

Estimating & Modelling All-Causes Diagnosis Rates in Critical Illness Insurance: UK Experience

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ABSTRACT

We present methods for estimating and graduating Critical Illness (CI) diagnosis rates. We use UK data for 1999-2005 supplied by the Continuous Mortality Investigation (CMI) to illustrate their use. Diagnosis rates are needed for the calculation of premium rates and policy values and also for monitoring CI experience. The first step of estimating the claim diagnosis rates is to model the delay between the diagnosis of an illness and the settlement of the subsequent claim. In modelling this delay, the so-called Claim Delay Distribution (CDD), Bayesian methods are employed. The non-recorded dates of diagnosis are included in the analysis as missing values using their posterior predictive distribution and MCMC methodology. Diagnosis rates for all-causes (combined) are estimated using an appropriate CDD where the observed numbers of claim counts are assumed to have a Poisson distribution.

Keywords: Critical illness insurance, diagnosis rates, claim delay distribution, Bayesian analysis, MCMC, Burr distribution.

References

- [1] CMI WP 43 (2010). "Continuous Mortality Investigation Committee Working Paper 43 - CMI Critical Illness diagnosis rates for accelerated business, 1999-2004." *Institute of Actuaries and Faculty of Actuaries*.
- [2] Ozkok, E., Streftaris, G., Waters, H.R. & Wilkie, A.D. (2012a). "Bayesian Modelling of the Time Delay Between Diagnosis and Settlement for Critical Illness Insurance Using a Burr Generalised-Linear-Type Model." *Insurance: Mathematics and Economics*, 50, 266-279.
- [3] Ozkok, E., Streftaris, G., Waters, H.R. & Wilkie, A.D. (2012b). "Modelling Critical Illness Claim Diagnosis Rates I: Methodology." *In preparation*.
- [4] Ozkok, E., Streftaris, G., Waters, H.R. & Wilkie, A.D. (2012c). "Modelling Critical Illness Claim Diagnosis Rates II: All Causes Rates." *In preparation*.