

Index

- α -Stable
 - LDA models, 333
- ν -Stable family, 332
 - Tail properties, 332
- Additive Exponential Dispersion Models, 312
- Ali-Mikhail-Haq copula, 397
- alpha-Stable distribution
 - asymptotic density expansion, 196
 - asymptotic tail behaviour, 220
 - Characterization 1, 149
 - Characterization 2, 149
 - Characterization 3, 153
 - Characterization 4, 156
 - density approximation FFT and Bergstrom, 189
 - density approximation polynomial series, 196
 - density approximation quadrature, 187
 - density approximation reparameterization, 198
 - density Scale Mixture of Normals (SMiN), 206
 - distribution approximation quadrature, 208
 - distribution approximation series, 209
 - domain of attraction, 152, 155
 - Fractional Lower Order Moments, 223
 - Levy distribution, 151
 - Levy LePage series, 205
 - Nolan's S0 and S1-Type Parameterization, 178
 - parameter estimation, 215
 - quantile function, 210
 - simulation, 214
 - Zolotarev's A-Type parameterization, 167, 172
 - Zolotarev's B-Type density, 185
 - Zolotarev's B-Type parameterization, 175
 - Zolotarev's C and E-Type parameterizations, 176
 - Zolotarev's W-Type parameterization, 176
- alpha-Stable distribution spectral measure, 162
- Archimedean copula, 397
- Asymmetric Laplace distribution, 327
 - Maximum-Likelihood estimation, 329
- Asymmetric Power distribution, 446
- Asymptotic equivalence in distribution, 110
- asymptotically locally constant distribution, 120
- Benktander II distribution, 68
- Bergstrom series expansion, 196
- Beta distribution, 592
- Binomial-Levy LDA Model, 345
- bounds
 - aggregate tail distributions, 111
 - probabilities of convolutions, 115
- Box–Muller transformation, 66
- Bromwich Inversion Integral for Laplace Transforms, 241
- Burr distribution, 60
- Burr Type III distribution, 61
- Burr Type XII distribution, 60
- Caputo fractional derivative, 513
- Central Limit Theorem
 - classical, 153
 - Lindeberg condition, 154
 - Lindeberg Levy, 153
 - Lyapunov condition, 154

- characteristic function, 140
 comonotonicity and stochastic decreasing, 396
 compound Poisson Levy process, 297
 compound process
 tail decomposition, 415
 consistent variation, 129
 convolution, 282
 convolution of distributions, 110
 convolution root closure, 137
 convolution semi-group, 281
 continuous, 290
 generator, 290
 Levy process, 295
 truncated Poisson, 291
 convolution symmetrization, 283
 counting process, 75
- De Bruyn conjugate, 126
 De Pril's first method, 538
 De Pril's second method, 539
 Decoupage de Levy, 79
 Discrete distributions
 D-distributions, 526
 extrapolation methods and acceleration, 533
 infinite divisibility, 527
 Linnik laws, 532
 non-degenerate, 525
 Panjer class, 525
 Sibuya distribution, 530
 Stable, 530
 discretization of distribution, 519
 distributions of common type, 25
 domain of attraction, 145
 Stable and Tweedie convergence, 303
 dominant variation, 130
 doubly stochastic Binomial-Levy LDA model, 346
 doubly stochastic Negative Binomial-Levy LDA model, 347
 doubly stochastic Poisson-Levy LDA model, 345
- Elongation transform, 255
 equality in distribution, 21
 Esscher transform, 229
 expectiles, 478
 Exponential Dispersion Family, 309, 441
 scale invariance, 313
 Exponential Dispersion models
 infinite divisibility, 319
 Exponential tilting, 229
- extended and O-Type regular variation, 135, 359
 extremal domain of attraction conditions, 33, 35
 Auxiliary function, 36
 extremal limit distribution
 extremal limit distribution families, 39
 Extreme Value Theory
 Block Maxima Approach, 40
 elemental percentile method, 95
 Generalized Extreme Value distribution, 26
 Generalized Pareto distribution (GPD), 56
 GEV distribution moments, 26, 54
 Gumbel family distributions, 65
 Maximum-likelihood GPD, 87
 mixed estimation methods MLE and L-Moments, 43
 Pareto distribution, 55
 Penultimate VaR approximation, 468
 Pickands estimator, 96
 POT's domain of attraction, 83
 Power-Normalized EVT domain of attraction, 469
 probability weighted moments GPD, 93
 profile likelihood GPD, 91
 simulation of GPD, 57
 small sample GPD, 90
 threshold exceedance, 72
 Extreme value theory, 17
 Extremal Limit Problem, 25
 Extreme Value Theory Peaks Over Threshold (POTs), 81
- Faa Di Bruno's formula, 513
 Farlie-Gumbel-Morgenstern copula, 401
 Fast Fourier Transform, 189
 First-Order stochastic dominance, 403
 Fourier Inversion theorem, 181
 fractional derivatives of composite functions, 513
 Fractional Fourier Transform, 191
 Fundamental Theorem of Calculus, 512
- g-and-h distribution, 127, 257, 262
 ABC, 274
 index of regular variation, 268
 moments, 265
 percentile matching, 270
 sample L-moments, 271
 simulation, 262
 slow variation, 269

