

Comments and Errata for the book Univariate stable distributions

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1 Comments

1.1 Inappropriate fitting data with stable laws

Unless there is a convincing explanation for why a stable distribution is expected, do not fit a small data set with a stable model. Without a large data set, you have no tail to observe, so fitting with a heavy tailed stable distribution is unreliable.

Even with a large data set, there are many heavy tailed distributions that are not stable, e.g. ones that are multimodal or have gaps in the support. So blindly fitting stable laws to heavy tailed data may not give a good description of the data. When there is a plausible explanation that the data comes from a sum of many (independent, identical) terms, then the Generalized Central Limit Theorem gives a basis for modeling with a stable distribution.

Some researchers are using stable distributions to model skewed data. A visual comparison of the fit to the data may give a reasonable looking fit over small and moderate values. But using this model to describe the tails of the distribution may be misleading. At the very least, the ecdfHT plot of Section 4.10.1 of the book should be used to verify that the data and the fitted stable model agree on the extremes before making any statements about the tails.

2 Errata

If you find mistakes that are not listed below, please send them to me at jpnolan@american.edu.

Corrections labeled (MJK) are from Maicon J. Karling, maiconkarling@gmail.com.

Corrections labeled (AP) are from Alecos Papadopoulos, papadopalex@aueb.gr

Corrections labeled (MG) are from Michael Grabchak, mgrabcha@charlotte.edu

Unattributed corrections are by the author.

1. (MJK) Preface, page vii, 1st line of 2nd paragraph: missing comma
“Zolotarev (1986) Samorodnitsky” should be “Zolotarev (1986), Samorodnitsky”

2. (MJK) Preface, page viii, last 2 lines of 3rd paragraph: “the parameters α , β , γ , and δ describe” should be “the parameters α , β , γ , and δ **to** describe”
3. (MJK) Preface, page viii, 3rd line of 5th paragraph: “qunatiles” should be “quantiles”
4. (MJK) Preface, page ix, last 6th line of 1st paragraph: “study stable processes” $\rightarrow$ “study **of** stable processes”
5. Page x, last line: Incomplete URL; the correct address is
<https://edspace.american.edu/jpnolan>
6. (MJK) Page 6, 1st line of last paragraph: “Above the general” $\rightarrow$ “Above, the general”
7. (MJK) Page 9, 2nd line: “the factor $\tan(\pi\alpha/2) = 0$ ” $\rightarrow$ “the factor $\tan(\pi\alpha/2)$ **vanishes**”
8. (MJK) Page 11, Proposition 1.1: “Thus the density” $\rightarrow$ “Thus, the density”
9. (MJK) Page 12, 2nd line: “ $\tan \frac{\pi\alpha}{2} = 0$ in (1.2) so” $\rightarrow$ “ $\tan \frac{\pi\alpha}{2} = 0$ in (1.2), so”
10. (MG) page 20, note that $\tan(\pi\alpha/2)$ blows up and changes sign at $\alpha = 1$. So on the domains (0,1) and (1,2), $\theta_0(\alpha, \beta)$ behaves differently - see Figure 3.2 on page 68. In particular $\theta_0(\alpha, 1) = \pi/2$ when $\alpha < 1$, but $\theta_0(\alpha, 1) = \pi/2 - \pi/\alpha$ when $\alpha > 1$.
11. (MJK) Page 31, Fig. 2.4: caption says plots (a), (b), (c) and (d), but the pictures have no such tags
12. (MJK) page 33, 1st line: “the Brownian motion hit” $\rightarrow$ “the Brownian motion hits”
13. Page 33, line -9: $\Delta^{\alpha/2}$ should be $-(-\Delta)^{\alpha/2}$.
14. (MJK) page 41, 1st line of last paragraph: “The large flies” $\rightarrow$ “The large files”
15. (MJK) Page 42, line 4: “Gaynor et al. (2000). Gunning” $\rightarrow$ “Gaynor et al. (2000), Gunning”
16. (MJK) Page 42, last line: “And West (1999)” $\rightarrow$ “West (1999)”
17. (MJK) Page 45, 1st paragraph of section 2.8.8, 3rd line: should be “difference between the exact value and the printed value”
18. Page 46, line -10: measures should be measure
19. (MJK) Page 64, 1st line: “infinitely divisble” $\rightarrow$ “infinitely divisible”

20. (MG) Page 64, Theorem 3.1: both integrals in the statement of the theorem should end in $dx/x^{\alpha+1}$, not dx/x^{α} .
21. (MJK) Page 64, expression of $\log \phi(u|\alpha, \beta; 1)$: in the second branch, should be $1 + i\beta\dots$, *idem* eq (1.6)
22. (MG) Page 64, the last equation in display form should be

$$\gamma^{\alpha} = \begin{cases} (\gamma_{+} + \gamma_{-}) \cos(\pi\alpha/2) \Gamma(-\alpha) & \alpha \neq 1 \\ (\gamma_{+} + \gamma_{-}) (\pi/2) & \alpha = 1. \end{cases}$$

