

## Author index

*The full references for the authors listed here are given in the bibliography, which also includes a selection of other references to provide the interested reader with material for further study*

- |                  |  |                        |                                 |
|------------------|--|------------------------|---------------------------------|
| Aitchison, J.    | 35, 39, 65, 84, 107, 128, 133, 135, 143, 220, 235, 247 | Halperin, M.           | 200, 202, 203, 208              |
| Anderson, T.W.   | 104, 235   | Hartley, H.O.          | 115, 116, 205                   |
| Ando, A.         | 39   | Hoadley, A.B.          | 202, 208                        |
| Aoki, M.         | 178  | Howe, W.G.             | 119, 120, 123, 128, 142         |
|                  |  | Hunt, H.H.             | 39                              |
| Bain, L.J.       | 107  | Jeffreys, H.           | 39                              |
| Barnett, B.N.    | 158  | Johns, M.V.            | 158                             |
| Beatty, G.H.     | 119, 128   |                        |                                 |
| Berkson, J.      | 200, 208   | Kabe, D.G.             | 39                              |
| Bowker, A.H.     | 208  | Kalotay, A.J.          | 208                             |
| Bratcher, T.L.   | 39   | Kaufman, G.M.          | 39                              |
| Brown, J.A.C.    | 35   | Kay, A.W.              | 84                              |
| Brown, J.J.      | 84   | Kay, J.W.              | 84, 220, 235                    |
| Brownlee, K.A.   | 208  | Krutchkoff, R.G.       | 202, 208                        |
|                  |  |                        |                                 |
| Campling, G.E.G. | 146, 158   | Laplace, P.S.          | 39                              |
| Chetty, V.K.     | 39, 178  | Lever, A.F.            | 84                              |
| Chew, V.         | 39, 107  | Lieberman, G.J.        | 96, 97, 118, 119, 128, 208, 253 |
|                  |  | Lindley, D.V.          | 39, 158, 178                    |
| Davies, O.L.     | 178  | Linnig, F.J.           | 208                             |
| De Finetti, B.   | 39   |                        |                                 |
| De Groot, M.H.   | 65   | Mandel, J.             | 208                             |
| Draper, N.R.     | 159  | Maritz, J.S.           | 138, 143                        |
| Dunsmore, I.R.   | 178, 189, 208, 235                                     | Martinelle, S.         | 200, 208                        |
|                  |  | Mises, R. von          | 137                             |
| Eisenhart, C.    | 208  |                        |                                 |
| Ellison, B.E.    | 119, 128   | Nakamizo, T.           | 178                             |
|                  |  | Neville, A.M.          | 84                              |
| Ferguson, T.S.   | 65   | Neyman, J.             | 143                             |
| Ferriss, J.B.    | 84   |                        |                                 |
| Fisher, R.A.     | 39, 235  | Odén, A.               | 208                             |
| Fraser, R.       | 84   | O'Muircheartaigh, I.G. | 84                              |
|                  |  | Owen, D.B.             | 96, 97, 142, 253                |
| Geisser, S.      | 39, 235  |                        |                                 |
| Guthrie, D.      | 158  | Paulson, E.            | 107                             |
| Guttman, I.      | 39, 107, 123, 128, 143, 159, 246, 247                  | Pearson, E.S.          | 39, 115, 116, 205               |
|                  |  | Pearson, K.            | 98, 116, 127, 253               |
| Habbema, D.      | 220  | Proschan, F.           | 107                             |

