

Covariance of the Queue Process Fed by Isonormal Gaussian Input Process

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Abstract : In this paper, we consider fluid queueing processes fed by an isonormal Gaussian process. We study the correlation structure of the queueing process and the rate of convergence of the running supremum in the queueing process. The Malliavin calculus techniques are applied to obtain relations that show the workload process inherits the dependence properties of the input process. As examples, we consider two isonormal Gaussian processes, the sub-fractional Brownian motion (SFBM) and the fractional Brownian motion (FBM). For these examples, we obtain upper bounds for the covariance function of the queueing process and its rate of convergence to zero. We also discover that the rate of convergence of the queueing process is related to the structure of the covariance function of the input process.

Keywords : queue length process, Malliavin calculus, covariance function, fractional Brownian motion, sub-fractional Brownian motion

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