23. (MJK) There are proofs that have the *qed* symbol missing, for instance, the proof of Theorem 3.2 and Corollary 3.2
24. (MJK) Page 68, Fig. 3.2: legend indicates “b” instead of “ β ” or “beta”
25. Page 76. Theorem 3.5(c) is only valid when $|\beta| < 1$. When $\beta = +1$, $\rho = -\pi\alpha$ and when $\beta = -1$, $\rho = 0$. In both of these cases $\sin(k\rho/\alpha) = 0$ for all integers k , making the given power series degenerate.
26. (MG) page 85, last two lines have a missing minus sign: $z^{\alpha/(\alpha-1)}$ should be $z^{-\alpha/(\alpha-1)}$
27. (MJK) Page 86, 2nd paragraph, 3rd line: revise the sentence “...they give computational forms of the simulation formulas are derived in...”
28. (AP) Page 92, line 3: the correct standard deviation is $\gamma\sqrt{2}$, not $\gamma/\sqrt{2}$
29. (MJK) Page 99, 2nd line: “derivivative” $\rightarrow$ “derivative”
30. (MG) Page 107, line -8: the integrand should have absolute values around x , e.g. $\int_{-\epsilon}^{\epsilon} |x|^p dx$
31. (MG) Page 117, line -5: the Laplace transform in the case $\alpha = 1$ should not have a minus sign in the exponent, e.g. $E \exp(-uX) = \exp(\gamma(2/\pi)u \log u)$.
32. (MJK) Page 141, 2nd line of Theorem 3.11: “ $a_n > 0$ and b_n such” $\rightarrow$ “ $a_n > 0$ and b_n such **that**”
33. (MJK) Page 141, last line of Theorem 3.11: “e.g. X and Y are the same type” $\rightarrow$ “i.e. X and Y are of the same type”
34. (AP) Page 143, line 1: the limit is $N(0,2)$, not $N(0,1/2)$
35. (MJK) Page 143, 1st line of Theorem 3.13: “is the in” $\rightarrow$ “is in the”
36. (MJK) Page 144, 4th line of 3rd paragraph: “important because of following” $\rightarrow$ “important because of **the** following”

37. Page 145, line 13 is misprinted, should be
Theorem 3.15 Let X_1 and X_2 be independent random variables with

$$P(X_j > x) = x^{-\alpha_j} L_j(x) \quad x \rightarrow \infty,$$

where ...

38. (MJK) Page 149, 3rd line after Eq. (3.75): “**Re** $S(x|\alpha, \beta)$ ” $\rightarrow$ “**Re** $s(x|\alpha, \beta)$ ”
39. (MJK) Page 161, caption of Fig 4.1: “parmaeterization” $\rightarrow$ “parameterization”
40. (MJK) Page 164: there appears to be a “newpage” command in the end of the page, so that a blank space takes place
41. (MJK) Page 175, 2nd and 3rd lines from below: what do you mean with “ α is above 1 and large data sets”?
42. (MJK) Page 178, 1st line of 3rd paragraph: “We note that is sometimes” $\rightarrow$ “We note that **it** is sometimes”
43. (MJK) Page 184, penultimate sentence of section 4.8.1: “to guarantee the the” $\rightarrow$ “to guarantee **that** the”
44. (MJK) Page 184, last equation: where it appears “log 2”, if I am correct, it should be a “2” instead
45. Page 200, last equation. This formula for $g(p)$ is correct; there was a typographical error in the original paper Nolan (2019a).
46. (MJK) Page 203, 3rd line of 2nd paragraph: 2 x “replace”
47. (MJK) Page 205, 2nd line: “(The original ...” sentence started inside “(” but the parentheses were never closed
48. (MJK) Page 208, caption of Fig. 4.34: “a diagnostic” $\rightarrow$ “**A** diagnostic”
49. (MJK) Page 214, 3rd line of 3rd paragraph: “ $Y_1 = X_2 - X_2 + X_3 - X_4$ ” $\rightarrow$ “ $Y_1 = X_1 - X_2 + X_3 - X_4$ ”
50. (MJK) Page 219, 1st line of 4th paragraph: 2 x “and”
51. (MJK) Page 219, last sentence in last paragraph: you say that “There is a faster method”, hence a reference should be provided
52. (MJK) Page 224, 1st line of 4th paragraph: “in the current paper are based on dissertation” $\rightarrow$ “in the current **chapter** are based on **the** dissertation”
53. Page 225, line 3 and below: replace ϵ with ϵ .
54. (MJK) Page 225, Eq. (5.2): use “cdots” command between “ $x_{i,1}\theta_1+$ ” and “ $+x_{i,k}\theta_k$ ” instead of “ldots”

- 55. (MJK) Page 239, penultimate sentence of 2nd paragraph: “a brief discussion some” → “a brief discussion **about** some”
- 56. (MJK) Page 242, 4th line from below: “minimzation” → “minimization”
- 57. (MJK) Page 245, 16th line of 3rd paragraph should be “radar system **sets**”.
- 58. (MJK) Page 247, 5th line of 3rd paragraph of Section 6.3.1: “the if the” → “if the”
- 59. (MJK) Page 260, 6th line of 2nd paragraph of Section 7.3.1: “Wiebull” → “Weibull”
- 60. (MJK) Page 270, 8th line of the paragraph after Definition A.3: “Springer (1979) The” → “Springer (1979). The”
- 61. (MJK) Page 271, equation (A.4): there is a missing dot at the end of the equation