Starting from the observation that increments of the log-realized-volatility possess a remarkably simple scaling property, we show that log-volatility behaves essentially as a fractional Brownian motion with Hurst exponent $H$ of order 0.1, at any reasonable time scale. The resulting Rough Fractional Stochastic Volatility (RFSV) model is remarkably consistent with financial time series data. We then show how the RFSV model can be used to price claims on both the underlying and integrated volatility. We analyze in detail a simple case of this model, the rBergomi model. In particular, we find that the rBergomi model fits the SPX volatility markedly better than conventional Markovian stochastic volatility models, and with fewer parameters. Finally, we show that actual SPX variance swap curves seem to be consistent with model forecasts, with particular dramatic examples from the weekend of the collapse of Lehman Brothers and the Flash Crash.

This is joint work with Christian Bayer, Peter Friz, Thibault Jaisson, and Mathieu Rosenbaum.