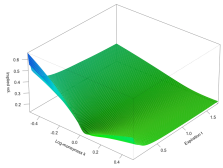
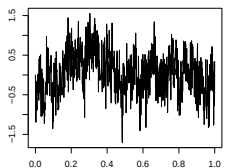
My main research interests are financial mathematics, stochastic numerics, and rough paths.

► Rough stochastic volatility models



SPX implied vol surface



Sample of fBm, $H = 0.1$

Models for consistently describing stock indices together with their volatility (e.g., SPX with VIX) based on *rough* fractional Brownian motion with Hurst index $H \ll 1/2$. These models are not Markovian leading to significant *theoretical and numerical challenges*.

► Applications of rough path analysis

A powerful method for analysisng controlled differential equations. Applications include:

- Analysis of deep neural networks
- Solving non-Markovian stochastic optimal control problems.

► Stochastic numerics

- Solving PDEs with random coefficients
- Regression based methods for stochastic optimal control
- Sparse grids and tensor trains for stochastic problems