Discriminating Gaussian and non-Gaussian processes by even empirical moments statistics

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Abstract

In my presentation, I introduce a novel framework that allows efficient stochastic process discrimination. The underlying test statistic is based on even empirical moments [1] and generalises the time-averaged mean squared displacement framework. The test is designed to allow goodness-of-fit statistical testing of processes with stationary increments and finite moments distribution. In particular, while this test statistic is based on a simple and intuitive idea, it enables efficient discrimination between finite moments and infinite moments processes even if the underlying laws are relatively close to each other. This claim is illustrated via an extensive simulation study, e.g. where alpha-stable processes with stability index close to 2 are confronted with their standard Gaussian equivalents. For completeness, it is also shown how to embed this methodology into the real data analysis by studying the real metal price data.

Keywords

goodness-of-fit test, even empirical moments, Gaussian process, alpha-stable process, Monte Carlo simulations, validation

References

[1] K. Maraj-Zygmat and G. Sikora and M. Pitera and A. Wylomanska. Goodness-of-fit test for stochastic processes using even empirical moment statistic, Chaos. 2023, vol. 33, nr 7, art. 073135, s. 1-13.