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Robust financial calibration: a Bayesian approach for neural SDEs
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Abstract: The paper presents a Bayesian framework for the calibration of financial models using neural stochastic differential equations (neural SDEs). The method is based on the specification of a prior distribution on the neural network weights and an adequately chosen likelihood function. The resulting posterior distribution can be seen as a mixture of different classical neural SDE models yielding robust bounds on the implied volatility surface. Both, historical financial time series data and option price data are taken into consideration, which necessitates a methodology to learn the change of measure between the risk-neutral and the historical measure. The key ingredient for a robust numerical optimization of the neural networks is to apply a Langevin-type algorithm, commonly used in the Bayesian approaches to draw posterior samples.

https://arxiv.org/abs/2409.06551