**M. A. Leshchinskaya, E. A. Pchelintsev** (TSU, Tomsk, Russia). **Adaptive function estimation in semimartingale regression**[1].

Let the observed process $(y_t)_{0\le t\le 1}$ satisfies the stochastic differential equation on the probability space $(\Omega,\mathcal{F},\mathbf{P})$: $\mathrm{d}y_t = S(t)\mathrm{d}t+\varepsilon\mathrm{d}\xi_t, \quad 0\le t\le 1$, where $\varepsilon>0$ is a noise intensity, $\xi_t$ is a square-integrable semimartingale with a distribution from some class $\mathcal{Q}_\varepsilon$. The function $S$ belongs to the Sobolev class $\Theta = \left\{S\in\mathcal{L}_2\,[0,1]\,:\,\sum_{j=1}^{\infty} e^{2\kappa j^\alpha}\theta_j^2\le \mathbf{r}\right\}$ with $\alpha\in(0,1)$, $\kappa>0$, $r>0$ and $(\theta_j)_{j\in\mathbb{N}}$ are the Fourier coefficients of the function $S$ with respect to the orthonormal basis $(\varphi_j)_{j\geqslant 1}$.

The problem is to estimate $S$ from observations $(y_t)_{0\le t\le 1}$. The quality of the estimate $\widehat{S}$ is measured by the robust quadratic risk $\mathcal{R}(\widehat{S},S)=\sup_{Q\in\mathcal{Q}_\varepsilon}\mathbf{E}_Q\|\widehat{S}-S\|^2$.

For the case of known smoothness parameters, a weighted projection estimate is constructed

$$\widehat{S}_\gamma(t)=\sum_{j=1}^{n}\gamma_j\widehat{\theta}_j\varphi_j(t)\,,\qquad \gamma_j=1-e^{-\kappa(n^\alpha-j^\alpha)}\,,\qquad \widehat{\theta}_j=\int_0^1\varphi_j(t)\mathrm{d}y_t\,,$$

$$n=\max\left\{l\geqslant 1\,:\,e^{\kappa l^\alpha}\sum_{j=1}^{l}e^{\kappa j^\alpha}-\sum_{j=1}^{l}e^{2\kappa j^\alpha}\leqslant\varepsilon^{-2}\,\mathbf{r}\right\}\,,$$

for which the robust risk asymptotics is found, i.e. $\mathcal{R}(\widehat{S}_\gamma,S)\sim\kappa^{-1/\alpha}\varepsilon^2|\ln\varepsilon|^{1/\alpha}\quad\text{for}\quad\varepsilon\to 0$ [1]. In the adaptive setting, when $\alpha,\kappa,r$ are unknown, a model selection procedure $S^*$ is proposed based on sharp oracle inequalities.

**Теорема.** The model selection procedure $S^*$ is asymptotically efficient, i.e.

$$\lim_{\varepsilon\to 0}\frac{\sup_{S\in\Theta}\mathcal{R}(S^*,S)}{\varepsilon^2|\ln\varepsilon|^{1/\alpha}}=\kappa^{-1/\alpha}.$$

REFERENCES

[1] Pchelintsev E., Pergamenshchikov S.M., Povzun M.A. Efficient estimation methods for non-Gaussian regression models in continuous time // Annals of the Institute of Statistical Mathematics. 2022. Vol. 74, № 1. P. 113–142.

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