

Author Index

- Adekola, A.O., 95
Ainslie, A., 195
Albano, G.L., 168
Albert, J., 201, 233
Allenby, G.M., 195
Amemiya, T., 94, 95, 109, 136, 148
Anderson, T.W., 165, 171
- Bajari, P., 65, 168
Barnard, G.A., 97
Barnett, G., 224
Barnett, W.A., 186
Bartlett, M.S., 83
Bayarri, M.J., 65, 262, 266
Berger, J. O., 21, 46, 47, 87, 97, 101, 102, 262, 266
Berger, R.L., 107, 116, 128, 203
Bernardo, J.M., 21
Birnbaum, A., 97
Box, G.E.P., 262
Brant, R., 218
Brooks, S.P., 146
Brown, P.J., 172
- Campolieti, M., 46
Carlin, B.P., 146, 255
Casella, G., 107, 116, 128, 203
Celeux, G., 210
Chaloner, K., 218
Chan, K.S., 148
Chatfield, C., 61
Chauveau, D., 148
Chen, C.-F., 96
Chib, S., 124, 199, 201, 202, 216, 224, 233, 234, 255, 257
- Chipman, H.A., 172
Cowles, M.K., 146, 199
- Dawid, A.P., 256
DeGroot, M., 21
DeJong, D.N., 46
Dellaportas, P., 46
DeRobertis, L., 88
Devroye, L., 204
Dey, D.K., 257, 259
Dickey, J.M., 266
Diebolt, J., 148, 216
Ding, Z., 266, 267
Doob, J.L., 176
Draper, D., 61
- Fisher, R.A., 97
Friedman, M., 8, 11, 46, 67
Fruhwrith-Schnatter, S., 210
Fudenberg, D., 167
- Gallant, A.R., 186
Garthwaite, P.H., 266
Geisel, M.S., 66
Gelfand, A.E., 14, 120, 257, 259
Gelman, A., 35, 146, 266
Geman, D., 120
Geman, S., 120
George, E.I., 172
Geweke, J., 14, 76, 87, 88, 113, 114, 119, 131, 146, 172, 202, 209, 216, 221, 229, 253, 259
Geyer, C.J., 119, 146, 148
Goldberger, A.S., 39, 73
Good, I.J., 268
Granger, C.W.J., 266, 267

- Green, P.J., 213, 255
 Greenberg, E., 124, 202, 216, 224
 Greene, W.H., 116, 164, 171
 Grilliches, Z., 73
- Hamilton, J.D., 176
 Hammersly, J.M., 14, 120, 129
 Han, C., 255
 Handscomb, D.C., 14, 120
 Harrison, J., 209
 Hartigan, J.A., 88
 Hastings, W.K., 120, 123
 Hildreth, C., 2, 127
 Hoeting, J.A., 61
- Jeffreys, H., 61, 67, 84
 Jeliaskov, I., 257
 Johnson, N.L., 26, 42, 90, 165, 171
 Jonas, A., 186
 Jouneau-Sion, F., 168
- Kadane, J.B., 87, 88, 255, 266
 Kass, R.E., 61
 Keane, M., 209, 216
 Kim, J., 195, 197
 Kloek, T., 114
 Kohn, R., 218
 Koop, G., 21
 Kotz, S., 42, 165, 171
- Lancaster, T., 21
 Lavine, M., 87, 88
 Leamer, E.E., 28, 61
 Lee, L.X., 65, 168
 Lindgren, G., 233
 Lindley, D.V., 73, 83
 Little, R.J.A., 35
 Liu, J.S., 129
- McCulloch, R.E., 76, 172, 201, 202, 233
 McKeague, I.W., 129
 Meng, X.L., 266
 Mengersen, K.L., 140
 Metropolis, N., 120, 123, 125
 Min, C.K., 258
 Mincer, J., 212
 Mittelhammer, R.C., 92
 Morgnestern, O., 17
 Morton, K.H., 129
 Mykland, P., 148
- Newey, W., 149, 275
- Percy, D.F., 166
 Peskun, P.H., 120
- Petrella, L., 87, 88
 Poirier, D.J., 21, 84, 97, 140, 181
 Pratt, J.W., 46
 Press, W.H., 180
- Raftery, A.E., 61, 257
 Raiffa, H., 23
 Rao, C.R., 68, 80, 107, 150
 Richardson, S., 213
 Ripley, R.D., 120
 Robert, C.P., 148, 216
 Roberts, H.V., 61
 Roberts, G.O., 133, 137, 138, 139, 146
 Roeder, K., 209
 Rossi, P.E., 50, 76, 195, 201, 216
 Royden, H.L., 80
 Rubin, D.B., 35, 146, 268
 Ryden, T., 6, 239, 243, 266, 267
- Sareen, S., 168
 Savage, L.J., 11, 46
 Schlaiffer, R., 23
 Schott, J.R., 227
 Shao, J., 119
 Shiller, R.J., 176
 Simon, H.A., 48
 Sims, C.A., 95
 Smith, A.F.M., 14, 21, 46, 73, 120, 133, 137, 138, 139
 Smith, M., 218
 Sweeting, T.J., 95
- Tanner, M.A., 120
 Theil, H., 39
 Tierney, L., 123, 135, 139, 143, 147, 148, 255
 Tirole, J., 167
 Tsay, R., 289
 Tweedie, R.L., 140
- Uhlig, H., 95
- van Dijk, H.K., 114
 Varian, H., 163
 von Neumann, J., 17
- Wasserman, L., 87, 88, 209
