

Christina Nikitopoulos Sklibosios

Title: **Implied Roughness in the Term Structure of Oil Markets Volatility.**

Abstract

This paper analyses the attributes and the significance of the roughness of oil market volatility. We employ unspanned stochastic volatility models driven by rough Brownian motions that yield semi-analytical prices for futures options entailing efficient calibration applications. By performing a Monte-Carlo simulation study, we show that the semi-analytical pricing performs well thus establishing its efficiency for calibration applications. Thus, we calibrate option prices written on oil futures and provide empirical evidence of the roughness in oil volatility. Introducing just one additional parameter, the Hurst parameter, indicating the roughness of the volatility improves the calibration by almost a factor of 10. The calibrated option-implied Hurst parameter varies over time, but the entire set of parameters becomes more stable than in the non-rough case corresponding to a fixed Hurst parameter $1/2$. These results underscore the importance to model the time dependency of the roughness of oil market volatility.

Paper:

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