Joint optimization of transition rules and premiums in a Bonus-Malus system

Márton Gyetvai*
Department of Operations Research and Actuarial Sciences, Corvinus University of Budapest
Institute of Economics, Research Centre for Economic and Regional Studies, Hungarian Academy of Sciences, gyetvai.marton@krtk.mta.hu

Kolos Cs. Ágoston
Department of Operations Research and Actuarial Sciences, Corvinus University of Budapest
Institute of Economics, Research Centre for Economic and Regional Studies, Hungarian Academy of Sciences, kolos.agoston@uni-corvinus.hu

Abstract

Bonus-Malus systems are widely used methods in actuarial sciences that are applied to distinguish the policyholders by their risks. In a Bonus-Malus system there are several classes and the classification of the policyholders depends on the class in the previous period and the number of claims reported in the present period.

Operating such a system one needs to set somehow the transition rules and premiums of each classes. In general, optimization of these systems usually means to calculate appropriate premium scales considering transition rules as outer parameter. We present a mixed integer programming formulation for determining jointly the premium scales with the transition rules for a given set of policyholders. Furthermore, we present numerical examples to demonstrate that this IP technique is suitable to handle existing Bonus-Malus systems.

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