 Wefelmeyer, W., 129
 West, K., 149
 West, M., 209, 275
 Whiteman, C., 221
 Wolfson, L.J., 266
 Wolpert, R.L., 21, 97, 101, 102
 Wong, W.H., 120
- Zellner, A., 21, 42, 54, 61, 156, 162, 258

Subject Index

- acceptance sampling, 111–113
 - examples, 112–113, 231
 - importance sampling hybrid, 117
 - marginal likelihood and, 256–257
 - Metropolis independence chain and, 123–124
 - tuning, 119
- action, 17, 46–47
 - example, 158–160
 - mean, 48
 - mode, 50
 - model choice, 65
 - quantile, 49
 - simulation, 18
 - direct sampling, 108–109
 - examples, 157, 161, 213
 - importance sampling, 117–118
 - Markov chain Monte Carlo, 136
- ancillary statistic, 33–35
 - decisionmaking and, 141–142
 - examples, 34–35, 37, 126–127
 - missing data and, 34–35
- antithetic acceleration, 131
- antithetic sampling, *see* variance reduction
- asymptotic concentration, 91–95
 - examples, 94–96
- asymptotic posterior distribution, 95–96
 - examples, 96–97
- auction, 75, 174
- autoregressive model, 222–226
 - BACC, in, 225
 - conditional posteriors, 224–225
 - examples, 126–127, 132–133, 249–250
 - Gibbs sampler, 126–127, 131, 224–225
 - marginal likelihood, 231
 - missing data in, 226
 - prior distribution, 224
- BACC software, 154–162
 - autoregressive model, 225
 - censored normal linear model, 197
 - censoring, 216
 - density-ratio class, 160, 280
 - independent finite state model, 204
 - marginal likelihood approximation, 260
 - Markov finite state model, first order, 231
 - nonlinear regression, 181
 - normal linear regression, 155
 - normal mixture linear model, 212
 - probit linear model, 201
 - reweighting, 275
 - seemingly unrelated regressions, 166
 - Student-*t* linear model, 208
- Bayes action, *see* action
- Bayesian analysis, computation and communication, *see* BACC software
- Bayesian client, *see* client
- Bayesian communication, 271–277
- Bayesian model averaging, *see* model averaging
- Bayesian updating, *see* updating
- Behrens-Fisher problem, 125–126
- blocking, 120–121
 - examples, 121, 127, 137, 138, 171, 211–212
- burn-in, 119, 145–147
 - examples, 146, 156, 181
- censored normal linear model, 196–200
 - BACC, in, 197
 - conditionally conjugate prior, 197
 - examples, 196–197, 199
 - extensions, 215–216

- censored normal linear model (*Continued*)
 Gibbs sampler, 198
 censoring, categorical, 199
 central limit theorem
 asymptotic posterior analysis, 95–96
 direct sampling
 actions, 108–109
 moments, 106–107
 quantiles, 106–107
 importance sampling
 actions, 117–118
 moments, 114
 Markov chain Monte Carlo
 actions, 148
 moments, 147–148
 moments, weighted, 273–274
 certainty equivalence principle, 48
 client, 2
 examples, 4, 6, 87, 245
 complete model, 10, 25, 153
 ancillarity and, 34–35
 concentrated expectations, *see* variance reduction
 confidence region (interval), 57
 consistent estimation, *see* asymptotic
 concentration
 convergence conditions
 direct sampling
 actions, 108–109
 moments, 106–107
 quantiles, 106–107
 Gibbs sampler, 137–139
 importance sampling
 actions, 117–118
 moments, 114
 Markov chain Monte Carlo
 actions, 148
 moments, 135
 vector of interest, 135–136
 credible sets, 56–61
 confidence region and, 57
 examples, 60–61, 191–192
 highest probability density, 57–59
 examples, 59–60
 optimality, 58
 improper prior and, 80
 invariance, 57, 60–61
 posterior predictive analysis and, 267–268
