

Fair valuation of Lévy-type drawdown-drawup contracts with general insured and penalty functions

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We consider some insurance policies related to drawdown event of log-returns for an underlying asset modeled by a spectrally negative geometric Lévy process. We consider four contracts.

The first one is an insurance contract where the protection buyer pays a constant premium until the drawdown of fixed size of log-returns occurs. In return at the drawdown epoch he/she receives an insured amount which may depend on a drawdown level.

Next policy is an extension of the previous one by additional cancellation feature which allows the investor to terminate contract earlier. In this case, the investor is obligated to pay a fee when he/she terminates the contract. The fee is assumed to be a function of the drawdown process.

The last two contracts extend the previous ones by an additional termination feature connected with the drawup process.

We focus on two problems: calculating the fair premium for the basic contracts and identifying the optimal rule for the policies with cancellation feature.

To do this we solve some two-sided exit problems related to drawdown and drawup of spectrally negative Lévy processes, which is of independent mathematical interest.

We also heavily rely on the theory of optimal stopping.