No-arbitrage with multiple-priors in discrete time.

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Abstract

Joint work with R. Blanchard.
In a discrete time and multiple-priors setting, we propose a new characterisation of the condition of quasi-sure no-arbitrage of Bouchard et Nutz (2015) which has become a standard assumption. This characterisation shows that it is a well-chosen condition. Indeed, at first sight at least, under this condition it is not even clear if there exists a model satisfying the uni-prior no-arbitrage condition. We prove that this is in fact possible. But still they may exist some models that are not arbitrage free. This means that an agent may not be able to delta-hedge a simple vanilla option using different levels of volatility in an arbitrage free way. We show that the quasi-sure no arbitrage condition for a set of prior Q^T is equivalent to the existence of a subclass of priors P^T such that P^T and Q^T have the same polar sets (roughly speaking the same relevant events) and such that every prior in P^T is arbitrage free. We also show that the condition of quasi-sure no-arbitrage is equivalent to several previously used alternative notions of no-arbitrage which allows the proof of important results in mathematical finance (super-hedging and utility maximization). We finally revisit the so-called geometric and quantitative no-arbitrage conditions and explicit two important examples where all these concepts are illustrated.