- data, 8, 22
 data-generating process, 91
 decision theory, 17–18, 46–55
 Bayesian, 46–47
 non-Bayesian, 51
 density ratio tests, 247–251
 importance sampling, 254–255
 observables density, for, 249–250
 prior density, for, 250–251
 Dirac delta function, 123, 172
 direct sampling, 106–110
 antithetic sampling and, 130–132
 central limit theorem
 actions, 108–109
 moments, 106–107
 quantiles, 106–107
 concentrated expectations and, 128–129
 convergence conditions
 actions, 108–109
 moments, 106–107
 quantiles, 106–107
 density ratio test, 247–248
 examples, 107–108, 110
 inverse c.d.f. method, 109
 distribution
 beta, 203
 chi square, 26
 Dirichlet, 203
 discrete normal mixture, 208
 exponential, 36, 44, 55, 70, 86, 96
 exponential family, 42–43
 gamma, 26, 167
 half-normal, 36, 43, 70
 log-normal, 55
 normal
 bivariate, 110, 140, 146–147
 conditional multivariate, 171
 density kernel, 29–30
 multivariate, 26
 truncated univariate, 37, 61, 113, 119
 univariate, 89–90
 normal-gamma, 41
 Poisson, 43, 86
 Student-*t*
 multivariate, 42
 univariate, 90–91
 uniform, 36, 43, 57, 60, 86
 Wishart, 165, 167
- earnings conditional distribution, 212–215
 extensions, 193, 218–219
 normal distribution inadequate for, 213
 posterior predictive analysis, 268–269
 prior predictive analysis, 263–266
 earnings data, 212
 employment spells, 45–46, 226
 estimation, 50–53
 examples, 52–53, 55, 60, 61, 71
 evidence, 98–99
 expected loss, 17–18

- expected utility, 17
- experiment, 98
- filtered probabilities, 236
- forecasting, 132–133, 221
- Gibbs sampler, 120–122, 137–139
 - autoregressive model, in, 126–127, 132–133, 224–225
 - Behrens-fisher problem, in, 125–126
 - bivariate normal distribution, in 140
 - censored normal linear model, in, 198
 - convergence conditions, 137–139
 - covariate selection and, 173–174
 - history, 120
 - improper posterior and, 140–141
 - inequality constraints and, 127, 140, 171–172
 - marginal likelihood approximation and, 257–258
 - Markov normal mixture linear model, in, 234
 - missing data and, 167
 - nonlinear regression model, in, 126–127, 131
 - normal mixture linear model, in, 211–212
 - normal linear regression model, in, 121, 156
 - panel data and, 168
 - probit linear model, in, 201
 - random coefficients and, 168
 - restricted linear regression model, in, 138, 171, 173–174
 - seemingly unrelated regressions model, in, 166
 - Student-*t* linear model, in, 206–208
- hierarchical prior, *see* prior density
- highest posterior density region, *see* credible sets, highest probability density
- hyperparameters, 75
 - example, 76–77
- identification, 140–141, 181, 208, 210
- importance sampling, 114–119
 - acceptance sampling and, 116–117
 - acceptance sampling hybrid, 117
 - antithetic sampling and, 133
 - central limit theorem
 - actions, 117–118
 - moments, 114
 - convergence conditions
 - actions, 117–118
 - moments, 114
 - density ratio test, 254–255
 - example, 231
 - history, 114
 - marginal likelihood approximation and, 256–257
 - Metropolis independence chain and, 123–124
 - prior reweighting of, 117
- improper prior density, *see* prior density, improper
- independent finite state model, 202–205
 - BACC, in, 204
 - component of other models, 208, 226
 - conjugate prior distribution, 203–204
 - empty cells in, 205
 - marginal likelihood, 204
 - posterior distribution, 204
- interval data, 45, 199, 215–216
