R., 17, 18  
 Portfolio diversification, 187  
 Prediction error, 15, 16, 20, 25, 33  
 Predictive regressions, with  
 macroeconomic and individual  
 economic variables, 27–30  
 Presumed idiosyncratic risk, 143, 156,  
 157, 159, 164, 176, 177, 183,  
 184, 204, 212, 228, 231  
 cross-sectional blocks quadratic  
 variation of, 217–223  
 Presumed model  
 of asset returns, 142–145  
 diversification in infinite dimensional  
 opportunity set, 149–150  
 diversification problem, objective  
 functional for, 150–158  
 empirical studies selection bias with  
 stock returns, 158–161  
 Hilbert space of (real) squared-  
 integrable random variables,  
 141, 142  
 projection error/idiosyncratic risk,  
 145–149  
 SDF methodology comparison,  
 161–166



- Pricing errors, 85, 88, 103–105, 163, 164  
 Probability distribution, 247  
 Projection errors, 144, 243, 248  
 Projection pursuit regression, 126  
 Proxies for factors, 131  
 Pseudo-factor, 108
- R**
- Random fields, 63, 156, 226, 227, 231, 255  
 Rapach, D.E., 36–38  
 Realized rates of return, 134n2  
 Reference variables, 130  
 Reisman, H., 8, 9, 124, 130  
 Reparameterization of factor premiums, 77  
 Reparametrization, 64  
   and asymptotic equivalence arguments, 75–77  
 Rescaled factor matrix, 118–119  
 Rescaled-variance statistic, 169  
 Rescaled-variance test, 167  
 Réveillac, A., 222  
 Riani, M., 255n3  
 Risk-free payoff, 55  
 Risk-free rate, 6, 17  
 Risk premiums of asset returns, 95, 105  
 Robotti, C., 62, 84, 85, 87–89  
 Robust linear model, 243–244  
 Rolling method, 92  
 Ross, S.A., 8, 148  
 Rothschild, M., 8, 9, 110n5, 148  
 Rust, J., 5
- S**
- Santa-Clara, P., 190  
 Scholes, M., 98  
 SDF, *see* Stochastic discount factor  
 Second-order moment for specification errors, 164  
 Second-order moment matrix, 59  
 Second-pass cross-sectional regressions, 28, 146, 254  
 Second-pass estimators, theorem for asymptotic distribution of, 101–102  
 Second-pass regressions, 92, 98, 232n5  
   regressor matrix in, 102  
 Security market data, 52  
 Selection bias, 158–161, 176, 177  
 Self-similar processes, 53, 167, 170, 211  
 Semiparametric inferences, conceptual errors, 238  
 Semiparametric vision, conceptual errors, 238  
 Sequential model search, 186–188, 237  
   findings and comparisons, 188–192  
   forward selection and control, 243–254  
   need for, 192–198  
   nonidentifiability of CCE estimator, 198–204  
 Sequential orthogonalization, 148, 194, 198  
 Shanken, J., 96, 98, 102, 110n4  
 Shmueli, G., 14–16  
 Short-term forecastability with asset pricing models, 16–27  
 Siegel, A.F., 77–81  
 Simin, T., 23–27  
 Smirnov, N.V., 215  
 Stage-wise regression, 126  
 Standard & Poor 500 index, 26, 32, 95  
 Statistical diagnostic tests, 166–176

- empirical applications with backward elimination in model search, 176–185
  - Statistical inferences, 3–5, 10, 19, 31, 45–46
  - conceptual errors, 238
  - data sources, anomalies and econometric issues, 46–51
  - with model selection criteria, 113–134
  - model specification tests and asymptotics (*see* Model specification tests, statistical inferences)
  - number of factors, development of tests for, 106–110
  - Statistical model, 114
  - Statistical tests for long dependence, 205
  - Step-by-step methods of model searching, 243
  - Stochastic discount factor (SDF), 131–133
    - bounds with conditioning information, 77–81
    - factor risk premium for, 77
    - Hansen-Jagannathan variance bound tests, 58–62
    - lower variance bound test, 52–58
    - model misspecification, cross-sectional regressions, 62–70
    - model selection (for factors) of, 84–91
    - new variance bound on, 81–84
    - reparametrization and asymptotic equivalence arguments, 75–77
    - return processes specifications, 70–75
  - Stock market data, 143
  - Stock return predictability, 10–16
    - forecasts combinations, 36–38
    - predictive regressions with macroeconomic and individual economic variables, 27–30
    - short-term forecastability with asset pricing models, 16–27
    - time series regressions of, 30–36
    - using long-term returns, 38–41
  - Systematic commonality, 140
  - Systematic factor, 191
  - Systematic risk in CAPM, 180
- T**
- T-bill rate, 90-day bid for, 26
  - Test statistics, 177, 178, 182, 183, 188, 190, 204, 211, 213–215, 223, 225, 226, 233n20, 233n21, 246, 249, 251, 252
    - based on beta-pricing models, 73–74
    - conventional, 139, 156, 248
    - KPSS, 153
    - power and size of, 237
    - under stochastic discount factor, 74–75
    - T*-sample Watson, 167
  - Theoretical asset pricing models, 27, 104, 231n5
  - Theoretical foundation, 3
  - Theoretical second-pass regressions, 105
  - Thompson, S.B., 32, 33
  - Three schools of thought, 34–35
  - Time-evolving system, 255
  - Time series data, 34
  - Time-series dynamics, 32, 255
  - Time-series forecasts, 140
  - Time series models
    - nonstationarity of, 32
    - structural instability of, 36
  - Time series predictability, 14

Time-series regressions, 7, 30, 67, 69, 70  
 of stock return predictability, 30–36  
 Time-varying coefficients in CAPM, 93–96  
 Tinic, S.M., 91–93, 96  
 Titman, S., 8, 140  
 Tobing, E., 152  
 Tolmatz, L., 215, 233n26  
 Torous, W., 31  
 Traditional time-series approach, 102  
 Treasury bills, 20  
 True (or correct) factor-pricing model, 113  
 True factor structure, 120, 123, 130  
 True model of data source, 15  
 T-sample rescaled-variance tests on forecast errors, 178–181  
*t*-statistics, 38, 63  
 Tudor, C.A., 221  
 Two-digit Standard Industrial Classification code, 39  
 Two-dimensional lattice-process setting for idiosyncratic risk, 223–231  
 Two-pass regressions, 91, 96  
 approach, 98, 99  
 asymptotic properties of, 99  
 method, 20, 28, 147  
 Two-path regressions of asset returns, 4  
 Two-step approach, 124

**U**  
 UE bound, proposition of, 79  
 Unconditional expectation, 24  
 Unconditional multi-factor models, 34  
 Unit-root representation, 156

Univariate regressions, 253  
 Unsystematic factor, 72–73

**V**

Variance bound, on stochastic discount factor, 81–84  
 Variance-covariance matrix, 59, 60, 64, 67  
 Vector autoregression (VAR), 149  
 of state variables, 30

**W**

Wang, Z., 62, 63, 67, 68, 70, 75, 77, 86, 165  
 Watson, G.S., 177  
 Wei, H.-L., 256n4  
 Welch, I., 30–33, 53  
 Well-diversified portfolios, 150–152, 155, 187, 205  
 West, R.R., 91–93, 96  
 Westerfield, R., 17, 18  
 White, H., 24, 172

**X**

Xu, Y., 176

**Y**

Yang, S.S., 48  
 Yule, G.U., 21

**Z**

Zero-mean normal random variable, 222, 223  
 Zhou, G., 53, 70–72, 75, 81–84, 110n4, 162, 165