- g-and-h distribution
 - L-moments, 261
- Gaussian copula, 401
- generalised inverse, 28, 452
 - properties, 28
- generalized moments, 115
- Gil–Pelaez inversion integral, 182
- GPD small sample behaviour, 91

- hazard function, 114
- hazard rate, 114
- higher order Panjer class, 573
- Hinde–Demetrio frequency distributions, 325
- Hougaard Levy domain of attraction, 307
- Hougaard Levy process, 306
- Hyper Geometric function, 203

- Infinite Divisible, 144, 286, 293
 - absolute moments, 295
 - exponential moments, 295
 - fractional moments, 296
 - large deviations, 296
 - Lipschitz function, 296

- Karamata’s Representation Theorem, 125, 269, 487
- Kolmogorov canonical characteristic function, 147
- Kolmogorov three series theorem, 362

- L-Class of distribution, 158
- L-moment estimator, 273
- L-moment Tukey transforms, 261
- L-moments, 46
 - distribution based, 44
 - GEV method of moments, 49
 - sample estimators, 45
- L-skewness and L-kurtosis
 - distribution, 47
- Lagrange inversion formula, 212
- Laguerre polynomials, 201
- Landau notation
 - Big Oh and Little Oh, 106
- large deviations inequality, 297
- large sample asymptotics, 308
- Levy canonical characteristic function, 147
- Levy Cramer continuity theorem, 141
- Levy measure, 294
- Levy triplets, 161
- Levy truncation functions, 162
- local sub-exponential distribution, 120
- locally heavy tailed, 128

- log-concave density, 529
- LogNormal distribution, 65
- Long-Tailed distribution, 131
- lower and upper negative association and dependence, 394
- LQ-moments
 - distribution, 46
- Lévy–Khintchine representation, 161

- Matuszewska index, 137
- max-sum equivalence, 112
- mixed poisson distribution, 542
- monotone density theorem, 481
- multivariate negative dependence, 394

- n-decomposable random variable, 143
- n-divisible random variable, 144
- n-fold convolution, 115
- Natural Exponential Family, 305
 - mean and variance function, 305
- Negative Binomial distribution, 103
- Negative Binomial-Levy LDA model, 347
- negative regression dependence, 395
- Normal Exponential Family
 - steepness and regularity, 311
- Normal Inverse Gaussian
 - semi-group, 288

- O-regular variation distributions, 359
- order statistics, 23

- pairwise negative quadrant dependence, 395
- pairwise positive quadrant dependence, 395
- Panjer recursion, 567
- Partial Rejection Control, 556
- Pickands-Balkema-deHaan theorem, 73
- Poisson summation of characteristic functions, 142
- Poisson-Levy LDA model, 344
- Poisson-Tweedie
 - discrete, 324
- Poisson-Tweedie models, 309
- Pollaczek–Spitzer–Wendell identity, 364
- Polya’s sufficient condition for characteristic functions, 141
- Potter bounds, 126
- probability distribution function, 21
- probability generating function, 525
- probability weighted moments, 94
- profile likelihood, 53
 - deviance statistic, 53

