Catastrophe Bond Pricing Under Renewal Process

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This paper introduces an innovative approach to catastrophe (CAT) bond pricing, addressing the shortcomings of existing methods that don't fully encompass catastrophe data characteristics or analyze the influence of both loss and inter-arrival time distributions on the CAT bond price. Our method combines the compound renewal process with the Cox-Ingersoll-Ross (CIR) process as a product measure to separately model uncertainties in insurance and financial risks. Valuation is performed in two steps, integrating risk-neutral measures for financial risks and a class of measures for insurance risks, preserving the structure of a renewal compound process. By using Bayesian inference, historical data, and capital market insights, we calibrate the pricing model effectively. Uniquely, our framework evaluates the impact of varying inter-arrival time distributions on CAT bond prices, an area previously unexplored in literature. This approach also separates market prices for claim frequency and severity under certain renewal process conditions. Empirical results reveal that inter-arrival time distribution notably influences the CAT bond price.