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Optimal investment strategy to minimize the ruin probability of an insurance company under borrowing constraints

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Abstract:

We consider that the reserve of an insurance company follows a Cramér-Lundberg process. The management has the possibility of investing part of the reserve in a risky asset. We consider that the risky asset is a stock whose price process is a geometric Brownian motion. Our aim is to find a dynamic choice of the investment policy which minimizes the ruin probability of the company. We impose that the proportion of the reserve invested in the risky asset should be smaller than a given positive bound a, for instance the case $a = 1$ means that the management cannot borrow money to buy stocks.

Hipp and Plum (2000) and Schmidli (2002) solved this problem without borrowing constraints. They found that, as the reserve approach to zero, the optimal proportion of the reserve invested in the risky asset goes to infinity, so the optimal strategies of the constrained and unconstrained problems never coincide.

We characterize the optimal value function as the classical solution of the associated Hamilton-Jacobi-Bellman equation. This equation is a second order non linear integro-differential equation. We obtain numerical solutions for some claim-size distributions and compare our results with those of the unconstrained case.

Keywords: Cramér-Lundberg process, ruin probability, insurance, portfolio optimization, borrowing constraints, Hamilton-Jacobi-Bellman equation, dynamic programming principle.

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