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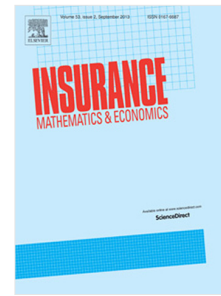
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Optimal investment management for a defined contribution pension fund under imperfect information [☆]

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Abstract

This paper investigates an optimal multi-period investment management problem for a defined contribution pension fund under the mean-variance criterion with imperfect information, meaning that both observable and unobservable states exist in the financial market. The dynamics of the unobservable market state process are formulated by a discrete-time finite-state hidden Markov chain with time-varying transition probability matrices. Due to the long investment horizon of a defined contribution pension fund, our paper considers only risky assets whose returns depend on both the observable and unobservable market states. Meanwhile, the stochastic salary process is also modulated by the observable and unobservable market states. By adopting sufficient statistics, the portfolio optimization problem for the defined contribution pension fund with imperfect information is transformed into one with complete information. Then, the optimal investment strategy and the efficient frontier are explicitly derived using the dynamic programming approach and the Lagrange dual method. Finally, numerical results show that the imperfection of market state information may cause a loss of investment return.

Keywords: Imperfect information; Hidden Markov model; Stochastic salary; Defined contribution pension fund.

1. Introduction

Recent decades have witnessed the widespread use of defined contribution (DC) pension funds all over the world due to the aging population and the longevity risk. Compared with the defined benefit (DB) pension fund, the contribution rate of DC pension funds is usually preset, and the benefit depends on the investment return in the financial market during the accumulation period before retiring. The DC pension fund thus has

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