Description of the methods used in the SDFC package

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Abstract

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Introduction

1 Normal distribution

1.1 Definition

Definition 1.1 (Normal distribution)**.** A random variable Y follows the *Normal distribution*, noted $Y \sim \mathcal{N}(\mu, \sigma)$, $\mu \in \mathbb{R}$, $\sigma > 0$ if

$$\mathbb{P}(Y \leq y) := \int_{-\infty}^{y} f(\tilde{y}).\mathrm{d}\tilde{y}$$

$$f(y) := \frac{1}{\sigma\sqrt{2\pi}} \exp\left[-\frac{1}{2}\left(\frac{y-\mu}{\sigma}\right)^2\right]$$

The function f is the density of the Normal distribution, μ is called the *location* parameter, and σ is called the *scale* parameter.

1.2 Likelihood function

For a time series of observations Y_i, the negative log-likelihood function is given by:

$$\mathbf{NL}(Y_i) := \sum_{i=1}^{N} \frac{1}{2} \left(\frac{Y_i - \mu_i}{\sigma_i} \right)^2 + \log(\sigma_i)$$

And its gradient is given by:

$$\partial_{\theta_j} \mathbf{NL}(Y_i) = \sum_{i=1}^{N} \partial_{\theta_j} \mu \left[-\frac{Z_i}{\sigma_i} \right] + \partial_{\theta_j} \sigma \left[-\frac{Y_i Z_i}{\sigma_i^2} + \frac{\mu_i Z_i}{\sigma_i^2} + \frac{1}{\sigma_i^2} \right]$$

2 GEV distribution

See Hosking et al. (1985).

Summary

References

Hosking, J. R. M. et al. (1985). "Estimation of the Generalized Extreme-Value Distribution by the Method of Probability-Weighted Moments". In: *Technometrics* 27.3, pp. 251–261.

Tabulars

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