INDEX

α, 142, 172
B₀, 72
B₁, 228
B₂, 72
B₃, 180
B₄, 228
B₅, 72
C, 97, 100, 105, 147, 152, 180
C₉₅, 278
Cₓ, 234
Cₓₙ, 237
Cₓ₁, 228
Cₓ₉₅, 240
Cₓ₂, 228
Cₓ₃, 234
Cₓ₅, 237
Cₓ₁₁, 228
Cₓ₉₅, 240
Cₓ₅, m=2, 234
Cₓ₅, many m, 237
Cₓ₅, M₉₅, 240
Cₓ₁₁, 242

αₗ, 142, 172
Dₜ, 174
Dₖ, 97
Eff₁₃, 86, 117
Eff₁₅, 86, 112, 151, 157, 188
Iₚ, 72
iv, 97
iv₉, 142, 172
L, 167
Lₗ, 167
m, 167
Mₐ₁, 174

mₐ, 242
nₐₙ, i₂, ..., iₙ, 79
vₐ(1), 242
Nₛ, 242
xₐ, 172
xₐ, i, 142
A, 69, 80, 97, 105, 118, 144, 152, 174
Aₓₙ, 236
Aₓ₁, 228
Aₓ₂, 228
Aₓₙ, 242

A-efficiency, 86
A-optimal design, 84
adding another factor, 265
affine plane, 24
affirmation bias, 12
alias structure, 29
aliased effects, 29
alternative specific attributes, 11
associated distribution, 67
asymmetric factorial design, 16
attribute, 3, 15
alternative specific, 11
availability designs, 11
balance
level, 89
utility, 89
balanced incomplete block design, 53
INDEX

symmetric, 53
bias
  affirmation, 12
  policy response, 12
  rationalization, 12
BIBD, 53, 244
binary response experiment, 2-5, 233-234
block diagonal, 76, 210
Bradley-Terry model, 60-79
  information matrix, 68
  likelihood function, 61
  maximum likelihood estimation, 62-65
  ML estimates
    convergence, 65-67
choice experiments
  binary attributes
    pairs, 95-135
    various choice set sizes, 242
  choice models, 58-60
  choice probabilities, 59-60
  choice set, 2
  choice set size
    optimal, 237-243
      main effects and two-factor interactions, binary attributes, 240
    main effects only, 237-240
  class of competing designs, 95, 138
  cognitive complexity, 12
  collapsed attributes, 257
  collapsing levels, 46, 258
  common base and none options, 236-237
  common base option, 2, 8-9, 234-236
  comparison, 19, 20
    independent, 19, 20
    orthogonal, 20
  complete factorial design, 16-25
  confounded effects, 29
  connected design, 66, 78
  contractive replacement, 47, 260, 267
  contrast, 20
    geometric, 24
    independent, 20
    orthogonal, 20
    orthogonal polynomial, 21-22
    polynomial, 25
  contrast matrix, 72, 105
    binary attributes, 99, 144
    interaction effects, 100
    main effects, 100, 180
    main effects and two-factor interaction effects, 198
    normalized, 180

