

"Heston 1.5"

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We propose a multi-scale stochastic volatility model in which a fast mean-reverting factor of volatility is built on top of the Heston stochastic volatility model. A singular perturbative expansion is then used to obtain an approximation for European option prices. The resulting pricing formulas are semi-analytic, in the sense that they can be expressed as integrals. Difficulties associated with the numerical evaluation of these integrals are discussed, and techniques for avoiding these difficulties are provided. Overall, it is shown that computational complexity for our model is comparable to the case of a pure Heston model, but our correction brings significant flexibility in terms of fitting to the implied volatility surface.

This is illustrated numerically and with option data.

Joint work with Matt Lorig (UCSB)