Local Volatility model Algorithm

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1 The Algorithm

Below are the steps to implement the local volatility model,

- Assemble the data, consisting of a matrix of quoted option prices $\left\{C\left(T_i, K_j^i\right)\right\}_{i-1}^{N}$ where $j = 1, 2, 3, ...M_i$
- Use cubic spline interpolation to produce a smooth volatility surface.
- Calculate $\sigma(K, T)$, the local volatility surface, using Dupire's formula where,

  $\frac{\partial C}{\partial T} \approx \frac{C(K,T+\Delta T)-C(K,T-\Delta T)}{2\Delta T}$

  $\frac{\partial C}{\partial K} \approx \frac{C(K+\Delta K,T)-C(K-\Delta K,T)}{2\Delta K}$

  $\frac{\partial^2 C}{\partial K^2} \approx \frac{C(K+\Delta K,T)-2C(K,T)+C(K-\Delta K,T)}{(\Delta K)^2}$
- Use discretized GBM SDE by Euler scheme and Monte Carlo simulation to calculate the option prices.