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Estimation and Pricing with a Diffusion Model with Jumps

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The Black-Scholes formula is a staple in finance. The formula for option pricing hinges on a diffusion model for stock prices. Yet, there are other ways of modeling stock prices. While Press proposed a diffusion model with normal jumps but no drifts, Merton extended Press's idea by adding a drift term. Whereas the diffusion model alone has a neat probability density function and thus lends itself well to standard estimation methods, including maximum likelihood, the diffusion model with jumps does not. However, all these models have nice characteristic functions which can be used in quadratic distance estimation. After estimating the parameters of the enhanced model (and yet avoiding the problems encountered with moment-type estimators), we look at ways of pricing options under that model. We finish with some numerical examples based on real data.