

Semi-Robust Replication of Volatility and Hybrid Derivatives for Models with Jumps

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We show how to price and replicate a variety of claims written on the log price X and quadratic variation $[X]$ of a risky asset. We model the risky asset as a strictly positive semimartingale, which experiences both stochastic volatility and jumps. Subject to an integrability condition, the volatility process may be any adapted right-continuous process that evolves independently of the Brownian motion and Poisson random measure that drives the price process. In particular, the volatility process may exhibit jumps and may be non-Markovian. The Poisson random measure that drives the price process may be any finite activity Poisson random measure with bounded jump sizes. As hedging instruments, we use only the underlying risky asset, a zero-coupon bond, and European calls and puts with the same maturity as the claim to be hedged. Examples of claims that we price include variance swaps, volatility swaps, a claim that pays the realized Sharpe ratio, and a call on a levered exchange traded fund.