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Title: Volatility in options formulae for general stochastic dynamics

Abstract: It is well-known that the Black-Scholes formula has been derived under the assumption of constant volatility in stocks. In spite of evidence that this parameter is not constant, this formula is widely used by financial markets. We address the question of whether an alternative model for stock price exists for which the Black-Scholes or similar formulae hold. The results are very general as no assumptions are made on the dynamics of the model, whether it be the underlying price process, the volatility process or how they relate to each other. It is shown that if the formula holds for a continuum of strikes and three terminal times then the volatility must be constant. However, when it only holds for finitely many strikes, and three or more maturity times, we obtain a universal bound on the variation of the volatility.