CALCULATION OF NET PREMIUM ON BONUS MALUS SYSTEM FOR MOTOR VEHICLE INSURANCE

UNDERGRADUATE THESIS

Submitted As One Of The Requirements To Obtain Sarjana Aktuaria

By :

Muhammad Alfarisi

021202100034

FACULTY OF BUSINESS

ACTUARIAL SCIENCE STUDY PROGRAM

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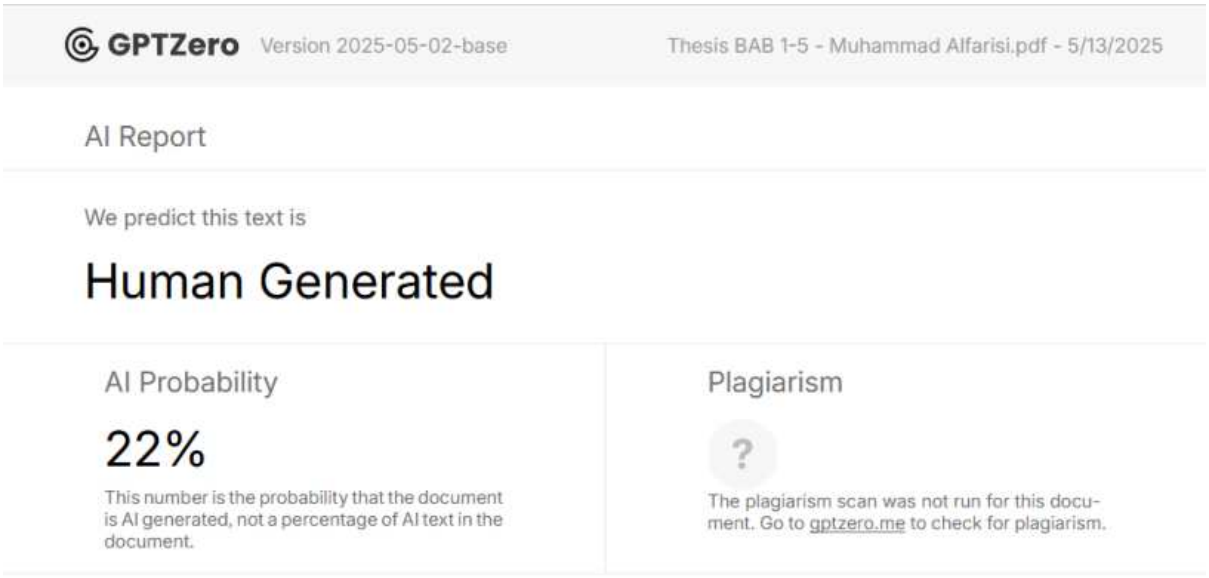

ABSTRACT

This research aims to develop a motor vehicle insurance premium calculation model using the Bonus Malus system (BMS) that adjusts premiums based on the policyholder's claim history. This system provides a bonus (premium decrease) if there is no claim and malus (premium increase) if there is a claim. The research modeled the frequency of claims with a Poisson-Gamma Lindley (GaL) distribution and the severity of claims with a Lognormal-Gamma distribution, using a Bayesian approach to produce fairer and more accurate premiums. The data used came from 2004-2005 motor vehicle insurance policies at Macquarie University, Australia, with a total of 67,856 policies and 4,624 claims. Distribution fit tests confirmed that the claim frequency data fit the Poisson-GaL distribution (Chi-Square test statistic: 1.150 < 5.991) and the claim severity data fit the Lognormal-Gamma distribution (Anderson-Darling test statistic: 0.399 < 2.492). Parameter estimation using Maximum Likelihood Estimation (MLE) resulted in parameter values for Poisson-GaL (θ = 18.553; β = 1.460) and Lognormal-Gamma (μ = 6.956; s = 9.996; m = 10.293). The results showed that the initial premium without a claim was $ 127.77. If the policyholder makes a claim in the first year, the premium increases to $ 225.37, while without a claim, the premium drops to $ 120.17. This system promotes premium fairness based on individual risk profiles, optimizes the financial stability of insurance companies, and motivates responsible behavior. Recommendations for future research include considering external factors such as government policies and applying the model to data from different regions or periods for broader validation.

Keyword : Bonus Malus System, Insurance Premium, Poisson-GaL, Lognormal-Gamma, Bayesian Approach

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