Anh, V. V.; McVinish, R.
Fractional differential equations driven by Lévy noise. (English) Zbl 1042.60034
J. Appl. Math. Stochastic Anal. 16, No. 2, 97-119 (2003).

Let for $f(t)$ be defined its Riemann-Liouville fractional derivative by

$$D^\alpha f(t)=\frac{1}{\Gamma(n-\alpha)}\frac{d^n}{dt^n}\int_0^t (t-\tau)^{n-\alpha-1}f(\tau)\,d\tau,\quad \alpha\in[n-1,n),\ n=1,2,\dots$$

and its Riemann-Liouville fractional integral by

$$I^\alpha f(t)=\frac{1}{\Gamma(\alpha)}\int_0^t (t-\tau)^{\alpha-1}f(\tau)\,d\tau,\quad \alpha>0.$$

The authors consider the fractional differential equations

$$(A_nD^{\beta_n}+\dots+A_1D^{\beta_1}+A_0D^{\beta_0})X(t)=\dot{L}(t),\quad \beta_n>\beta_{n-1}>\dots>\beta_1>\beta_0,\ n\ge 1, \tag{1}$$

and the fractional integral equation

$$X(t)+\frac{A_{n-1}}{A_n}I^{\beta_n-\beta_{n-1}}X(t)+\dots+\frac{A_0}{A_n}I^{\beta_n-\beta_0}X(t)=\frac{1}{A_n}I^{\beta_n-1}L(t),\quad \beta_n\ge 1, \tag{2}$$

driven by Lévy noise $\dot{L}$. The singularity spectrum of solution $X(t)$ of (2) is obtained. They also study conditions under which this solution is a semi-martingale.

The authors give a numerical scheme to approximate the sample paths of equations of the form (1). This scheme is almost surely uniformly convergent. Using this numeric algorithm the authors present the sample paths of some fractional differential equation.

Reviewer: Maria Stolarczyk (Katowice)

MSC:

60H10 Stochastic ordinary differential equations (aspects of stochastic analysis)
60H35 Computational methods for stochastic equations (aspects of stochastic analysis)

Keywords:
stochastic fractional differential and integral equation; semi-martingale representation

Full Text: DOI EuDML