Volatility derivatives and model-free implied leverage

Masaaki Fukasawa*[1]

[1]Osaka University – Japan

Abstract

We revisit robust replication theory of volatility derivatives and introduce a broader class which may be considered as the second generation of volatility derivatives. One of them is a swap contract on the quadratic covariation between an asset price and the model-free implied variance (MFIV) of the asset. It can be replicated in a model-free manner and its fair strike may be interpreted as a model-free measure for the covariance of the asset price and the realized variance. The fair strike is given in a remarkably simple form, which enable to compute it from the Black-Scholes implied volatility surface. We call it the model-free implied leverage (MFIL) and give several characterizations. In particular, we show its simple relation to the Black-Scholes implied volatility skew by an asymptotic method. Further to get an intuition, we demonstrate some explicit calculations under the Heston model. We report some empirical evidence from the time series of the MFIV and MFIL of the Nikkei stock average.

*Speaker