

## A Stochastic Volatility Model for Optimal Market-Making

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**Abstract :** The electronification of financial markets and the rise of algorithmic trading has sparked a lot of interest from the mathematical community, for the market making-problem in particular. The research presented in this short paper solves the classic stochastic control problem in order to derive the strategy for a market-maker. It also shows how to calibrate and simulate the strategy with real limit order book data for back-testing. The ambiguity of limit-order priority in back-testing is dealt with by considering optimistic and pessimistic priority scenarios. The model, although it does outperform a naive strategy, assumes constant volatility, therefore, is not best suited to the LOB data. The Heston model is introduced to describe the price and variance process of the asset. The Trader's constant absolute risk aversion utility function is optimised by numerically solving a 3-dimensional Hamilton-Jacobi-Bellman partial differential equation to find the optimal limit order quotes. The results show that the stochastic volatility market-making model is more suitable for a risk-averse trader and is also less sensitive to calibration error than the constant volatility model.

**Keywords :** market-making, market-microstructure, stochastic volatility, quantitative trading

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