

SDEs with distributional drift and path-by-path solutions

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We study existence and uniqueness of solutions to the equation $X_t = b(X_t)dt + dB_t$, where b may be distributional and B is a fractional Brownian motion with Hurst parameter $H \leq 1/2$. We are considering the usual probabilistic notion of a solution to an SDE and solutions in a (deterministic) path-by-path sense. In the case of b being in a class of distributions containing nonnegative finite measures, we show existence of solutions for $H < \sqrt{2} - 1$ via an Euler scheme using a construction of the nonlinear Young integral in p -variation. Furthermore, in the Brownian case $H = 1/2$ we present examples of drifts in which the classical notion of a solution and solutions in a path-by-path sense coincide, respectively not coincide.

Mostly based on [1] and [2].

Références

- [1] Lukas Anzeletti. Comparison of classical and path-by-path solutions to sdes. 2022.
- [2] Lukas Anzeletti, Alexandre Richard, and Etienne Tanré. Regularisation by fractional noise for one-dimensional differential equations with nonnegative distributional drift. 2021.