

Generalized Whittle Estimate for Irregularly Spaced Data

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Let $s_j, j = 1, \dots, n$ be irregularly spaced points on which spatial data $y(s_j)$ is observed. We consider a spatial regression model:

$$y(s_j) = b_0 + b_1\alpha_1(s_j) + \dots + b_m\alpha_m(s_j) + X(s_j) + Z_j, \quad j = 1, \dots, n,$$

where $\alpha_i(s), i = 1, \dots, m$ are covariates observed on the point s , $X(s)$ is a unobserved stationary process and Z_j is a iid($0, \sigma^2$) measurement error. Suppose the spectral density function of $X(s)$ is identified as $f(\theta, \lambda), \lambda \in R_2$ with a parameter $\theta \in \Theta$. Our aim is to estimate the parameter θ by the irregularly spaced data $y(s_1), \dots, y(s_n)$.

It is very difficult to estimate the parameter when the sample size is huge such as larger than a few thousand in a usual way of Gaussian maximum likelihood method. This is because calculation of the inverse and determinant of the huge covariance matrix is required to evaluate the Gaussian likelihood function. In this talk, we introduce generalized Whittle likelihood function to estimate the parameter θ , which we claim provides efficient approximations for the likelihood function, and demonstrate it by real data analysis of land price data in Tokyo, whose sampling points are shown in the figure below.

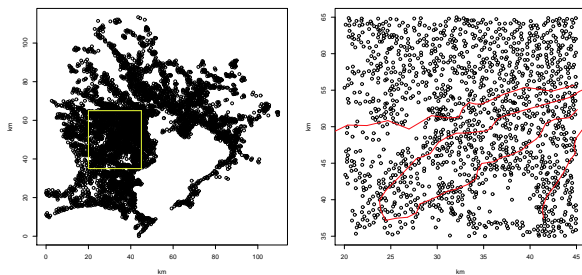


Figure 1: the 5573 sampling points of land price in Tokyo (left) and its focus on the 1431 points in the south west area (right), which is to be analyzed by the Generalized Whittle likelihood method proposed by us.

Subtitle

It is sometimes difficult to evaluate the likelihood function of the irregularly spaced data. In this talk, we propose a method that approximates it on the frequency domain, which is considered to be a generalized version of celebrated Whittle likelihood for time series.

REFERENCES (RÉFÉRENCES)

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