

Discrete-time option pricing with stochastic liquidity*

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Abstract

Classical option pricing theories are usually built on the law of one price, neglecting the impact of market liquidity that may contribute to significant bid-ask spreads. Within the framework of conic finance, we develop a stochastic liquidity model, extending the discrete-time constant liquidity model of Madan (2010). With this extension, we can replicate the term and skew structures of bid-ask spreads typically observed in option markets. We show how to implement such a stochastic liquidity model within our framework using multidimensional binomial trees and we calibrate it to call and put options on the S&P 500.

JEL Classification: C51; D52; G12; G13

Keywords: Market Liquidity; Bid-Ask Spreads; Option Pricing; Stochastic Liquidity; Conic Finance

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