Presentation template

With some typical frames

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Motivation

A series of frame with the different layout one might want to use for a presentation

Outline

Rough Volatility

Model name	$K(t)$	Domain of H	Semi-mart.	Markovian
rough	$\eta t^{H-1/2}$	$(0, 1/2]$	✗	✗
path-dependent	$\eta(t+\varepsilon)^{H-1/2}$	$(-\infty, 1/2]$	✓	✗
one-factor	$\eta\varepsilon^{H-1/2}e^{-(1/2-H)\varepsilon^{-1}t}$	$(-\infty, 1/2]$	✓	✓
two-factor	$\eta_1\varepsilon^{H_1-1/2}e^{-(1/2-H_1)\varepsilon^{-1}t}+$ $\eta_2\varepsilon^{H_2-1/2}e^{-(1/2-H_2)\varepsilon^{-1}t}$	$(-\infty, 1/2]$	✓	✓

Table: Different kernels used through the paper, table and names from [AL24].

fBM

We estimate a Hurst exponent $H \approx 0.14$, consistent with [GJR22].
A convenient way to get rougher volatility is to change the stochastic driver to a fractional Brownian motion.

Fractional Brownian motion

This process B_t^H is a continuous zero-mean Gaussian with covariance function

$$\mathbb{E}[B_t^H B_s^H] = \frac{1}{2}\left(|t|^{2H} + |s|^{2H} - |t-s|^{2H}\right).$$

This yields models that are neither Markovian nor semimartingales! Is it a good tradeoff?

Solving the optimization problem

We've tested different optimizers but choose to go with SLSQP, in particular because it accepts constraints.

Initial guess

We start the optimization with the set of parameters:

$$\Theta = \{a, b, c, H, \eta, \rho, \xi_0, \varepsilon\} = \{0.3, 0.1, 0.0025, 0.14, 0.7, -1.0, 0.3, 1/52\},$$

although we have empirical proxies for a, b and c (convexity, skew and ATM vol level).

References I

[GJR22] Jim Gatheral, Thibault Jaisson, and Mathieu Rosenbaum. "Volatility is rough". In: *Commodities*. Chapman and Hall/CRC, 2022, pp. 659–690.

[AL24] Eduardo Abi Jaber and Shaun Xiaoyuan Li. "Volatility models in practice: Rough, Path-dependent or Markovian?" In: *Path-Dependent or Markovian* (2024).