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A multivariate Vasicek diffusion driven by an inhomogeneous drift

Communication Info

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Abstract

Multivariate modeling is essential when growth components are driven by shared environmental factors [1, 2]. Although affine models such as the multivariate Vasicek process are analytically convenient, they fail to capture multiplicative saturating dynamics.

This paper introduces the MIVDP model, derives its main properties, such us its explicit Itô solution [3,4,5], and characterize its conditional and unconditional means as well as its cross-correlation structure. We then develop maximum-likelihood estimators for the Vasicek parameters, discuss numerical challenges, and outline approximate-likelihood methods when exact transition densities are unavailable. Finally, we apply the multivariate Vasicek framework to environmental data and assess model fit and forecasting performance.

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