Local polynomial estimation of the intensity of a doubly stochastic Poisson process with bandwidth selection procedure.

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Mots-clés : Doubly stochastic Poisson process, Non parametric estimation, Oracle inequality, Local polynomial estimator, Minimax optimality, Semimartingale, Dependence, Electricity prices, Temperature.

We consider a doubly stochastic Poisson process with stochastic intensity $\lambda_t = nq(X_t)$ where X is a continuous Itô semimartingale and n is an integer. Both processes are observed continuously over a fixed period $[0, T]$. An estimation procedure is proposed in a non parametrical setting for the function q on an interval I where X is sufficiently observed using a local polynomial estimator. A method to select the bandwidth in a non asymptotic framework is proposed, leading to an oracle inequality. If m is the degree of the chosen polynomial, the accuracy of our estimator over the Hölder class of order β is $n^{\frac{-\beta}{2\beta+1}}$ if $m \geq \lfloor \beta \rfloor$ and $n^{\frac{-m}{2m+1}}$ if $m < \lfloor \beta \rfloor$ and is optimal in the minimax sense if $m \geq \lfloor \beta \rfloor$. A parametrical test is also proposed to test if q belongs to some parametrical family. Those results are applied to French temperature and electricity spot prices data where we infer the intensity of electricity spot spikes as a function of the temperature.

Références

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