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Ornstein-Uhlenbeck模型下DC养老金计划的最优投资策略

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Optimal Investment Strategy under Ornstein-Uhlenbeck Model for a DC Pension Plan

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摘要 本文研究了Ornstein-Uhlenbeck模型下确定缴费型养老金计划(简称DC 计划) 的最优投资策略, 其中以最大化 DC 计划参与者终端财富(退休时其账户金额) 的CRRA效用为目标. 假定投资者可投资于无风险资产和一种风险资产, 风险资产的瞬时收益率由 Ornstein-Uhlenbeck 过程驱动, 该过程能反映市场所处的状态. 利用随机控制理论, 给出了相应的HJB 方程与验证定理; 并通过求解相应的HJB 方程, 得到了最优投资策略和最优值函数的解析式. 最后分析了瞬时收益率对最优投资策略的影响, 发现当市场向良性状态发展时, 投资在风险资产上的财富比例呈上升趋势; 当初始财富足够大且市场状态不变时, 投资在风险资产上的财富比例几乎不受时间的影响.

关键词: DC型养老基金计划 最优投资策略 Ornstein-Uhlenbeck 过程 Hamilton-Jacobi-Bellman方程

Abstract: This paper studies an optimal portfolio strategy under Ornstein-Uhlenbeck model for an investor whose target is to maximize CRRA utility of the terminal wealth in a defined contribution (DC) pension plan. The investor is allowed to invest in a risk-free asset and a risky asset. The instantaneous return rate of the risky asset is driven by Ornstein-Uhlenbeck process, which can reflect the states of the market. By applying stochastic control theory, the corresponding Hamilton-Jacobi-Bellman equation and verification theorem are provided, and the explicit expressions of the optimal investment strategy and the optimal value function are obtained. Moreover, the impact of the instantaneous return rate of the risky asset on the optimal investment strategy is analyzed. In particular, we find that the proportion invested in the risky asset increases when the state of the market becomes better and that at the same market state, the optimal investment proportion is almost independent of time when the initial wealth is big enough.

Key words: defined contribution pension plan optimal investment strategy Ornstein-Uhlenbeck process Hamilton-Jacobi-Bellman equation

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