- investigator, 2–3
 - examples, 87, 245–246
 - modeling and, 15
 - parameters and, 51–52
 - tools for, 245–246
- iterated expectations, law of, 128, 129, 132–133
- joint distribution tests, 251–254
 - examples, 253–254
- kernel, 24
 - invariant, 134
 - transition, 134
 - ergodic, 135
 - Harris recurrent, 135
 - p*-irreducible, 134
 - aperiodic, 134
 - uniformly ergodic, 147
- Kronecker delta function, 203
- Kullback-Leibler information, 92
- latent variables, 22, 73–76
 - examples, 73, 196–197, 200–201, 206, 208, 233
- likelihood function, 22
- likelihood principle, 97–103
- Lindley's paradox, 83, 86–87
- linear model with serial correlation, *see* autoregressive model
- loss function, 17–18, 46–47, 50–52
 - examples, 159
 - linear-exponential, 54
 - linear-linear, 48–49, 54
 - model choice and, 65, 71
- quadratic, 47–48, 53
 - smooth, 108–109, 117–118, 148
 - zero-one, 50, 55
- marginal likelihood, 16, 23
 - approximation by simulation, 255–259
 - BACC, in, 260
 - density ratio method, 259–260

- marginal likelihood (*Continued*)
 - examples, 157, 182–183, 187, 213
 - Gibbs sampler, using, 257–258
 - importance sampling, using, 256–257
- decomposition, 67
- examples, 62–64, 70, 161, 175, 204, 226, 233
- improper prior and, 83–84
- model comparison and, 62–65
- numerical approximation of, 157
- predictive likelihood and, 67
- Markov chain Monte Carlo, 119–127, 133–152
 - central limit theorem
 - actions, 148
 - moments, 147–148
 - moments, weighted, 273–274
 - convergence assessment, 145–152
 - convergence conditions
 - actions, 148
 - moments, 135
 - vector of interest, 135–136
 - history, 120, 133
 - hybrid methods, 142–147
 - Metropolis within Gibbs, 143–145
 - transition mixtures, 142–143, 147
 - numerical accuracy, 145–152
 - numerical standard error, 149, 274–275
 - reweighting of, 272–275
 - separated partial means test for, 149–150
- Markov finite state model, first order, 220–233
 - BACC, in, 231
 - conjugate prior distribution, 230
 - marginal likelihood, 233
 - marginal likelihood approximation, 261
 - nonstationary model, 229–230
 - posterior distributions, 230, 231
 - posterior simulator, 231
 - properties, 226–229
 - stationary model, 230–231
- Markov normal mixture linear model, 233–243
 - applications, 13, 238–241, 266–267, 270
 - conditional posteriors, 234
 - label switching, 242
 - posterior predictive analysis, 270
 - posterior simulator, 234
 - prior predictive analysis, 266–267
- merger, 1–2, 55–56
- Metropolis independence chain, 123–124
 - convergence, 139, 147
 - marginal likelihood and, 257
- Metropolis within Gibbs, 143–145
 - convergence, 144–145
 - examples, 207–208, 224–225
- Metropolis-Hastings algorithm, 122–124, 139–140
 - convergence conditions, 139–140
 - examples, 125, 231
 - history, 120
- missing data, 34–35, 167, 225–226
- mixed experiment, 99
- model averaging, 15–16, 62
 - examples, 71
- model choice, 65, 71
- Monte Hall problem, *see* televised game show
- nonlinear regression, 175–193
 - basis functions, with, 185–190
 - examples, 186–190
 - prior specification, 187
 - smoothness priors, with, 176–184
 - examples, 180–184
 - prior specification, 176–180
- normal linear regression model, 25–29
 - ancillary statistic, 34
 - asymptotic concentration, 94–95
 - BACC, in, 154–161
 - Bayes factor, 64–65
 - Bayesian communication, 275–277
 - covariate selection, 172–174
