

# NMFM402 – Mathematics of Non-Life Insurance 2

## GLM 5 - confidence intervals

### Practical 6

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To review the necessary theory for this practicals, you may check the book [2], Chapter 3.2. and lecture notes [1].

#### Exercise 1:

Consider the Poisson model for claim frequency with logarithmic link function (see 2.3.1. in [1]). Using general MLE theory, construct approximate confidence intervals based on Fisher information for:

- (a) parameters  $\beta_l$
- (b) multiplicative risk factors  $\exp(\beta_l)$
- (c) expected number of claims per policy  $\mathbb{E}Y_n$  in the  $n$ -th risk class.

#### Exercise 2:

Recall Exercise 3 from Practical 5 : Consider the claim amounts  $(S_{i,j})$  sorted into the table below according to the risk classes of the two risk factors (vehicle type and driver age).

	21-30y	31-40y	41-50y	51-60y
passenger car	2000	1800	1500	1600
delivery van	2200	1600	1400	1400
truck	2500	2000	1700	1600

Assume (for simplicity) unit exposure, i.e. number of claims are  $v_{i,j} = 1$ . Consider the GLM model with Inverse Gaussian error distribution and logarithmic link function. Find approximate 95% confidence intervals for

- (a) parameters  $\beta_l$
- (b) multiplicative risk factors  $\exp(\beta_l)$
- (c) expected number of claims per policy  $\mathbb{E}Y_n$  in the  $n$ -th risk class.

## Reference

- [1] L. Mazurová *Mathematics of Non-life Insurance 2 - lecture notes*. Version March 2021. Available online at Moodle: [https://dl1.cuni.cz/pluginfile.php/1162656/mod\\_resource/content/2/MNP2LectureNotes.pdf](https://dl1.cuni.cz/pluginfile.php/1162656/mod_resource/content/2/MNP2LectureNotes.pdf)
- [2] E. Ohlsson, B. Johansson: *Non-Life Insurance Pricing with Generalized Linear Models*, 15 EAA Lecture Notes, DOI 10.1007/978-3-642-10791-7\_2, Springer-Verlag Berlin Heidelberg, 2010