

Problems for the oral exam in the course “Topics in non-life insurance” (Skade 2), March 30, 2011

1. Definition, examples of point processes. Simple point processes. Examples (renewal process, the point process of claim arrivals and claim sizes, point process of exceedances,...). Which of them are simple? Laplace functional of a point process. Relation between the distribution of a point process and its Laplace functional. (Section 7.1, without Example 7.1.8)
2. PRM. Definition and examples. When is a PRM simple? (Section 7.2.1, without Example 7.2.4). Laplace functional (main ideas of Lemma 7.2.7(1), not part (2)). Compound Poisson representation of Poisson integral (Corollary 7.2.8).
3. Poisson integrals and their properties, incl. proofs (Section 7.2.3).
4. Construction of new PRMs. Transformation, marking and aggregation, incl. proofs. (Section 7.3, without Example 7.3.4)
5. The basic model and basic decomposition (Section 8.2.1). Basic decomposition of claim number process (Section 8.2.2). Basic decomposition of total claim amount (Section 8.2.3). All incl. proofs.
6. The stationary version of the IBNR claim number process. The expected value and covariance function of the process. (Section 8.2.4)
7. Weak convergence of point processes. Convergence of Laplace functionals. Weak convergence of PRM. (Section 9.1 without Example 9.1.5, Definition 9.1.6 and Example 9.1.7) Kallenberg’s theorem with an application of it.
8. The point process of exceedances and the convergence in distribution of maxima and order statistics. Fisher-Tippett theorem. Maximum domains of attraction (Section 9.2)
9. ECOMOR and largest claims reinsurance treaties. The joint distribution of the k upper order statistics in a random sample. Basic ideas about the limit distribution for ECOMOR reinsurance for distributions in the maximum domain of attraction of the Gumbel distribution. (Section 9.3).
10. The chain ladder and Mack’s model. (Sections 11.2.1 and 11.2.2) The rationale for the form of the chain ladder estimators (Section 11.2.3). First moment and variance of chain ladder estimators (Section 11.2.4, basic ideas for the derivation of the variance and why one needs Mack’s second condition). 1-step ahead prediction and corresponding prediction error in Mack’s model, basic idea of k -step prediction.