 - generalized, 30
 - geometric interpretation, 28–29
 - Gibbs sampler, 121
 - convergence, 137, 156
 - inequality constraints and, 170–172
 - hierarchical prior distribution, 77–78
 - highest posterior density region, 59–60
 - improper prior distribution, 81–84
 - inequality constraints, 138, 140, 170–174
 - marginal likelihood, 62–64, 175
 - marginal likelihood approximation, 157
 - nonlinear in coefficients, 126–127, 131
 - nonlinear in covariates, *see* nonlinear regression
 - nuisance parameters, 36
 - omitted covariates, 96–97
 - outliers, 218
 - posterior predictive analysis, 271
 - prediction problem, 82–83, 107–108, 161–162
 - predictive density, 67–70
 - prior distribution, 26
 - conditionally conjugate, 40
 - conjugate, 39, 40–42, 107–108
 - prior predictive analysis, 271
 - restricted, 112–113, 125, 127, 169–175
 - short rank, 30
 - sufficient statistic, 33
- normal mixture linear model, 208–215
 - BACC, in, 155

- normal mixture linear model (*Continued*)
 censored, 215–216
 conditional posteriors, 211–212
 conditionally conjugate prior, 209–210
 examples, 212–215,
 Gibbs sampler, 209–210
 labeling, 210
 marginal likelihood approximation, 213
 outliers and, 218
 posterior predictive analysis, 268–269
 prior predictive analysis, 263–266
 properties, 208–209
 public school class size, 217
- notation
 covariates \mathbf{X} , 26
 data \mathbf{y}_t^o , 22
 Dirac delta function $\delta_\theta(\cdot)$, 123
 distribution of interest I , 106
 Gibbs transition G , 121
 Hastings transition H , 122
 Kronecker delta function $\delta(\cdot, \cdot)$, 203
 MCMC transition C , 133
 measure ν , 22
 model A , 22
 models, alternative A_j , 61
 observables \mathbf{y}_t , 21
 order of unobservables k_A , 22
 probability density $p(\cdot)$, 22
 sample size T , 22
 sample space Ψ , 22
 source distribution S , 111
 subsample \mathbf{Y}_t , 22
 unobservables θ_A , 22
 vector of interest ω , 24
- nuisance parameters, 35–36
 example, 36
- numerical standard error (NSE), 107
 BACC, in, 156–157
 Markov chain Monte Carlo, 149
 reweighting and, 274–275
- observables, 7, 21–22
- order-restricted inference, 174–175
- outliers, 218, 253
- panel data, 168–169
- panel study of income dynamics (PSID), 212
- posterior density (distribution), 10, 24
 exponential family, of, 43
 kernel instandard form, 24
 multinomial, 151–152
 normalized, 24
 vector of interest, of, 25
- posterior odds ratio, 16, 64
 Bayes critical value and, 65
- posterior predictive analysis, *see* specification analysis
- posterior simulation, 13–15, 105–106
 acceptance sampling, 111–113
 direct sampling, 106–110
 efficiency, 141–142
 Gibbs sampler, 120–122, 137–139
 importance sampling, 114–119
 joint distribution test for, 253–254
 Markov chain Monte Carlo, 114–127, 133–152
 Metropolis-Hastings algorithm, 122–124, 139–140
- precision, 26
- prediction step, 235–236
- predictive Bayes factor, *see* Bayes factor, predictive
- predictive density, 66
 examples, 67–70, 161–162, 236–238
 improper prior and, 85–86
- predictive likelihood, 66
 example, 67–70
 marginal likelihood and, 67
- prior density (distribution), 10, 23
 conditionally conjugate, 39–42
 examples, 40, 164–166, 197, 209–210
 conjugate, 38–39
 exponential family, in, 43
 density-ratio class, 87–91
 BACC, in, 160, 281
 bounds approximation, 277–281
 example, 160
 hierarchical, 73–78
 examples, 74, 76–77, 168–169, 192