268 *Author index*

- Raiffa, H. 39, 65, 136  
Resnikoff, G.J. 118  
Robbins, H. 137, 138, 143  
Roberts, H.V. 39  
Robertson, J.I.S. 84
- Sawagari, Y. 178  
Scheffé, H. 208  
Schlaifer, R. 39, 65, 136  
Schucany, W.R. 39  
Sculthorpe, Diane 39, 65, 84, 107,  
128, 133, 135, 143  
Shukla, G.K. 208  
Siegel, C.L. 249  
Sunahara, Y. 178  
Symington, T. 84
- Teicher, H. 136  
Thatcher, A.R. 39  
Tiao, G.C. 39, 246, 247
- Wald, A. 65, 119, 128  
Wallis, W.A. 119, 128  
Weeks, D.L. 107  
Weissberg, A. 119, 128  
Wetherill, G.B. 146, 158, 159  
Wilks, S.S. 107, 143  
Williams, E.J. 200, 208  
Winkler, R.L. 39  
Wolfowitz, J. 119, 128
- Zellner, A. 39, 178

## Subject index

- action set 45, 54, 147, 163, 199, 234, 258
- arrival parameter 186–7, 217–8
- atypicality 77, 224–7, 231, 233, 235–6
- Bayesian cover 67–70, 84–6
- Bayesian coverage 77–8, 84, 86, 93, 131–2, 153
- Bayesian mean coverage 77–8, 93–4
- Bayesian prediction, most plausible 70–2, 84–6, 131, 199
- Bayes's theorem 18, 23, 26, 136, 187–8, 219, 228
- beta distribution 20, 28, 34–5, 99, 123, 138, 148, 150–2, 155, 158, 167, 178, 235, 250, 256
- beta-binomial distribution 24, 28, 34, 48, 63, 150, 155, 165, 250, 253, 256
- binomial distribution 20, 27–8, 33, 88, 94, 96, 114–5, 128–9, 148, 250, 253, 256
- binomial trials 39, 83, 90, 108, 112
- bivariate normal distribution 130, 217, 221
- calibration 12–3, 162, 181–211, 215, 239, 258
  - designed 184, 189–90, 195, 198, 218
  - natural 184, 186–90, 192, 197, 218
- calibration curve 15
- calibrative distribution 185–200, 206–7, 215, 258
- calibrative estimates
  - classical 199, 202–3, 208
  - inverse 200, 202–3, 208
  - modified inverse 202–3
- case records 216–18
- chi-squared distribution 21, 28, 31, 33, 35, 101, 103, 122, 133–4, 168, 172, 175, 191, 210–11, 250, 252–4, 256
- classification 171
- confidence interval 79, 114–16, 201–4
- conjugate prior distribution 19–20, 26, 39–40, 51, 166, 175
- cost function 164, 170, 174, 176–7
- cover 70–1, 73, 77, 79–80, 84–6, 88, 90–1, 110
- coverage 82–3, 94, 99, 117–19, 124, 131
- coverage distribution 69, 79–83, 86, 88, 94, 99, 101–2, 105, 110, 117–18
- decisive prediction 4, 45–68, 70, 131–2, 146, 258
- diagnosis 12–13, 39, 77, 162, 212–37, 239, 258
  - designed 218, 220, 231
  - differential 75–6, 212
  - estimative 227–33
  - natural 218, 220–2, 231
  - predictive 227–33
- diagnostic assessment 12
- diagnostic distribution 215–24, 226, 234, 236, 258
- Dirichlet distribution 21, 28, 139–41, 221, 255–6
  - ordered 139–40, 255
- Dirichlet-multinomial distribution 24, 28, 255–6
- discriminant analysis 12
- distribution-free prediction 4, 138–43
- distribution-free tolerance intervals 140–3
- empirical Bayes methods 4, 137–8, 143–5
- exponential distribution 13, 17, 20, 41–2, 51, 80, 82, 85–6, 89, 92, 99, 106, 108, 111–12, 128, 144–5, 160, 236, 250, 252
- exponential left-sided distribution 22, 250, 254
- exponential left-sided gamma distri-

