Exact Distribution of Estimators of Parameters in AR(1) Processes by the Help of MAPLE

M. Arató, A. Kuki, A. Szabó
Department of Information Technology,
University of Debrecen
P.O. Box 12, H-4010 Debrecen, Hungary.
E-mail: kuki@math.klte.hu

Let us consider the stochastic differential equation

$$d\xi(t) = -\lambda\xi(t)dt + \sigma_w dw(t), \qquad \sigma_w > 0,$$

where w is a standard Wiener process. $\xi(t)$ is called an Ornstein-Uhlenbeck or AR(1) process [1].

In the theory of diffusion processes, λ is called the drift parameter, but in the theory of ordinary differential equations it is called the damping (or decay) parameter.

The exact distribution of the maximum-likelihood estimator of the drift (damping) parameter in a stationary AR(1) (or Ornstein-Uhlenbeck) process is investigated [2]. Quantiles of the distribution function for different levels are given.

The main goal is to reproduce, by the help of PC and MAPLE, the table of the distribution function of maximum-likelihood estimator, given by Prof. Arató, and calculated on URAL and CDC 3300 computers.

When we reproduced the earlier calculations, the applied hardware was a SUN Sparc Station with operating system SUN OS. The software tool was the MAPLE, Release 2, which can be efficiently used for symbolical and numerical computations.

References

[1] M. Arató. *Linear Stochastic Systems with Constatnt Coefficients,* Springer-Verlag, (1982).

[2] M. Arató and A. Benczúr. *Distribution Function of the Damping Parameter of Stationary Gaussian processes,* Studia Sci. Math. Hungar. pp. 445–456 (1970).