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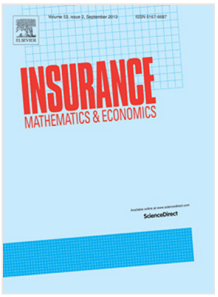

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A characterization of equilibrium strategies in continuous-time mean-variance problems for insurers

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Abstract

In this work, we study the equilibrium reinsurance/new business and investment strategy for mean-variance insurers with constant risk aversion. The insurers are allowed to purchase proportional reinsurance, acquire new business and invest in a financial market, where the surplus of the insurers is assumed to follow a jump-diffusion model and the financial market consists of one riskless asset and a multiple risky assets whose price processes are driven by Poisson random measures and independent Brownian motions. By using a version of the stochastic maximum principle approach, we characterize the open loop equilibrium strategies via a stochastic system which consists of a flow of forward-backward stochastic differential equations (FBSDEs in short) and an equilibrium condition. Then by decoupling the flow of FSBDEs, an explicit representation of an equilibrium solution is derived as well as it corresponding objective function value.

Keys words: Time inconsistency, mean-variance criterion, investment-reinsurance strategy, insurer, equilibrium strategy, forward–backward stochastic differential equation.

MSC 2010 subject classifications, 93E20, 60H30, 93E99, 60H10.

1 Introduction

In the recent decades, the risk models for insurers that can control and manage their risk by means of some business activities to optimize some objectives have received remarkable attention. Browne [6] first obtained the optimal investment strategy which maximizes the exponential utility of terminal wealth, where the surplus process of the insurer is modelled by a geometric Brownian motion. Yang and Zhang [29] followed by Wang [27] considered the same optimal investment problem, where the surplus process of the insurer is modelled, respectively, by a jump-diffusion process and an increasing pure jump process. Moreover, Xu et al. [28], Cao and Wan [7] and Gu et al. [16] have investigated the optimal investment and reinsurance strategies for the insurers to optimize the expected utility of the terminal wealth in different situations.

In addition to the expected utility maximization, the mean-variance criterion, introduced by Markowitz [20], is another important objective function to the optimal investment and reinsurance problems for insurers. The idea of mean-variance criterion is that it quantifies the risk using the variance, which enables insurers to seek the highest return after evaluating their acceptable risk level. Bäuerle [3] considered the optimal proportional reinsurance problem under the mean-variance

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