

Option Pricing within the Black-Scholes Framework: Theoretical and Numerical Methods with Emphasis on the Exotics

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Abstract

The aim of this thesis is to build up the Black-Scholes model of derivative pricing and give examples of relevant applications specifically in the realm of options. We begin the first section with introductory material including notation and basic concepts. The one-period model is briefly discussed, which leads to the multi-period discrete market representation in the Black-Scholes framework. The second section generalizes the concepts introduced in the first section to continuous time, slightly modifying definitions and theorems where appropriate. Vital results from stochastic calculus, which are used to prove the replicability of the general contingent claim, are also mentioned for completeness. The third section focuses on a specific type of contingent claim, namely the option. The European style option is covered in detail, and the most relevant results are given for American options as well. This naturally leads to the final section, which lists several exotic option payoffs and goes into great detail on pricing Asian options; we explore both Curran's and Večeř's method with numerical results.