Implied Lévy volatility

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Abstract

Although several advanced asset return models have been developed these last two decades, including jumps and stochastic volatility characteristics, the Black-Scholes model has remained the standard quoting tool for many banks and financial institutions. This is partly due to the simple and widespread used concept of the Black-Scholes implied volatility and to the fact that over the years option traders have developed an intuition into this model parameter.

Here a similar concept is developed but now under a Lévy framework and therefore based on distributions that match more closely historical returns since they allow to introduce both skewness and excess of kurtosis into the model. In particular, we propose two models, the Lévy implied space and time volatility models; the first arising when the Lévy distribution is multiplied by the volatility and the second one when the time argument of the Lévy distribution is multiplied by the square of the volatility. Moreover the concept of implied Lévy space and time volatility is introduced and a study of the shape of implied Lévy volatilities is made. Model performance is studied by analyzing delta-hedging strategies for the Normal Inverse Gaussian and the Meixner model, both qualitatively and on historical time-series of the S&P500. It is shown that under such parameter settings the model performs systematically better.