The use/abuse of copulas in actuarial science and finance

Abstract

This is an assignment for the actuarial models course. The assignment is to summarize [EMS02], [DE] and [FV98] and discuss the following:

- The purpose is to understand the impact of the assumption regarding the dependence structure between risk factors.
- This is done by means of the concept of copulas.
- In particular, we study the impact of misused copulas and correlation in the valuation of collateralized debt obligations (CDO's).

1 Overview

[EMS02] introduces linear dependency, copulas, comonotonicity and rank correlation which already are introduced in the course. Also spherical/elliptical distributions and tail dependence are introduced. Spherical/elliptical distributions generalize the normal distribution and has good properties for common dependency measures. Tail dependence quantifies dependency in the tails. [EMS02] discusses some common dependency fallacies. It also covers simulation of copulas what we also covered in the course.

References

[DE] Catherine Donnelly and Paul Embrechts. "THE DEVIL IS IN THE TAILS: ACTUARIAL MATHEMATICS AND THE SUBPRIME MORTGAGE CRISIS". en. In: ().

[EMS02] Paul Embrechts, Alexander J. McNeil, and Daniel Straumann. "Correlation and Dependence in Risk Management: Properties and Pitfalls". en. In: *Risk Management*. Ed. by M. A. H. Dempster. 1st ed. Cambridge University Press, Jan. 2002, pp. 176–223. ISBN: 978-0-521-78180-0 978-0-511-61533-7 978-0-521-16963-9. DOI: 10.1017/CBO9780511615337.008. URL: https://www.cambridge.org/core/product/identifier/CBO9780511615337A013/type/book_part (visited on 04/21/2024).

[FV98] Edward W. Frees and Emiliano A. Valdez. "Understanding Relationships Using Copulas". en. In: *North American Actuarial Journal* 2.1 (Jan. 1998), pp. 1–25. ISSN: 1092-0277, 2325-0453. DOI: 10.1080/10920277.1998.10595667. URL: http://www.tandfonline.com/doi/abs/10.1080/10920277.1998.10595667 (visited on 04/05/2024).