

Estimating Heston's Volatility Model Using VIX

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Abstract

An asset's volatility is often assumed to be constant for a period of interest, for example when pricing an option with the Black-Scholes pricing model. Introducing a stochastic volatility model, such as the one of Heston (1993), can help to better take into account the true dynamics of volatility. This paper shows a method of estimating Heston's volatility model using VIX data with maximum likelihood estimation.

The results indicate that while Heston's model is misspecified, and the more general CEV model offers a significantly better fit, the estimated models both show similar results. The goodness of the fit does decrease if the data includes multiple time periods where the VIX shows distinct features with regard to its long run average or variability, or when the data includes frequent extreme movements.

Finally, care has to be taken when using the model to forecast the probabilities of future VIX levels. Even if the parameters may be stable for years, there are sudden changes in the dynamics of volatility that severely deteriorate the reliability of a prediction.