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Optimal portfolio management rules in a non-Gaussian market with durability and intertemporal substitution. (English) Zbl 1049.91059

Finance Stoch. 5, No. 4, 447-467 (2001).

An optimization problem with the notions of durability and intertemporal substitution was proposed and studied by *A. Hindy* and *C. Huang* [Econometrica 61, No. 1, 85–121 (1993; Zbl 0772.90015)] who construct an explicit solution to the optimization problem when the utility function is of HARA (hyperbolic absolute risk aversion) type and the price of the stock is modeled by a geometric Brownian motion. The present paper continues the study of the optimal portfolio selection problem with consumption started in *F. E. Benth, K. H. Karlsen* and *K. Reikvam* [Finance Stoch. 5, No. 3, 275–303 (2001; Zbl 0978.91039)], where the Hindy-Huang model was extended to exponential pure-jump Lévy processes and where it was shown that the value function is the unique constrained solution of the associated Hamilton-Jacobi-Bellman equation. In this paper the basic model for the asset price dynamics is $S_t = S_0 e^{\sigma W_t + L_t}$, where L_t is a pure-jump Lévy process, W_t is a Wiener process independent of L_t and σ, S_0 are constants. This is a generalization of the asset price dynamics considered in the previous paper. This model can be considered also as a model for the asset price, where a pure-jump Lévy process L_t accounts the sudden "big" changes in the price and the Brownian motion part models the "small" or "normal" variations in the price movements. The authors formulate the optimal portfolio-consumption problem. The optimization problem is a singular stochastic control problem and the associated Hamilton-Jacobi-Bellman equation is a nonlinear second order degenerate elliptic integro-differential equation subject to gradient and state constraints. For utility functions of HARA type the optimal investment and consumption policies together with an explicit expression for the value function are calculated when the Lévy process has only negative jumps. For the classical Merton problem, which is a special case of the optimization problem, explicit policies for general Lévy processes having both positive and negative jumps are provided. The value function of the singular control problem is characterized as the unique constrained viscosity solution of the Hamilton-Jacobi-Bellman equation in the case of general utilities and general Lévy processes.

Reviewer: Mikhail Moklyachuk (Kyïv)

MSC:

91B28	Finance etc. (MSC2000)
45K05	Integro-partial differential equations
49L20	Dynamic programming in optimal control and differential games
49L25	Viscosity solutions to Hamilton-Jacobi equations in optimal control and differential games
93E20	Optimal stochastic control

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Keywords:

portfolio choice; intertemporal substitution; singular stochastic control; dynamic programming method; integro-differential variational inequality; viscosity solution; closed form solution

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