Kriging of financial term-structures

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Abstract

Due to the lack of reliable market information, building financial term-structures may be associated with a significant degree of uncertainty. In this paper, we propose a new term-structure interpolation method that extends classical spline techniques by additionally allowing for quantification of uncertainty. The proposed method is based on a generalization of kriging models with linear equality constraints (market-fit conditions) and shape-preserving conditions such as monotonicity or positivity (no-arbitrage conditions). We define the most likely curve and show how to build confidence bands. The Gaussian process covariance hyper-parameters under the construction constraints are estimated using cross-validation techniques. Based on observed market quotes at different dates, we demonstrate the efficiency of the method by building curves together with confidence intervals for term-structures of OIS discount rates, of zero-coupon swaps rates and of CDS implied default probabilities. We also show how to construct interest-rate surfaces or default probability surfaces by considering time (quotation dates) as an additional dimension.

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