Optimal portfolios in illiquid markets under a drawdown constraint

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In the classical Merton problem of optimal investment with a finite horizon, it is assumed, that the market is perfectly liquid. However, this is not a realistic assumption, especially in OTC markets. Therefore, we consider here an investment problem, where observing and trading is only possible at discrete random time points. These time points are given by the jump times of an inhomogeneous Poisson process. Moreover, we require that the wealth process does not fall under a certain percentage of its running maximum. We assume a general utility function and the assets are described by inhomogeneous Lévy processes. In this setting we solve our investment problem by a discrete-time contracting Markov Decision Process. Due to that consideration we are able to show that there exists an optimal portfolio and the value function can be characterized by the unique fix point of the maximal reward operator. Howard's policy improvement algorithm can be used for the computation of an optimal policy. A numerical example is presented.