

时滞均值回复 θ 过程及其数值解的收敛性

张春赛, 胡良剑

东华大学应用数学系, 上海 200051

MEAN-REVERTING PROCESS WITH TIME DELAY AND THE CONVERGENCE OF ITS NUMERICAL SOLUTION

Zhang Chunsai, Hu Liangjian

Department of Applied Mathematics, Donghua University, Shanghai 200051, China

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摘要

时滞均值回复 θ 过程用于描述受时间延迟影响的利率、波动率等金融特征,本文利用随机时滞微分方程理论证明了过程在 $1/2 \leq \theta < 1$ 情况时解的存在唯一性和非负性. 由于表示该过程的随机时滞微分方程没有显示解,所以数值近似解是研究过程的重要的方法,本文证明了时滞均值回复 θ 过程Euler-Maruyama 数值解的 $p(p \geq 2)$ 阶矩意义上的强收敛性.

关键词: 均值回复 θ 过程 存在唯一性 非负性 Euler-Maruyama数值解

Abstract:

The mean-reverting θ process with delay is used as a model for interest rates and volatility as well as other financial quantities which are past level dependent. For $1/2 \leq \theta < 1$, we prove the model has a unique nonnegative solution. Since the corresponding stochastic delay differential equation has no explicit solution, it is very important to study numerical methods for the solution approximations. We prove the strong convergence of Euler-Maruyama approximate solution in sense of p -th moment ($p \geq 2$).

Key words: the mean-reverting θ process existence and uniqueness nonnegativity Euler-Maruyama approximate solution

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