ON A SIMPLIFIED METHOD OF THE ESTIMATION OF THE CORRELOGRAM FOR A STATIONARY GAUSSIAN PROCESS, II

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§1. Summary.

For the estimation of the correlogram of a real valued weakly stationary process $x(t)$, we usually use the estimate using the term $x(t)x(t+h)$. We try to replace the term $x(t)x(t+h)$ by the term $x(t)\operatorname{sgn}(x(t+h))$. In the previous paper [2], we showed that, when the variance is known, we can get an unbiased estimate by this replacement for a Gaussian process, and also showed its variance for a simple markov Gaussian process. In this paper, we shall evaluate its variance for a general Gaussian process, and show that this estimate is a consistent estimate under a some condition. And especially, we compare, numerically, its variance with that of usual estimate, for the second-order process.

§2. The estimate and its variance.

Let $x(t)$ be a real valued weakly stationary process with continuous time parameter t, such that $Ex(t)=0$, $Ex(t)^2=\sigma^2$, $Ex(t)x(t+h)=\sigma^2\rho_h$. We assume the variance σ^2 to be known. And, given observations $\{x(t),\ t=1, 2, \cdots, N, \cdots, N+h\}$, we consider to estimate the correlogram ρ_h, where N and h are positive integers. We shall try to replace the term $x(t)x(t+h)$ of the usual estimate

$$\tilde{\gamma}_h=\frac{1}{\sigma^2}\frac{1}{N}\sum_{t=1}^{N}x(t)x(t+h)$$

by the term $x(t)\operatorname{sgn}(x(t+h))$, where $\operatorname{sgn}(y)$ means 1, 0 and -1, correspondingly as $y>0$, $y=0$ and $y<0$.

For a Gaussian process, the estimate

$$\gamma_h=\sqrt{\frac{\pi}{2}}\frac{1}{\sigma}\frac{1}{N}\sum_{t=1}^{N}x(t)\operatorname{sgn}(x(t+h))$$

is an unbiased estimate [2]. We shall determine the variance of this estimate. Now,

$$\text{Var.}(\gamma_h)=E\gamma_h^2-\rho_h^2,$$

Received June 1, 1964.