BIG DATA & ALGORITHMIC FINANCE

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Xiaoyuan (Shaun) Li is a CIFRE PhD student at Université Paris 1, France under the supervision of Professor Eduardo Abi Jaber (École Polytechnique, France) and Professor Bernard De Meyer (Université Paris 1), sponsored by AXA Investment Managers in Paris. His thesis centers on volatility modelling, derivative pricing/hedging, and machine learning. Originally from New Zealand, Shaun moved to France in 2018 to pursue study in applied mathematics. He holds a master's degree in applied mathematics in Quantitative Finance from Université Paris 1.

JOINT SPX-VIX CALIBRATION WITH GAUSSIAN POLYNOMIAL VOLATILITY MODELS: DEEP PRICING WITH QUANTIZATION HINTS

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We consider the joint SPX-VIX calibration within a general class of Gaussian polynomial volatility models in which the volatility of the SPX is assumed to be a polynomial function of a Gaussian Volterra process dened as a stochastic convolution between a kernel and a Brownian motion. By performing joint calibration to daily SPX-VIX implied volatility surface data between 2012 and 2022, we compare the empirical performance of different kernels and their associated Markovian and non-Markovian models, such as rough and non-rough path- dependent volatility models. In order to ensure an efficient calibration and a fair comparison between the models, we develop a generic unified method in our class of models for fast and accurate pricing of SPX and VIX derivatives based on functional quantization and Neural Networks. For the first time, we identify a conventional one-factor Markovian continuous stochastic volatility model that is able to achieve remarkable fits of the implied volatility surfaces of the SPX and VIX together with the term structure of VIX futures. What is even more remarkable is that our conventional one-factor Markovian continuous stochastic volatility model outperforms, in all market conditions, its rough and non-rough path-dependent counterparts with the same number of parameters.

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