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Research Article

A Theoretical Argument Why the t-Copula Explains Credit Risk Contagion Better than the Gaussian Copula

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One of the key questions in credit dependence modelling is the specfication of the copula function linking the marginals of default variables. Copulae functions are important because they allow to decouple statistical inference into two parts: inference of the marginals and inference of the dependence. This is particularly important in the area of credit risk where information on dependence is scant. Whereas the techniques to estimate the parameters of the copula function seem to be fairly well established, the choice of the copula function is still an open problem. We find out by simulation that the t-copula naturally arises from a structural model of credit risk, proposed by Cossin and Schellhorn (2007). If revenues are linked by a Gaussian copula, we demonstrate that the t-copula provides a better fit to simulations than does a Gaussian copula. This is done under various specfications of the marginals and various configurations of the network. Beyond its quantitative importance, this result is qualitatively intriguing. Student's t-copulae induce fatter (joint) tails than Gaussian copulae *ceteris paribus*. On the other hand observed credit spreads have generally fatter joint tails than the ones implied by the Gaussian distribution. We thus provide a new statistical explanation why (i) credit spreads have fat joint tails, and (ii) financial crises are amplified by network effects.

1. Introduction

One of the key questions in credit dependence modelling is currently the specification of the copula function linking the marginals of default variables. Several books have been written on copulae as well as their application to finance, for example, Cherubini et al. [1], Embrechts et al. [2], Joe [3], and Nelsen [4]. We refer to these books for an exposition of copula theory. The main application of copulae seems to be the following. In several domains,