Wang, Ruodu; **Peng, Liang**; **Yang, Jingping**
CreditRisk$^+$ model with dependent risk factors. (English) Zbl 1414.91402
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Summary: The CreditRisk$^+$ model is widely used in industry for computing the loss of a credit portfolio. The standard CreditRisk$^+$ model assumes independence among a set of common risk factors, a simplified assumption that leads to computational ease. In this article, we propose to model the common risk factors by a class of multivariate extreme copulas as a generalization of bivariate Fréchet copulas. Further we present a conditional compound Poisson model to approximate the credit portfolio and provide a cost-efficient recursive algorithm to calculate the loss distribution. The new model is more flexible than the standard model, with computational advantages compared to other dependence models of risk factors.

Reviewer: Reviewer (Berlin)

MSC:

91G40 Credit risk
62P05 Applications of statistics to actuarial sciences and financial mathematics
62H05 Characterization and structure theory for multivariate probability distributions; copulas

Keywords:

credit risk model; conditional independence; dependent risk factors; Panjer's recursion; multivariate copulas

Software:

CreditRisk+

Full Text: DOI

References:

[1] Bürgisser, P.; Kurth, A.; Wagner, A.; Wolf, M., Integrating Correlations, Risk Magazine, 12, 1-7, (1999)

[2] Cherubini, U.; Luciano, E.; Vecchiato, W., Copula Methods in Finance, (2004), New York: Wiley, New York · Zbl 1163.62081

[3] Credit Suisse First Boston, CreditRisk+—A Credit Risk Management Framework, (1997)

[4] Deshpande, A.; Iyer, S. K., The Credit Risk+ Model with General Sector Correlations, Central European Journal of Operations Research, 17, 219-228, (2009) · Zbl 1204.91134

[5] Dhaene, J.; Denuit, M.; Goovaerts, M. J.; Kaas, R.; Vyncke, D., The Concept of Comonotonicity in Actuarial Science and Insurance: Theory, Insurance: Mathematics and Economics, 31, 3-33, (2002) · Zbl 1051.62107

[6] Dhaene, J.; Denuit, M.; Goovaerts, M. J.; Kaas, R.; Vyncke, D., The Concept of Comonotonicity in Actuarial Science and Insurance: Applications, Insurance: Mathematics and Economics, 31, 133-161, (2002) · Zbl 1037.62107

[7] Giese, G.; Gundlach, M.; Lehrbass, F., Enhanced CreditRisk+, CreditRisk+ in the Banking Industry, 79-90, (2004), New York: Springer, New York · Zbl 1095.91029

[8] Gordy, M. B., Saddlepoint Approximation of CreditRisk+, Journal of Banking and Finance, 26, 1335-1353, (2002)

[9] Gundlach, M.; Lehrbass, F., CreditRisk+ in the Banking Industry, (2004), New York: Springer-Verlag, New York · Zbl 1046.91001

[10] Gupton, G. M.; Finger, C. C.; Bhatia, M., CreditMetrics, (1997)

[11] Kostadinov, K., Tail Approximation for Credit Risk Portfolios with Heavy-Tailed Risk Factors, Journal of Risk, 8, 81-107, (2006)

[12] Nelsen, R. B., An Introduction to Copulas, (2006), New York: Springer, New York · Zbl 1152.62030

[13] Panjer, H., Recursive Evaluation of a Family of Compound Distributions, ASTIN Bulletin, 12, 22-26, (1981)

[14] Panjer, H.; Willmot, E., Insurance Risk Models, (1992), Schaumberg, IL: Society of Actuaries, Schaumberg, IL

[15] Reiss, O.; Gundlach, M.; Lehrbass, F., Dependent Sectors and an Extension to Incorporate Market Risk, CreditRisk+ in the

Banking Industry, 215-230, (2004), New York: Springer, New York · Zbl 1095.91038

[16] Vandendorpea, A.; Hob, N.-D.; Vanduffelc, S.; Doorenb, P. V., On the Parameterization of the CreditRisk+ Model for Estimating Credit Portfolio Risk, Insurance: Mathematics and Economics, 42, 736-745, (2008)

[17] Wilson, T. C., FRBNY Economic Policy Review, Portfolio Credit Risk, 4, 3, 71-82, (1998)

[18] Yang, J.; Qi, Y.; Wang, R., A Class of Multivariate Copulas with Bivariate Frechet Marginal Copulas, Insurance: Mathematics and Economics, 45, 139-147, (2009) · Zbl 1231.91253

[19] Yang, J.; Cheng, S.; Zhang, L., Bivariate Copula Decomposition in Terms of Comonotonicity, Countermonotonicity and Independence, Insurance: Mathematics and Economics, 39, 267-284, (2006) · Zbl 1098.62070

[20] Yang, J.; Zhou, S.; Zhang, Z., The Compound Poisson Random Variable Approximation to the Individual Risk Model, Insurance: Mathematics and Economics, 36, 57-77, (2005) · Zbl 1130.91360