OPTIMAL ASSETS ALLOCATION AND BENEFIT OUTGO POLICIES OF THE DC PENSION PLAN TO MAINTAIN THE PURCHASING POWER

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ABSTRACT. In this paper, we study the optimal dynamic asset allocation and benefit outgo policies of the DC pension plan to maintain the purchasing power during the distribution phase. In the model, the change of the alive member's fund scale is affected by three factors: investment return, benefit outgo and mortality credit.The pension management controls the asset allocation and the benefit outgo policies to achieve the goals of the pension members. The change of the fund scale could be simplified to follow the stochastic differential equations with two control variables. The widely used performance criterion in the DC pension management is to maintain the purchasing power of the members after retirement. A pre-set proportion (expected pension replacement rate) multiplied by the average salary as the target of the expected benefit outgo, i.e., the benchmark of purchasing power. The average salary process also satisfies the stochastic differential equation which is partially correlated with the fund scale process. Our objective aims at minimizing the square deviations between the actual benefit outgo and expected benefit outgo. Using Bellman's stochastic principle of optimality and HJB methods, we establish the optimal proportions allocated in the risky and risk-free asset separately and the optimal benefit outgo policy. We theoretically prove that, the fund scale has negative impacts on the optimal proportion allocated in the risky asset. It is a counterintuitive result with respect to the Merton model. While the average salary and the expected pension replacement rate have positive impacts on the optimal proportion allocated in the risky asset, and vice verse. Furthermore, when actual pension-salary ratio is high, the deviation between the optimal benefit outgo and the expected benefit outgo is positive. The increase of the fund scale and the decrease of average salary will enlarge the deviation, and vice verse. Besides that, the optimal control policies have convergent effects with respect to time according to the Monte Carlo simulations.

Keywords: DC pension plan; Optimal asset allocation; Optimal benefit outgo; Pension replacement rate; Bellman's stochastic principle of optimality.

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