- bution 22, 29–30, 87, 254  
 exponential right-sided distribution 22,  
 29–32, 105–6, 108, 129, 250,  
 252, 254  
 exponential right-sided gamma distri-  
 bution 22, 254  
 exponential two-parameter distribution  
 22, 29, 31, 39, 105, 124  
 exponential weighing 1
- F-distribution 104, 252  
 feature vector 215, 217–18, 220–1,  
 223, 225, 228, 233, 235  
 fiducial approach 39  
 frequentist decision theory 132–3,  
 143  
 frequentist linear utility theory 133–5  
 future experiment 1–6, 12–13, 18–19,  
 31–2, 35, 40–3, 45, 51, 54, 56,  
 65, 68–9, 75, 79, 83, 91, 94,  
 97–8, 107, 115–16, 118, 122,  
 128, 138, 140, 146, 154, 162–4,  
 171, 173, 183, 191, 197, 199,  
 202, 204, 211, 215, 239–40, 258  
 choice of 4–6, 162  
 detection of 6, 12
- gamma distribution 20, 26–30, 32–3,  
 41–2, 44, 51, 86, 88, 99–100,  
 105–6, 117, 128, 136, 144–5,  
 160, 166, 250, 252–4  
 geometric distribution 107, 128,  
 251–2  
 guarantee 110, 113–14, 124  
 guarantee function 110–12, 118–19
- hypergeometric distribution 48, 63  
 96–7, 253
- inadmissible prediction 57  
 incomplete beta function 48–9, 63,  
 73, 75, 79, 98–9, 105, 115–6,  
 141–2, 166, 171, 226, 245, 253  
 incomplete gamma function 116, 124–7,  
 253  
 index set 162, 171–2, 185, 198, 239  
 induced utility 64, 133  
 informative experiment 1–2, 4–6, 8,  
 13, 18–9, 23, 27, 31–2, 37, 40–3,  
 45, 51, 68, 77, 79–80, 83, 86,  
 91–2, 94, 97–8, 101, 103–4, 107,  
 113–16, 118, 122, 128, 133, 136–  
 8, 140, 142–3, 146, 151, 154, 162,  
 166, 168–9, 172, 174–5, 177,  
 181, 199, 205, 209–11, 213, 218,  
 220, 239, 241
- informative prediction 4, 47, 65, 68–87,  
 131, 135, 137, 153  
 informative prediction, Bayesian 68–9  
 interval prediction 50, 55–7, 62, 66,  
 78  
 all-or-nothing 70  
 linear utility 56  
 invariance 92–3, 99, 101  
 inverse beta distribution 24, 26–8, 30,  
 48, 51, 63, 78, 144, 165, 251–3  
 inverse prediction 183
- linear discriminant 235  
 linear least squares prediction 1  
 lognormal distribution 35
- multinomial distribution 21, 28, 41,  
 255–6  
 multinormal distribution 21, 27, 29, 31,  
 73, 75, 84, 104, 107, 109, 123,  
 128, 172, 220–1, 226, 230–1, 235,  
 255–7  
 multivariate regression 39
- negative binomial distribution 24, 28,  
 48, 63, 165–7, 171, 251–3, 256  
 negative multinomial distribution 42,  
 255–6  
 normal chi-squared distribution 21, 28,  
 35–6, 42, 168, 172, 175, 190,  
 254, 256  
 normal distribution 14, 21, 27–8, 31,  
 33, 35, 39, 42, 66–7, 84, 88, 101,  
 103, 107, 118, 120, 122, 133–4,  
 136, 138, 142, 160, 168, 172, 174,  
 183, 189–91, 195–6, 210–1, 228,  
 236, 241–2, 251–2, 254, 256  
 normal–Wishart distribution 21, 29,  
 221, 256–7
- optimisation 6, 162, 173–8, 183, 239,  
 258  
 order statistics 31, 140–1
- parameter space 45, 136, 163, 198, 234  
 Pareto distribution 39–40, 44, 66, 107,  
 129, 251  
 Pareto-gamma distribution 44  
 point prediction 45, 50, 54–7, 69, 78,  
 199, 200  
 all-or-nothing 46, 55  
 linear loss 46, 62, 164  
 quadratic loss 47  
 Poisson distribution 17, 20, 27–8, 33,  
 42, 66, 97, 98, 114, 116, 128–9,  
 145, 166, 170, 208, 251, 253

