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Statistical Risk Analyses and Application of ENSO-Based Index Insurance

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ABSTRACT

Index insurance has recently been advocated as a useful risk transfer tool for disaster management situations where rapid fiscal relief is desirable, and where estimating insured losses may be difficult, time consuming, or subject to manipulation and falsification. For climate related hazards, a rainfall or temperature index may be proposed. However, rainfall may be highly spatially variable relative to the gauge network, and in many locations data are inadequate to develop an index due to short time-series and the spatial dispersion of stations. In such cases, it may be helpful to consider a climate proxy index as a regional rainfall index. This is particularly useful if a long record is available for the climate index through an independent source and it is well correlated with the regional rainfall hazard. Here, ENSO related climate indices are explored for use as a proxy to extremes in rainfall. Specifically, the ENSO index insurance product may be purchased by banks or microfinance institutions (MFIs) to aid agricultural damage relief. Crop losses in the region are highly correlated with floods, but are difficult to assess directly. Beyond agriculture, many other sectors suffer as well. Basic infrastructure is destroyed during the most severe events. This disrupts trade for many microenterprises. The reliability and quality of the local rainfall data are variable. Averaging the financial risk across the region is desirable. Some issues with the implementation of the proxy ENSO index are identified and discussed. Specifically, we explore (a) the reliability of the index at different levels of probability of exceedance of maximum seasonal rainfall; (b) the effect of sampling uncertainties and the strength of the proxy's association to local outcome, (c) the potential for clustering of payoffs; (d) the potential that the index could be predicted with some lead time prior to the flood season; and (e) evidence for climate change or non-stationarity in the flood exceedance probability from the long ENSO record.

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