Block bootstrap for Poisson-sampled almost periodic processes

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Abstract

Let $\{X(t), t \geq 0\}$ be an APC process and $\{N(t), t \geq 0\}$ be a homogeneous Poisson process and $\{T_k, k \geq 1\}$ be its jump moments. We assume that $\{X(t), t \geq 0\}$ and $\{N(t), t \geq 0\}$ are independent. Moreover, the process $\{X(t), t \geq 0\}$ is not observed continuously but only in the time moments $\{T_k, k \geq 1\}$ i.e. the sequence $\{(X(T_k), T_k)\}$ is observed. In this paper we focus on the estimation of the cyclic means of $\{X(t), t \geq 0\}$. The asymptotic normality of the rescaled error of the estimator is shown. Additionally, the bootstrap method based on the Circular Block Bootstrap is proposed. The consistency of the bootstrap technique is proved and the bootstrap pointwise and simultaneous confidence intervals for the cyclic means and the cyclic covariance are constructed. The results are illustrated by a simulated data example.