

On asymptotic properties of Bonus-Malus systems based on the number and on the size of the claims

Heikki Bonsdorff
Ministry of Social Affairs and Health
Helsinki, Finland

Abstract

Almost all existing Bonus-Malus systems (BM-systems) are based on the number of the claims without taking into account the size of the claims. The existing BM-systems are unfair for those riders who have only small claims. Naturally, this affects matching the risks, as well. We present a general framework for a BMS based on the number of claims of the previous year and the total amount of claims of the previous year. The set of the bonus classes will be an interval $[a, b]$, say $[0.3, 1.5]$, where 1 presents the premium before bonus or malus. The framework allows one to design a BM-system which takes into account, in a suitable way, different desirable properties of the system, as matching the risks, responding to competition and acceptance of the policyholders.

Our consideration is based on the theory of general Markov chains. The BMS is interpreted as a general Markov chain with state space $[a, b]$. It turns out that, under certain assumptions, the Markov chain possesses an invariant limit distribution to which it converges with a geometric rate. We show how the invariant distribution can be evaluated by means of simulation.

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