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Financial Market Modeling via Telegraph Processes

The talk develops a class of financial market models based on generalized telegraph processes: Markov random flows with alternating velocities and jumps occurring when the velocities are switching. While such markets may admit arbitrage opportunities, the model under consideration is arbitrage-free and complete if directions of jumps in stock prices are in a certain correspondence with stock prices velocities and interest rates behavior. An analog of the Black–Scholes fundamental differential equation is derived, but in contrast with the Black–Scholes model, this equation is hyperbolic. Explicit formulas for prices of European options are obtained using perfect and quantile hedging.

The talk is based on a joint paper with N. Ratanov, *On financial markets based on telegraph processes*, Stochastics **80**(2008), 247–268.