

Task list 2

Michał Balcerek

Computer Simulations of Stochastic Processes

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1. (Estimation of α in 1-dimensional case) Write a function that for a given sample estimates parameter α (assuming sample comes from stable distribution).
 - (a) via fitting power law to the tail of ECDF (for 10% biggest values, this can be also a parameter in your function)
 - (b) via fitting appropriate exponential to the modulus of the characteristic function (as a byproduct you can also estimate scale)

Your task will be to present estimators of parameter α for a few (2-3) chosen cases (of your choice). Additionally, you will get already simulated samples to estimate parameters so that you will not have any prior information.

2. Write a multivariate stable distribution generator for any given discrete spectral measure and parameter α . Consider only 2 dimensional case. Present your simulated sample on scatterplot. Simulate the following cases:
 - (a) symmetric stable vector
 - (b) stable vector with independent components
 - (c) stable vector which is not symmetric and has not independent components

You can consider any $\alpha < 2$.

3. Write a generator for sub-Gaussian random vector.
4. Write a generator for multivariate Gaussian distribution with given expectation vector μ and covariance matrix Σ .
5. Write a function/script that estimates α and spectral measure Γ for a given sample.
6. Write a function/script that estimates the characteristic function for multivariate data (2-dimensional).
7. Write a function/script estimating codifference measure for a given 2-dimensional sample.

8. Present your results for provided data. To obtain one, please send me an e-mail.

Important For your generators: check if they are correct.
For estimation of spectral measure: be able to tell if the measure is discrete or continuous.