Black-Scholes Model on Non-liquid Markets

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The problem of valuing financial options on non-liquid markets will be discussed. The standard (liquid) case is covered by the celebrated Black-Scholes model. We will consider a generalization of this model by scaling the time of the underlying instrument using infinitely divisible inverse subordinators. Such models, in contrast to their classical counterparts, can be applied in markets where periods of stagnation are observed. We will introduce the subordinated Cox-Ross-Rubinstein model and present the corresponding limit theorems. Motivated by this, we will price selected option contracts using binomial trees. Moreover, for stable and tempered stable inverse subordinators, the governing fractional differential equations and related weighted numerical schemes, which generalize the classical Crank-Nicolson scheme, will be derived. For both cases, the stability and convergence analysis will be discussed. A comparison of numerical methods will be provided.

References

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