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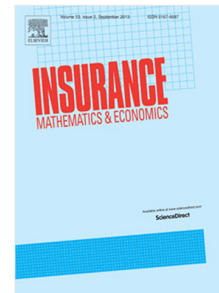
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Purchasing Casualty Insurance to Avoid Lifetime Ruin

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Abstract: We determine the optimal strategies for purchasing deductible insurance and for investing in a risky financial market in order to minimize the probability of lifetime ruin when an individual is subject to an insurable loss that occurs at a Poisson rate. We specialize to the case for which the casualty loss is constant and insurance is priced actuarially fairly. We learn that the optimal deductible strategy is for the individual to purchase no insurance when her wealth is below a so-called *buy level*. However, when wealth is greater than the buy level, the individual optimally purchases full insurance coverage.

JEL Codes: C61, G02, G11, G22.

Keywords: Compound Poisson process; casualty loss; consumption; optimal investment; stochastic control.

1. Introduction

We determine the optimal strategies for purchasing deductible insurance and for investing in a risky financial market in order to minimize the probability of lifetime ruin when an individual is subject to an insurable loss that occurs at a Poisson rate. We specialize to the case for which the insurable loss is constant and insurance is priced actuarially fairly. We learn that the optimal deductible strategy is for the individual to purchase no insurance when her wealth is below a so-called *buy level*. However, when wealth is greater than the buy level, the individual optimally purchases full insurance coverage.

The work in this paper combines three areas of research. One area is classical ruin theory, although most work in that area is from the viewpoint of an insurance company facing possible ruin. As in classical ruin theory, we assume that the individual's wealth is subject to a loss that follows a compound Poisson process. As in more recent work in ruin theory, we allow the agent (an individual in our case) to invest in a risky financial market and to buy insurance to mitigate the loss. However, because we take the viewpoint of an individual, the game ends if the individual dies before ruin, a feature not seen in classical ruin theory. That said, the Gerber-Shiu function (Gerber and Shiu, 1998) includes a discount rate when considering the time of ruin, which is mathematically equivalent to a constant force of mortality in our setting.

The second area is optimally controlling wealth to reach a goal or to avoid ruin. Research on this topic began with the seminal work of Dubins and Savage (1965, 1976) and continued with the work of Pestien and Sudderth (1985), Orey et al. (1987), Sudderth and Weerasinghe (1989), Kulldorff (1993), Karatzas (1997), and Browne (1997, 1999a, and 1999b). Milevsky et al. (1997) and Milevsky and Robinson (2000) introduced the notion of *lifetime ruin*, namely, the event that

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