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**Asymptotic expansion for functionals of a fractional Brownian motion**

An asymptotic expansion of the distribution of a quadratic form with random weights for a Brownian motion, more generally for a diffusion process, was obtained by an application of the martingale expansion in mixed normal limit (Y SPA2013, arXiv2012). Podolskij and Yoshida (AAP2016) found an Edgeworth expansion for the power variation of a diffusion process, and Podolskij, Veliyev and Yoshida (SPA2017) derived an expansion for the pre-averaging estimator for volatility estimation under micro structure noise. Recently Podolskij, Veliyev and Yoshida (2018) gave an expansion for the Euler-Maruyama approximation of a diffusion process. In the scheme of the martingale expansion, the tangent and the torsion appeared, expressed by the adaptive random symbol and the anticipative random symbol, respectively.

D. Nualart and Yoshida (EJP, to appear) recently gave asymptotic expansion for Skorohod integrals. There the expansion formula is written by the quasi-torsion and the quasi-tangent expressed by certain random symbols. Applying this scheme, they derived expansions of a quadratic form with random weights for a fractional Brownian motion. The expansion takes different forms, depending on the Hurst parameter.

Related work is Tudor and Yoshida (SPA2018) for expansion of Wiener functionals. Recently they also obtained expansions of any order in the normal limit case.