TARAS SHEVCHENKO NATIONAL UNIVERSITY OF KYIV

INTERNATIONAL CONFERENCE

MODERN STOCHASTICS: THEORY AND APPLICATIONS III

Dedicated to 100th anniversary of B.V. Gnedenko and 80th anniversary of M.I. Yadrenko

September 10-14, 2012, Kyiv, Ukraine

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Modern Stochastics: Theory and Applications III

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NON-ASYMPTOTIC CONFIDENCE INTERVALS FOR BAXTER ESTIMATES OF THE PARAMETER OF RANDOM FUNCTIONS

O.O. Synyavska

Let $\{\xi(t), t \in [0,1]\}$ be a stochastic process with K_1-increments [1] with zero mean and covariance function $r(t,s) = \frac{1}{2}\left(|t|^{2H} + |s|^{2H} - |t-s|^{2H}\right)$, where $H \in (0,1)$. For the observation of a stochastic process $\{\xi(t), t \in [0,1]\}$ at the points $\left\{\frac{k}{2^n} | 0 \leqslant k \leqslant 2^n, n \geqslant 1\right\}$ we obtain an estimate of unknown parameters H and construct non-asymptotic confidence intervals.

Consider the sequences of Baxter sums:
$\hat{S}_n^{(1)} = 2^{n(2H-1)} \sum_{k=0}^{2^n-1} \left(\xi\left(\frac{k+1}{2^n}\right) - \xi\left(\frac{k}{2^n}\right)\right)^2$, $\hat{S}_n^{(2)} = 2^{n(2H-1)} \sum_{k=0}^{2^n-1} \left(\xi\left(\frac{k+1}{2^n}\right) - 2\xi\left(\frac{k}{2^n} + \frac{1}{2^{n+1}}\right) + \xi\left(\frac{k}{2^n}\right)\right)^2, n \geqslant 1$. Let $\theta(H) = 2^{2-2H} - 1$, $H \in [0,1]$, where $H = H(\theta)$, $\theta \in (0,3)$ is the inverse function of $\theta(H)$.

Theorem 1. *Statistics $H_n = H(\theta_n)$, $n \geqslant 1$, where $\theta_n = \hat{S}_n^{(2)}/\hat{S}_n^{(1)} \to \theta(H)$, is strongly consistent estimator of the parameter H.*

Theorem 2. *Let $H_1, H_2 \in [0,1]$ — fixed, $H_1 < H_2$, $H \in (H_1, H_2)$. Then the interval $(H(\theta_n + m_\varepsilon(n)), H(\theta_n - m_\varepsilon(n))) \cap (H_1, H_2)$, where*

$$m_\varepsilon(n) \geqslant \sup_{H \in (H_1, H_2)} \frac{8\theta a_{1,n} + 2\sqrt{16\theta^2 a_{1,n}^2 + 2(2^n\varepsilon - 8a_{1,n})(\theta^2 a_{1,n} + a_{2,n})}}{2^n\varepsilon - 8a_{1,n}},$$

$$a_{1,n} = \sum_{l=1}^{2^n-1} \left(\frac{1}{2}(l+1)^{2H} - l^{2H} + \frac{1}{2}(l-1)^{2H}\right)^2,$$

$$a_{2,n} = \sum_{l=1}^{2^n-1} \left(-3l^{2H} + 2\left(l+\frac{1}{2}\right)^{2H} - \frac{1}{2}(l+1)^{2H} - \frac{1}{2}(l-1)^{2H} + 2\left(l-\frac{1}{2}\right)^{2H}\right)^2,$$

is a confidence interval with confidence level $1-\varepsilon$.

References

[1] Y.V. Kozachenko, O.O. Kurchenko *Levy–Baxter theorems for one class of non-Gaussian stochastic processes.* Random Oper. Sto. Equ., Volume 19 (4), 2011, 313-326.

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STATISTICS OF PARTIALLY OBSERVED LINEAR SYSTEMS

V. Zaiats

Our objective is to focus on a model related to partially observed linear systems, where the function we would like to control is not observed directly, and to perform estimation of different functional characteristics in this model.

Assume that we observe a process $X = (X_t, 0 \le t \le T)$ satisfying the following system of stochastic differential equations:

$$\mathrm{d}X_t = h_t Y_t \,\mathrm{d}t + \varepsilon \,\mathrm{d}W_t, \quad X_0 = 0,$$
$$\mathrm{d}Y_t = g_t Y_t \,\mathrm{d}t + \varepsilon \,\mathrm{d}V_t, \quad Y_0 = y_0 \neq 0, \quad 0 \le t \le T,$$

where W_t and V_t, $0 \le t \le T$, are two independent Wiener processes. The process $Y = (Y_t, 0 \le t \le T)$ **cannot be observed** directly, but it is the one *we would like to control.*

In this model, we consider the problem of estimation of different functions on $0 \le t \le T$, in the asymptotics of a *small noise*, i.e., as $\varepsilon \to 0$. We propose some kernel-type estimators for the functions $f_t := h_t y_t$, h_t, y_t, g_t, $0 \le t \le T$, and study their properties. Here y_t, $0 \le t \le T$, is the solution of the above model with the noise dropped.

This is a joint work with Yu. Kutoyants (Université du Maine, France).

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THE BEST CRITERIA OF CHECKING HYPOTHESES

Zurab Zerakidze

The necessary and sufficient conditions for existence of consistent criteria are obtained.

Let H be sets hypotheses and $\beta(H)$ be σ-algebra that contains all finite subsets of H.

Definition. The family of probability measures $\{\mu_h, h \in H\}$ is said to admit a consistent criterion of hypothesis if there exists even though one measurable map δ of the space (E,S) in $(H, \beta(H))$ such that $\mu_h(x : \delta(x) = h) = 1$. $\forall h \in H$. We prove the following theorems:

Theorem 1. Let $H = \{H_i, i \in N\}$. The family of probability measures $\{\mu_{H_i}, i \in N\}$ admits a consistent criterion of hypothesis if and only if the family of probability measures $\{\mu_{H_i}, i \in N\}$, $N = \{1, 2, \ldots, n, \ldots\}$ is strongly separable

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