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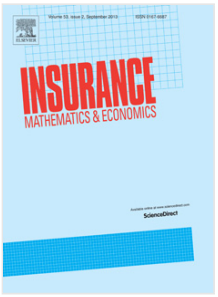

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Optimal Dividends under a Stochastic Interest Rate

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Abstract

We consider an insurance entity endowed with an initial capital and an income, modeled as a Brownian motion with drift. The discounting factor is modeled as a stochastic process: at first as a geometric Brownian motion, then as an exponential function of an integrated Ornstein-Uhlenbeck process. It is assumed that the insurance company seeks to maximize the cumulated value of expected discounted dividends up to the ruin time. We find an explicit expression for the value function and for the optimal strategy in the first but not in the second case, where one has to switch to the viscosity ansatz.

Keywords: optimal control, Hamilton–Jacobi–Bellman equation, Vasicek model, geometric Brownian motion, interest rate, short rate, dividends

2010 MSC: 93B05, 49L20, 49L25

1. Introduction

In fact, the present paper deals with the excessively investigated problem of dividend maximization in the Brownian risk model, however under a stochastic interest rate independent of the surplus. That is to say, in the previous studies the discounting rate, which undoubtedly plays a crucial role in the choice of the optimal strategy, is assumed to be a positive constant. Since as already mentioned, the dividend optimization problems have been investigated for a quite long time, we omit listing the existing literature and just refer to a survey on the dividend problems in insurance by Albrecher and Thonhauser [1] and references therein.

Interest rates build an integral part of market economy, influencing huge firm investment as well as small households spending decisions. Random perturbations on financial markets can cardinally change the monetary behaviour of an investor, leading to a totally different result than expected under the assumption of a constant interest rate. Intuitively, it is clear that a stochastic interest rate reflects fluctuations on the market much better than a deterministic one. Thus, it is clear that in order to describe the behaviour of an economic agent possibly realistic, we should use a stochastic interest rate. Rather, the question is which short rate (rates of interest for a short period of time) models should be used and whether any explicit results can be obtained.

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