*Subject index*

271

- Poisson process 41, 86, 108, 208  
 posterior distribution 19, 36, 44, 218  
 posterior plausibility function 18, 19,  
 26–7, 35, 64, 241  
 prediction interval 69, 84, 199  
   Bayesian 85  
 prediction region 70, 73, 79, 104  
 predictive distribution 4, 19, 23–4,  
 26–8, 31–2, 34–7, 39–42, 44–6,  
 48–9, 51–2, 54, 60, 63–4, 67–9,  
 71–2, 75, 84–5, 109, 131–2, 136,  
 139, 146–7, 159, 163–4, 168,  
 172, 174, 177, 188, 190–2, 196,  
 205–6, 220, 225, 241, 246–7,  
 258  
   estimated 137–8  
   mean of 48, 50, 199  
   mode of 46, 48, 50, 55, 199  
   quantile of 47–8, 50, 52, 252  
 predictive regression density function 33  
 predictor, simple 45–6  
 preposterior analysis 147, 154–5, 160,  
 174  
 prior distribution 19, 23, 40–4, 79, 80,  
 93–4, 136, 138, 152, 192, 197,  
 198, 218  
   ignorance 169–71, 173, 175–7  
   information 42, 85, 149, 156  
   plausibility function 18–19, 26, 132,  
   137–8, 228, 241  
   predictive distribution 150, 155  
 prognostic distribution 240–3, 258
- range of previous experience 72  
 region of previous experience 72–3,  
 75–6, 84–6, 109, 225, 227  
 regression 8, 31–2, 37, 128, 162, 173,  
 205  
   binomial 33–4  
   gamma 33  
   linear 109, 189, 199, 205  
   normal 33, 37, 241–2  
   Poisson 33, 42  
   polynomial 175  
 regulation 5, 162–74, 178, 183, 239,  
 258  
   finite index set 171–3  
   point 163–70  
   set 170–1  
 response surface 174–5, 177–8  
   quadratic 176
- sample size, choice of 154–6  
 sample space 45, 68, 77, 135, 258  
   class of measurable subsets 54, 68,  
   77, 258
- sampling inspection 146–61, 258  
   fixed size 146–52, 154, 156  
   sequential 146, 156–8, 160  
 set prediction 54–5, 57, 200, 204–5  
   all-or-nothing 55  
 set predictor 54  
 Siegel distribution 24, 29, 251–3, 256  
   multivariate 25, 29, 156–7  
 simple prediction 46–7, 54  
 simple predictor 46, 54  
   all-or-nothing 65  
   linear loss 65  
   quadratic loss 65  
 Simpson's rule 193  
 stochastic control 178  
 structural parameter 187, 217, 228, 231  
 Student distribution 24, 29, 37, 48, 63,  
 73, 104, 164, 168, 172, 175, 190,  
 192, 196–8, 201, 206, 228, 242–3,  
 251–3, 256  
   multivariate 25, 29, 75, 221, 226,  
   255–6  
 Student-Siegel distribution 24, 29, 191,  
 194, 206, 254, 256  
   multivariate 25, 29, 256–7  
 sufficient statistic 26–7, 32–3, 35, 44,  
 51, 107, 133, 168, 175, 191
- t*-distribution, non-central 118  
 $T^2$ -distribution 104  
 terminal analysis 147, 152, 154–5, 160,  
 174  
 time series analysis 1  
 tolerance regions 4, 69, 79–83, 131,  
 134  
   guaranteed coverage 69, 81–3, 86,  
   110–30, 142, 152–3  
   mean coverage 69, 81, 83, 86, 88–  
   109, 116, 133, 142, 152  
   similar guaranteed coverage 111,  
   113, 117–19  
   similar mean coverage 88, 90–1, 93,  
   96, 100, 102–4, 106–7, 109  
 treatment allocation 238–48, 258  
 type of case 215–18, 223, 226–7
- uniform distribution 40, 43, 206  
 uniformly diffuse prior 40  
 utility function 4, 45–6, 50–2, 54, 56,  
 60, 62, 64–5, 68–9, 84, 131–3,  
 144, 147, 152–5, 157, 160, 163,  
 170, 172, 174–5, 179, 199–200,  
 204–5, 239, 246–7, 258  
   additive 147, 157, 160  
   all-or-nothing 163, 165–6  
   expected 45, 53–7, 59, 61, 64,

