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BSDEs in Utility Maximization with BMO Market Price of Risk

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This article studies quadratic semimartingale BSDEs arising in power utility maximization when the market price of risk is of BMO type. In a Brownian setting we provide a necessary and sufficient condition for the existence of a solution but show that uniqueness fails to hold in the sense that there exists a continuum of distinct square-integrable solutions. This feature occurs since, contrary to the classical Ito representation theorem, a representation of random variables in terms of stochastic exponentials is not unique. We study in detail when the BSDE has a bounded solution and derive a new dynamic exponential moments condition which is shown to be the minimal sufficient condition in a general filtration. The main results are complemented by several interesting examples which illustrate their sharpness as well as important properties of the utility maximization BSDE.

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