## Hawkes Processes in Insurance: Risk Modelling and Optimal Investment

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For certain classes of insurance claims, an interesting phenomenon to study is temporal clustering of claim payments, for instance caused by a claim payment arrival that induces a stream of subsequent payments. In order to capture this characteristic, we introduce a risk model based on a self-exciting Hawkes process and show that it is suitable to model empirical insurance data. We review a law of large numbers and functional central limit theorem proved by [1] for this model and derive an approximation of the risk process which allows analytical calculation of ruin probabilities. The approximation enables us to apply results by [2] on asset-liability management to study the influence of the self-exciting property of a Hawkes process on optimal investment strategies for an insurer in an incomplete market. In particular, we highlight that not only the expected number and size, but also the potential temporal clustering of incoming claims has to be taken into account in order to avoid breaching given risk limits.

## References

- [1] A. Swishchuk, Risk model based on general compound Hawkes processes. Available on arXiv: https://arxiv.org/abs/1706.09038.
- [2] S. Xie, Z. Li, S. Wang, Continuous-time portfolio selection with liability: Mean-variance model and stochastic lq approach, *Insurance: Mathematics and Economics*, vol. **42**(3), pp. 943–953.