The Bayesian Premium Under Entropy Loss

Authors : Farouk Metiri, Halim Zeghdoudi, Mohamed Riad Remita

Abstract : Credibility theory is an experience rating technique in actuarial science which can be seen as one of quantitative tools that allows the insurers to perform experience rating, that is, to adjust future premiums based on past experiences. It is used usually in automobile insurance, worker's compensation premium, and IBNR (incurred but not reported claims to the insurer) where credibility theory can be used to estimate the claim size amount. In this study, we focused on a popular tool in credibility theory which is the Bayesian premium estimator, considering Lindley distribution as a claim distribution. We derive this estimator under entropy loss which is asymmetric and squared error loss which is a symmetric loss function with informative and non-informative priors. In a purely Bayesian setting, the prior distribution represents the insurer's prior belief about the insured's risk level after collection of the insured's data at the end of the period. However, the explicit form of the Bayesian premium in the case when the prior is not a member of the exponential family could be quite difficult to obtain as it involves a number of integrations which are not analytically solvable. The paper finds a solution to this problem by deriving this estimator using numerical approximation (Lindley approximation) which is one of the suitable approximation methods for solving such problems, it approaches the ratio of the integrals as a whole and produces a single numerical result. Simulation study using Monte Carlo method is then performed to evaluate this estimator and mean squared error technique is made to compare the Bayesian premium estimator under the above loss functions.

Keywords : bayesian estimator, credibility theory, entropy loss, monte carlo simulation
Conference Title : ICAMEM 2016 : International Conference on Applied Mathematics and Engineering Mathematics
Conference Location : Istanbul, Türkiye
Conference Dates : April 19-20, 2016