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Approximation at first and second order of m-order integrals of the fractional Brownian motion and of certain semimartingales. (English) Zbl 1063.60079

Electron. J. Probab. 8, Paper No. 18, 26 p. (2003).

The authors investigate the accurate convergence of some approximations of m-order integrals which appear when one performs stochastic calculus with respect to processes which are not semimartingales, for instance the fractional Brownian motion. Let X be the fractional Brownian motion of any Hurst index H in $(0,1)$ (resp. a semimartingale). Let Y be a continuous process and let m be a positive integer. The authors study the existence of the limit of the approximation of m-order integral of Y with respect to X and prove that the limits are almost sure, uniformly on each compact interval, and are in terms of the mth moment of the Gaussian standard random variable. In particular, if m is an odd integer, the limit equals to zero. They also show that the limit is a Brownian motion when X is the fractional Brownian motion of index H in $(0,1]$, and it is in terms of a two-dimensional standard Brownian motion when X is a semimartingale.

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MSC:

60H05 Stochastic integrals
60F05 Central limit and other weak theorems
60F15 Strong limit theorems
60G15 Gaussian processes
60J65 Brownian motion

Keywords:

m-order integrals; fractional Brownian motion; limit theorems; stochastic integrals

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