Vine Copula Structure among Yield, Price and Weather Variables for Rating Crop Insurance Premium

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Abstract : The main goal of our research is to apply the Vine copula measuring dependency between price, temperature, and precipitation indices to calculate a fair crop insurance premium. This research is focused on Worth, Iowa, United States, over the period from 2000 to 2020, where the farmers are dependent on precipitation and average temperature during the growth period of corn. Our proposed insurance considers both the natural risk and the price risk in agricultural production. We first estimate the distributions of crops using parametric methods based on Goodness of Fit tests, and then Vine Copula is applied to model dependence between yield price, crop yield, and weather indices. Once the vine structure and its parameters are determined based on AIC/BIC criteria and forecasting price and yield are obtained from the ARIMA model, we calculate this crop insurance premium using the simulation data generated from the vine copula by the Monte Carlo Simulation method. It is shown that, compared with traditional crop insurance, our proposed insurance is more fair and thus less costly for the farmers and government.