272

*Subject index*

- 67–8, 149–51, 154–5, 163, 166,  
168, 170, 199, 234, 241, 246  
piecewise-linear 56, 66, 131–3,  
143–4, 164–6  
quadratic 164–5, 167, 169, 178  
vague prior distribution 75, 84, 159,  
190–1, 206, 246  
vague prior information 19–22, 34–5,  
39, 42–3, 59  
Wishart distribution 21, 29, 75, 104,  
221, 256–257

## *Example and problem index*

- airflow through doorways 179  
 airlock in components 142–3  
 antibiotic assay 6–9, 205–8  
 autoanalyser calibration 183–5, 195–7  
  
 ball-bearing diameters 42, 84–5  
 barrier cream 240, 246, 247  
 batch acceptance 146–61  
 bird-nesting 34, 129  
 breakdown times 85  
  
 chemical process fault diagnosis 15–16, 237  
 choice of sample size 154–6  
 chromatographic assay 209  
 clearance circle assay 6–9, 210  
 cloth blemishes 108  
 component length control 173  
 component lifetimes 41, 42, 85, 142–3  
 Conn's syndrome 10–13, 85, 231–4, 236, 237  
 crop prediction 103, 142  
 crushing strength of mortar 179  
 Cushing's syndrome 73–7, 212–15, 221–7, 230  
  
 design components 120–3  
 destructive testing 146–61  
 disintegration times 236  
 double-sampling inspection 160  
 drug response 176–7  
  
 extrusion process 41, 65  
  
 fertiliser effectiveness 43, 85  
 foetal measurement 13, 84  
  
 income tax 14, 66, 129  
 industrial process yield 5–6, 177  
 insecticide strength 179–80  
 item characteristics 87  
 item inspection 208  
  
 laminate design 4–5, 170–1  
  
 light bulb lifetimes 108, 129  
  
 machine tool replacement 2–3, 50–4, 57–60, 66, 70–2, 77–9  
 medical diagnosis 10–3, 212–5, 221–7, 230, 236  
 medical prognosis 2, 35–8  
 metabolic excretion rates 73–7, 85–6, 109  
  
 particle emission 166–8  
 patient reactions 208–9  
 perishable commodity supply 65  
 psychiatric diagnosis 235  
  
 quality control 3–4, 96–7, 115–16  
 quality improving process 238–40, 241–5, 247  
  
 radiocarbon dating 15, 208  
 recall time of patients 13–4, 65  
 relapse times 129  
 response to stimulus 109, 208–9  
  
 seed germination 98  
 self-destructive components 86, 108  
 sequential sampling inspection 156–9, 160  
 setting strength of adhesive 14, 179  
 shoe manufacture 130  
 skin allergy 240, 246, 247  
 sterilising liquid 67  
 storage tank size 145  
 suppressor drug dose level 168–70  
 survival times 2, 35–8  
  
 theatre ticket agency 66  
 treatment allocation 247–8  
  
 ultrasonic cephalometry 13, 84  
 university applicants 178  
  
 vitamin assay 209–10  
  
 water content of soil 181–3, 192–5, 197, 203–5