CHARACTERIZATION OF THE MINIMAL PENALTY OF A CONVEX RISK MEASURE WITH APPLICATIONS TO ROBUST UTILITY MAXIMIZATION PROBLEM FOR A MARKET MODEL BASED ON LÉVY PROCESSES.

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The minimality of the penalization function associated with a convex risk measure is analyzed. First, in a general static framework, we provide necessary and sufficient conditions for a penalty function defined in a convex and closed subset of the absolutely continuous measures with respect to some reference measure $\mathbb{P}$ to be minimal. When the probability space supports a Lévy process, we establish results that guarantee the minimality property of a penalty function described in terms of the coefficients associated with the density processes. The set of densities processes is described and the convergence of its quadratic variation is analyzed. The class of equivalent local martingale measures is characterized in terms of the parameters of the price process, and the connection with convex risk measures is also presented. Then the robust utility maximization problem for a market model based on Lévy processes is analyzed. The interplay between the form of the utility function and the penalization function required to have a well posed problem is studied, and for a large class of utility functions it is proved that the dual problem is solvable as well as the existence of optimal solutions.