 multi-tier, 77
 two-tier, 74–75
- improper, 78–87
 credible set and, 80
 limit of proper priors, 79–81
 marginal likelihood and, 83
 normal linear regression model, 81–83
 predictive density and, 87
 Jeffreys, 84–85
 examples, 86
 normal-gamma, 41
 reweighting, 117, 272
 robust, 87
 sensitivity to, 157–158, 159, 242–243
 transformation of unobservables, 78–79
- prior odds ratio, 16, 64
- prior predictive analysis, *see* specification analysis

- probit linear model, 200–202
 - BACC, in, 201
 - examples, 200–201
 - Gibbs sampler, 201
 - marginal likelihood approximation, 260
 - ordered probit, 202
- public school class size, 154–161
 - Bayesian communication and, 275–277
 - decisions regarding, 4
 - loss functions, 159–160
 - Massachusetts (MCAS) data, 155
 - nonlinear regression and, 180–190
 - normal linear regression model and, 154–158
 - normal mixture linear model and, 217–218
 - posterior predictive analysis, 271
 - Student-*t* linear model and, 217
- quantile
 - direct simulation of posterior, 106–107
 - linear-linear loss function, 49
- random coefficients, 168
- random walk Metropolis chain, 123
 - convergence, 139
 - example, 125
- Rao-Blackwell theorem, 128–129
- Rao-Blackwellization, *see* concentrated expectations
- relative numerical efficiency (RNE), 117
 - examples, 156, 275–277
 - importance sampling, 119
- reversibility condition, 124
- reweighting, 117, 272
 - central limit theorem for moments, 273–274
 - convergence conditions, 272–273
- risk, 47
- seemingly unrelated regressions (SUR), 162–169
 - BACC, in, 166
 - conditional posteriors, 166
 - conditionally conjugate prior, 165–166
 - Gibbs sampler, 166
 - hierarchical prior, 168–169
 - inequality constraints, 174–175
- sequential experiment, 101
- simulation consistency, *see* convergence conditions
- simultaneous equations, 37
- smoothed probabilities, 236
- source density, 111
- specification analysis, 262–271
 - posterior predictive analysis, 267–270
 - examples, 268–269, 271
 - prior predictive analysis, 262–267
 - examples, 263–267, 271
- Standard and Poors 500, 6, 239, 243
- stopping rule, 97–98, 101
- Student-*t* linear model, 206–208
 - BACC, in, 208
 - censored, 215–216
 - conditional posteriors, 207–208
 - example, 217
 - mixture distribution, component in, 257
 - prior distribution, 206
- student : teacher ratio, *see* public school class size
- substochastic, 134
- sufficient statistic, 31–33
 - ex ante and ex post equivalence, 31
 - examples, 33, 36–38, 45–46, 98, 203
 - exponential family, in, 42–43
 - factorization criterion, 32
- televised game show, 12
- unit simplex, 203
- unobservables, 7, 22
- update step, 241
- updating, 10–11
 - examples, 178–179
 - predictive likelihood and, 66
- value at risk, 5–6
 - posterior inference for, 238–243
 - posterior predictive analysis, 270–271
 - prior predictive analysis, 266–267, 271
 - simulation and, 5–6
 - vector of interest, 24
- variance reduction, 127–133
 - antithetic sampling, 130–132
 - asymptotic properties, 131
 - examples, 131, 132–133
 - forecasting and, 132–133
 - importance sampling and, 133
 - concentrated expectations, 128–130
 - examples, 129–130, 174
 - forecasting and, 132–133
- vector of interest, 9, 15, 17, 24
 - examples, 17, 24, 25, 47, 51, 176, 221
- warm-up, *see* burn-in
- weak conditionality principle, 99
- weak sufficiency principle, 99
- Wiener process, 176