RESEARCH INTERESTS

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1. Quantile options and options based on occupation times. I have done an amount of research on this (see items [3], [4], [5] and [10], which can be summarised by an identity that obtains the distribution of the quantile of a Lévy process as the convolution of two independent random variables, the supremum and the infimum of two independent copies of the process. My current research focuses on two points. Multidimensional extensions of the identity and some special properties that the median has.

2. Excursion theory for Lévy processes and the generalisation of Parisian option results. This research also has an interface with insurance mathematics, as it leads to the calculation of the probability of "Parisian type" ruin. This is the event that the process crosses a level and stays on one side of it for a continuous time interval of fixed length. See [14], [15], [16], on the main publications list as well as papers to be submitted and conference papers. This is ongoing research which is now focusing on direct computational approaches rather than Laplace transform inversion (see [22])

3. Brownian motion hitting stochastic boundaries and applications (see [20]).

4. Multidimensional models for default risk. This goes beyond measuring the so called "correlation" of default rates and affine processes. Default in one asset has an effect on the default rate of another asset. This comes on top of any dependence structure between the default rates. Some of the first results in this as well as important connections to the theory of point processes can be found in [17] and [23]. See also [30] for more advanced work (ask me for a copy; I will put it on my website soon).

5. Asian options when the underlying price is not a geometric Brownian motion; see for example [11] in the main publications list for the square root process.

6. Point processes and their application as claim arrival processes in general insurance. For general results see item [8] on the main publications list and for estimation problems and the use of the Kalman filter in this setup, see [9]. Moreover, one can demonstrate that the processes are nice models for the delayed settlement of claims, see [21]. Current research is focusing on advanced dynamic contagion models (see [18]). Related work using Cox models can be found in [19], [21] and [24].

7. Developing statistical tests for independence and association (this is joint with Wicher Bergsma, see [25]). Plese note that you must get in Wicher if you are interested in this, as he is motivating the work.

References

3. The distribution of the quantiles of a Brownian motion with drift and the pricing of related path dependent options, 1995,*Annals of Applied Probability*, **5**(2), 389-398.

4. Sample quantiles of additive renewal reward processes, 1996, *Journal of Applied Probability*, **33**, 1018-1032.

5. Sample quantiles of stochastic processes with stationary and independent increments and of sums of exchangeable random variables, 1996,*Annals of Applied Probability*, **6**(3), 1041-1043.

9. Kalman–Bucy filtering for linear systems driven by the Cox process with shot noise intensity and its application to the pricing of reinsurance contracts. (with J. Jang), 2005, *Journal of Applied Probability*, **42**(1), 93-107.

10. On the quantiles of the Brownian motion and their hitting times, 2005, *Bernoulli*, **11**(1) 29-36.

11. The square root process and Asian options (with J. Nagaradjasarma), *Quantitative Finance*, 2006, **6**(4) 337-347.

14. On barrier strategy dividends with Parisian implementation delay for classical surplus processes (with S. Wu), 2009, *Insurance Mathematics and Economics*, **45**, 195-202

15. Perturbed Brownian motion and its application to Parisian option pricing (with S. Wu), 2010, *Finance and Stochastics*, **14**, 473-494.

16. Double barrier Parisian options (with S. Wu), 2011, *Journal of Applied Probability*, **48**(1), 1-20.

17. A dynamic contagion process (with H. Zhao), 2011, *Advances in Applied Probability*, **43**(3), 814-846 .

19. A double shot noise process and its application in insurance (with J Jang), 2011, *Journal of Mathematics and System Science*.

20. Stochastic boundary crossing probabilities for the Brownian motion (with X Che), 2013, *Journal of Applied Probability*, **50**(2), 419-429

21. A risk model with delayed claims, (with H Zhao), 2013, *Journal of Applied Probability*, **50**(3), 686-702.

22. Parisian option pricing: A recursive solution for the density of the Parisian stopping time, (with J. W. Lim), 2013, *SIAM J. Financial Mathematics*, **4**(1), 599-615.

23. Exact Simulation of Hawkes Process with Exponential Decaying Intensity, (with H. Zhao), 2013, *Electronic Communications in Probability*, **18:**0 http://ecp.ejpecp.org/article/view/2717

24. A bivariate shot noise process for insurance (with J Jang), 2013, *Insurance Mathematics and Economics*, **53**(3), 524-532.

25. A consistent test of independence based on a sign covariance related to Kendall's tau, 2014, (with W. P. Bergsma), *Bernoulli*, to appear (search arxiv for a copy).

30. Stationarity of a two-dimensional dynamic contagion process, (with X Dong), submitted to the *Electronic Journal of Probability*.