



Contribution ID: 82

Type: not specified

# A Solution to the Time-Scale Fractional Puzzle in the Implied Volatility

*Wednesday, August 29, 2018 9:00 AM (40 minutes)*

In the option pricing literature, it is well known that (i) the decrease in the smile amplitude is much slower than the standard stochastic volatility models and (ii) the term structure of the at-the-money volatility skew is approximated by a power-law function with the exponent close to zero. These stylized facts cannot be captured by standard models and, while (i) has been explained by using a fractional volatility model with Hurst index  $H > 1/2$ , (ii) is proved to be satisfied by a rough volatility model with  $H < 1/2$  under a risk-neutral measure. This paper provides a solution to this fractional puzzle in the implied volatility. Namely, we construct a two-factor fractional volatility model and develop an approximation formula for European option prices. It is shown through numerical examples that our model can resolve the fractional puzzle, when the correlations between the underlying asset process and the factors of rough volatility and persistence belong to a certain range. More specifically, depending on the three correlation values, the implied volatility surface is classified into four types: (1) the roughness exists, but the persistence does not; (2) the persistence exists, but the roughness does not; (3) both the roughness and the persistence exist; and (4) neither the roughness nor the persistence exist. (Joint work with H. Funahashi)

## Summary

**Presenter:** KIJIMA, Masaaki (Tokyo Metropolitan University)