Abstract:
Motivated by empirical evidence of long range dependence in macroeconomic variables like interest rates, domestic gross products or supply and demand rates, we propose a fractional Brownian motion (fBm) driven model to describe the dynamics of the short rate in a bond market as well as the default rate for possible default. We aim at results analogous to those achieved in recent years for affine models. We start with a bivariate fractional Vasicek model (with time dependent coefficient functions) for short and default rate, which allows for fairly explicit calculations. We calculate the prices of corresponding zero-coupon bonds by invoking Wick calculus. The mathematical challenges are the prediction of exponentials of two dependent fBm integrals, and to find closed formulas for the prices of defaultable zerocoupon bonds. Applying a pathwise Girsanov theorem we derive today's prices of European calls. More general options will be priced exploiting Fourier methods. We also compare our results to the classical Brownian motion driven Vasicek model.

Stichworte:
credit risk, defaultable bond, default rate, derivatives pricing, fractional Brownian motion, fractional Vasicek model, hazard rate, interest rate, long range dependence, macroeconomic variables process, option pricing, prediction, short rate, Wick product