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On the Insurance of Environmental Risks: Modeling and Pricing with Mean-Reverting Regime-Switching Lévy Processes

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The insurance business is a core component of the economic system, which is faced with expanding environmental challenges. By adequately protecting against climate risks, insurance companies are an important factor in ensuring that other businesses persist and grow. The claims associated with environmental risks, such as shrinking soils or hail, are quickly increasing in both severity and frequency, where predictability is an additional key concern for insurance companies. This paper constructs and compares several models to tackle and price environmental risks. These models mean-revert towards a seasonality function, present jumps with infinite arrival rates - via Lévy processes, and display a regime switching nature to allow for variety of scenarios for the coming future years. We introduce structural and reduced-form frameworks, that is, frameworks that are more phenomenological or more efficiency-based. An empirical illustration and a sensitivity analysis conclude the paper.