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Stochastic differential equations driven by multi-fractional Brownian motion and Poisson point process. (English) Zbl 1449.60107

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Summary: In this paper, we study a class of stochastic differential equations with additive noise that contains a non-stationary multi-fractional Brownian motion (mBm) with a Hurst parameter as a function of time and a Poisson point process of class (QL). The differential equation of this kind is motivated by the reserve processes in a general insurance model, in which there is the long term dependence between the claim payment and the past history of liability. By using the variable order fractional calculus on the fractional Wiener-Poisson space and a multi-fractional derivative operator, and employing Girsanov theorem for multi-fractional Brownian motion, we prove the existence of weak solutions to the SDEs under consideration. As a consequence, we deduce the uniqueness in law and the pathwise uniqueness.

MSC:

60H15 Stochastic partial differential equations (aspects of stochastic analysis)
60G22 Fractional processes, including fractional Brownian motion
60G55 Point processes (e.g., Poisson, Cox, Hawkes processes)

Keywords:

stochastic differential equations; multi-fractional Brownian motion; fractional Wiener-Poisson space; Poisson point process; Girsanov theorem

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