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Implied vol for any local-stochastic vol model.

We consider an asset whose risk-neutral dynamics are described by a general local-stochastic volatility model. In this setting, we derive a family of asymptotic expansions for the transition density of the underlying as well as for European-style option prices and for implied volatilities. Our expansions are numerically efficient. Approximate transition densities and implied volatilities are explicit; they do not require any special functions nor do they require numerical integration. Approximate option prices require only a Normal CDF (as is the case of the Black-Scholes setting). Additionally, we establish rigorous error bounds for our transition density expansion. To illustrate the accuracy and versatility of our implied volatility expansion, we implement this expansion under classical model dynamics: Heston stochastic volatility, 3/2 stochastic volatility, and SABR local-stochastic volatility. Our implied volatility expansion is found to perform favorably compared to other well-known expansions for these models. (Received July 28, 2013)