- quantile function, 29
 - GEV distribution, 31
 - properties, 29
 - tail, 29
- recursions
 - continous Panjer recursion, 581
 - De Pril transform, 537
 - higher order recursions, 575
 - mixed Poisson, 577
 - Panjer recursion, 566
 - partial sums, 535
 - random sums, 565
 - Waldmann's recursion, 575
 - Wilmot class, 580
- regular and slow variation, 121
 - quantile functions, 127
 - uniform convergence, 124
- renewal process, 75
- representation theorem of slowly varying functions, 431
- reproductive Exponential Dispersion models, 313
- return levels
 - Generalized Extreme Value distribution, 54
- Richardson extrapolation, 533
- risk measures
 - admissible risk spectrum, 492
 - CARA risk aversion function, 494
 - empirical quantile process, 450
 - ES for Asymmetric Power distribution, 447
 - ES for Exponential Dispersion Models, 443
 - ES for Exponential Dispersion Models Partial Sums, 444
 - ES for g-and-h, 446
 - EVT Hill estimator, 471
 - Extreme Value Theory penultimate approximation, 468
 - g-and-h model, 445
 - non-parametric estimators, 448
 - penultimate single-loss approximation POT's, 473
 - second order VaR, 458
 - single loss approximation VaR, 452
 - spectral risk measure single loss approximations, 478
 - TCE for Exponential Dispersion Models, 443
 - tempered, 503
 - VaR first and second-order single-loss approximations, 451
 - VaR for Asymmetric Power distribution, 447
 - VaR for Exponential Dispersion Models, 441
 - VaR for g-and-h, 445
 - VaR single-loss approximation with mean correction, 458
 - VaR time scaling property single loss approximation, 457
 - VaR via point processes, 473
 - Var, ES and spectral risk, 439
- risk weighted assets, 438
- Rosinski measure, 231
- second order regular variation, 486
- self-decomposable random variables, 145
- Sequential Monte Carlo samplers, 550
- severity distribution
 - splice model, 11
- slowly varying distribution tail, 122
- small sample asymptotics, 307
- smoothly varying function, 129
- splice models, 11
- Stable rate of convergence
 - Stable rate of convergence, 225
- Stieltjes integral, 157
- sub-exponential distribution, 113, 118
- subversively varying tail, 131
- tail asymptotic
 - compound process light-tailed severity, 370
 - compound processes, 367
 - consistent variation, 373
 - convolution root closure, 358
 - convolution root closure O-regular varying, 360
 - dependent severity and frequency, 374
 - dominant frequency distribution, 372
 - first order single-loss approximation, 376
 - first order single-loss regular variation, 380
 - first-order single-loss sub-exponential, 377
 - Frechet domain of attraction, 373
 - generalized tail ratios, 381
 - Gumbel domain of attraction, 373
 - higher order single-loss approximation smooth variation, 432
 - higher order single-loss approximations, 414
 - higher order single-loss approximations slow variation, 431
 - independent frequency and severity, 375
 - Inverse Laplace Characters, 424
 - Laplace Characters, 423
 - large deviations for partial sums, 367

- large number of losses, 362
- long tailed distribution, 361
- partial sum, 356
- partial sum distributional lower bound, 357
- partial sum long tailed, 362
- partial sums o-regularly varying, 359
- remainder analysis regular variation, 386
- remainder analysis for sub-exponential, 385
- Saddlepoint conditions, 370
- second-order single-loss approximations, 389
- second-order single-loss approximation
 - dependent risks, 413
 - stochastic bounds for distributions of partial sums, 403
- tail balance condition, 126
- tail dependence measure, 398
- tail distribution function, 21
- tail equivalence, 21
- tempered α -Stable LDA model, 231, 349
- tempered Levy measure, 230
- tempered Stable model
 - closure under convolution, 243
 - cummulants, 244, 245
 - density, 237, 241
 - Fractional Lower Order Moments, 243
 - Levy measure MTS, 239
 - parameter estimation, 246
 - representation 1, 232
 - representation 2 (CTS), 232
 - representation 3 (RDTS), 233
 - representation 4 (GTS), 234
 - representation 5, 236
 - representation 6 (MTS), 239
 - representation 7 (NMTS), 240
 - representation CGMY, 235
 - shot noise representation, 249
 - simulation, 248
 - standardized, 245
 - tail behaviour, 252
- Tier I Capital, 437
- Tier I Capital Ratio, 438
- Tier II Capital, 438
- trimmed L-moments
 - distribution, 46
 - estimator variance, 48
 - sample estimators, 48
- Tukey distribution, 268
- Tukey transformation, 253
 - h-transform, 254
 - j-transform, 254
 - k-transform, 254
- Tweedie convergence, 307
- Tweedie loss model
 - cumulant function, 314
- Tweedie models
 - parameter estimation, 317
- underflow, 572
- uniform convergence, 20
- unimodality of distribution, 158
- Vinogradov notation, 108
- Volterra integral equations second kind, 581
- von Mises condition
 - von Mises condition, 40
- weak convergence in distribution
 - Helly–Bray theorem, 22
- weak convergence in distribution, 21
- weak convergence Levy process to Stable Levy process, 304
- Weibull Stretched Exponential distribution, 119