D-efficiency, 86
D-optimal design, 84
  any m
    asymmetric attributes, 187
    binary attributes, 149, 154
asymmetric attributes
  any m, 187
binary attributes
  any m, 149, 154
  paired comparisons, 103, 107
  paired comparisons
    binary attributes, 103, 107
D-optimal forced choice design
  binary attributes
    any m, 159-164
  defining contrasts, 27, 33
  defining effects, 29
  defining equations, 27, 33
  independent, 27
design
  A-efficiency, 86
  A-optimal, 84
  connected, 66
  D-efficiency, 86
  D-optimal, 84
  DCE
    construction strategy, 279-287
    strategy comparison, 291-293
  E-optimal, 84
  efficiency, 85
  near-optimal, 159-164
  orthogonal, 89
  shifted, 89
difference family, 55
difference set, 54, 264
difference vector
  choice set of size m, asymmetric attributes, 169-173
  choice set of size m, binary attributes, 138-143
discrete choice experiment, 2
distribution
  associated, 67
dominating option, 3, 10, 133, 164, 261
E-optimal design, 84
effects
  aliased, 29
  confounded, 29
  defining, 29
  interaction, 17-19, 23-25
  main, 16-17, 19-20, 25
  simple, 16
efficiency, 85
  A-, 86
  D-, 86
experimen
  expansive replacement, 47, 260
  paired comparison, 60
factor, 15
  level, 15
  qualitative, 19
  quantitative, 19, 20
factorial design. 15
  \(2^k\). 16–19
  \(2^k\) regular fractional. 27–33
  \(3^k\). 19–24
  \(3^k\) regular fractional. 33–37
  alias structure. 29
  asymmetric. 16, 24–25
collapsing levels. 46
collapsing levels. 46
  complete. 16–25
  contractive replacement. 47
  expansive replacement. 47
fractional. 27
  interaction effects. 17–19, 23–25, 29
  higher-order. 18
two-factor. 17
irregular fractional. 27, 41–52
  resolution 3. 41
  resolution 5. 42
  main effects. 16–17, 19–20, 25
prime-power levels regular fractional. 39–41
  resolution 3. 39
  resolution 5. 40
regular fractional. 27–41
generator vector. 31, 37
  resolution 3, 29, 31, 43, 251–267
  resolution 4, 29, 271, 276–279
  resolution 5, 30, 31, 163, 271–276
  symmetric. 16
factorial designs
tables. 55
finite field. 37–39
  irreducible polynomial. 38
  primitive element. 39
  Fisher information matrix. 67
foldover. 78
foldover treatment. 98
forced choice. 95
forced choice experiment. 2, 5–7, 57
  optimal. 137, 167
forced choice stated preference experiment
  optimal. 137, 167
fractional factorial design. 27
  \(D\)-optimal design. binary attributes
  any \(m\). 159–164
  as starting design. 249
  irregular. 41–52
Galois field. 37–39
generator
  paired comparison design. 122
generator vector. 37
generators
  choosing. 264–267
  estimable set. 129
  fractional factorial designs. 31
  main effects
  asymmetric attributes. 191
  small. optimal choice experiments. 160, 163
Hadamard matrix. 55
higher-order interaction effect. 18
IIA. 83
independence from irrelevant alternatives. 83
independent comparison. 20
independent contrast. 20
independent defining equations. 27
indicator variable. 97
information matrix. 97
  Bradley–Terry model. 68
derivation. 174–180
derivation of. 97–99. 118–119, 143–147
  Fisher. 67
general form. 176
general form. binary attributes. 144
  main effect of attribute \(q\). 184
  main effects. 102, 148, 180, 184
  main effects and two-factor interactions. 105, 152, 201
interaction. 17–19, 23–24
  higher-order. 18, 24
  linear \(\times\) linear. 23
  linear \(\times\) quadratic. 23
  quadratic \(\times\) quadratic. 23
  three-factor. 18
two-factor. 17
interaction effects. 17–19, 23–25
definition by restriction. 29
irreducible polynomial. 38
irregular fractional factorial design. 27, 41–52
  resolution 3. 41
  resolution 5. 42
labeled options. 11
level. 3, 15
level balance. 89
lexicographic order. 97
main effects. 16–17, 19–20, 25
correlated. 257
  variance-covariance matrix. 74
main effects plan
  orthogonal. 42
matrix
  contrast. 72
  merit. 61
minimum overlap. 89
MNL model. 58, 79–83
model
  Bradley–Terry. 60–79
  GEV. 58, 83
  main effects and two-factor interactions. 105–117, 121–133, 152–159, 163–
  164, 197–210
  main effects only. 100–105, 119–121, 147–
  151, 160–162, 180–189
  mixed logit. 58
  MNL. 58, 79–83
probit, 58
multiplicative inverse, 38

near-optimal design, 159-164
main effects only, 251-267
main effects plus some two-factor interactions
non-binary attributes, 276-279
main effects plus two-factor interactions.
269-279
binary attributes, 271-272
non-binary attributes, 272-276
null hypothesis
usual, 98, 144, 174

OMEP, 42
optimal choice set size, 237-243
optimal choice sets, 137, 167
asymmetric attributes
m2, 2, 167-210
binary attributes
m2, 2, 137-165
pairs, 95-117

optimality
A-, 84
D-, 84
E-, 84
options
labeled, 11
orthogonal array, 42
adding one more factor, 49
asymmetric, 42
collapsing levels, 46
construction, 43-44, 46, 47
contractive replacement, 47
expansive replacement, 47
index, 42
juxtaposing two OAs, 50
number of constraints, 42
number of levels, 42
parent design, 55
recursive construction, 49, 50
saturated, 47
strength, 42
symmetric, 43-44
table of, 55
resolution 3, 55
tight, 47, 261
orthogonal comparison, 20
orthogonal contrast, 20
orthogonal main effects plan, 42
orthogonal polynomial, 21-22
orthogonality, 89
orthonormal matrix, 72

paired comparison design
binary attributes, 95-135
A-optimal, 105, 113

D-optimal, 103
D-optimal, 107
fractional factorial, 118-119
paired comparison experiment, 60
partial profiles, 243-244
pencil, 24, 35
policy response bias, 12
polynomial
irreducible, 38
primitive element, 39
principal fraction, 28
principal minor, 74
prior information, 245-246
pseudo-factor, 39
qualitative factor, 19
quantitative factor, 19

rationalization bias, 12
regular fractional factorial
2k resolution 3, 31
2k resolution 5, 33
3k resolution 3, 37
3k resolution 5, 37
regular fractional factorial design, 27-41
2k, 27-33
3k, 33-37
generator vector, 31, 37
prime-power levels, 39-41
resolution 3, 39
resolution 5, 40
resolution 3 factorial design, 29, 31, 251-267
resolution 4 factorial design, 29, 271, 276-279
resolution 5 factorial design, 30, 31, 271-276
ring of polynomials, 39
SBIBD, 53
shifted design, 89
simple effects, 16
starting design, 249
obtaining, 256-263, 269-271
stated choice experiment, 2
stated preference choice experiment, 2
symmetric balanced incomplete block design, 53
symmetric factorial design, 16
tight orthogonal array, 261
treatment combinations, 15
standard order, 97
unrealistic, 51
Yates standard order, 97
two-factor interaction effect, 17
unrealistic treatment combination, 9-10, 51, 262
utility, 58
utility balance, 89
variance-covariance matrix, 84
main effects, 74
various choice set sizes, 242
Yates standard order, 97