Bayesian quantile regression for weather index insurance design: Insuring idiosyncratic risk under data scarcity

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Abstract:

Crop insurances play a key role in managing farmers' financial exposure to climate risks. Recent developments have shown that weather index insurances (WII) help to overcome problems of asymmetric information in classical indemnity based crop insurances. However, basis risk, i.e. the discrepancy between WII payout and on-farm losses, constitutes the largest adoption hurdle to overcome. Currently, rich farm-level yield records are indispensable to design functioning WII contracts. Thus, farmers remain mostly unprotected in case of farm-level yield data scarcity. We here develop a Bayesian quantile regression (BQR) framework to reduce this type of basis. To this end, we use county-level yield data as informative prior for estimating the impact of farm-level rainfall on farm-level yields. We are thus able to combine the rich sources of county-level yield data with scarce data on the farm-level. We use an empirical example of insuring drought risk in Eastern German winter wheat production. Our results show that, although our approach helps to effectively reduce farmers' financial exposure to drought risk, basis risk remains unaffected in our case study context. Further research might expand the here proposed BQR to other perils with higher spatial dependence and regions with longer records of county yields.

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