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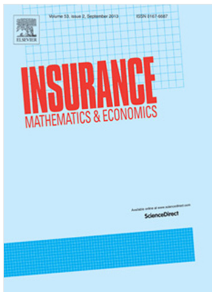

Dividends: From refracting to ratcheting

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DIVIDENDS: FROM REFRACTING TO RATCHETING

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ABSTRACT. In this paper we consider an alternative dividend payment strategy in risk theory, where the dividend rate can never decrease. This addresses a concern that has often been raised in connection with the practical relevance of optimal classical dividend payment strategies of barrier and threshold type. We study the case where once during the lifetime of the risk process the dividend rate can be increased and derive corresponding formulae for the resulting expected discounted dividend payments until ruin. We first consider a general spectrally-negative Lévy risk model, and then refine the analysis for a diffusion approximation and a compound Poisson risk model. It is shown that for the diffusion approximation the optimal barrier for the ratcheting strategy is characterized by an unexpected relation to the case of refracted dividend payments. Finally, numerical illustrations for the diffusion case indicate that with such a simple ratcheting dividend strategy the expected value of discounted dividends can already get quite close to the respective value of the refracted dividend strategy, the latter being known to be optimal among all admissible dividend strategies.

1. Introduction

Starting with de Finetti's work [13], the study of optimal dividend payout strategies in collective risk theory has been a very active field of research over the last 60 years. It is nowadays well-known that in order to maximize the expected aggregate discounted dividends until ruin, it is optimal to pay dividends according to a band strategy, which in a number of cases collapses to a barrier strategy; see e.g. [15], [27], [26] and [10].

When this optimal control problem is considered with an upper bound on the dividend rate, then in many cases a *refracting* dividend strategy (or, synonymously, a *threshold* strategy) is optimal (i.e., no dividend payments up to a certain barrier level, and dividend payments at maximal allowed rate above that barrier); see for instance [20], [6] for diffusions, [16] and [24] for the compound Poisson process, as well as [23] for the general spectrally negative Lévy case. Related recent references for the spectrally positive Lévy model are for instance [28] and [8]. Since then numerous extensions and variations of the dividend problem have been considered, many of which lead to intricate and interesting mathematical problems; see e.g. [4] and [7] for surveys on the topic.

Among these variations, some also address the issue that the theoretically optimal refraction strategy may not be realistic when it comes to implementation in practice. One constraint is that dividends can only be paid out in a discrete rather than a continuous-time fashion, see [1] for a contribution in this direction for random discrete payment times. Another problem with the threshold strategy is the strong variability of payment patterns across time. In [9] it was proposed for a diffusion process to consider dividend payments that are proportional to the current surplus level, which leads to much smoother dividend streams. Recently, the respective analysis of performance measures was extended to the compound Poisson model in [3]. In [11] and [12] the aim was to maximize risk-sensitive