## A.N. Shiryaev and Contemporary Probability Theory



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## Two price valuation theory

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In classical economic theory the law of one price prevails and market participants trade freely in both directions at the same price. This approach is appropriate for highly liquid markets. In the absence of perfect liquidity, the law of one price has to be replaced by a two price economy where market participants continue to trade freely with the market but the terms of trade now depend on the direction of the trade.

We give an introduction to this new approach. The two prices are termed bid and ask or lower and upper price but they should not be confused with the literature relating bid-ask spreads to transaction costs or other frictions involved in modeling financial markets. The two prices are determined in a non marketclearing equilibrium with a view to make loss exposures acceptable. Acceptability is defined via a positive expectation under a family of test measures or scenarios. As a result the bid price is the infimum of test valuations whereas the ask price is the supremum of such valuations. The two prices are related to nonlinear expectation operators. We consider examples where the uncertainty is given by purely discontinuous Lévy processes. Various aspects such as liquidity measurement and portfolio theory are discussed. Finally we present a defaultable asset price model (DAM) in the context of the two price valuation.

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