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Title: “Volatility modeling”

Abstract

This minicourse is about volatility modeling in finance. After introducing the different types of volatility and volatility derivatives, we will explain how volatility modeling has evolved over the years, from Black-Scholes to local volatility to stochastic volatility to local stochastic volatility to rough volatility and path-dependent volatility, in order to capture important stylized facts about the volatility of financial markets. We will also cover the following topics: the volatility smile; the links between instantaneous volatility and implied volatility; the calibration of volatility models; and multiasset volatility modeling.

- Tentative agenda:

- The different types of volatility

- The different types of volatility derivatives

- The volatility smile

- Volatility modeling: a brief history

- Static vs dynamic properties of volatility models

- Black-Scholes

- Link between instantaneous volatility and implied volatility

- Local volatility

- Stochastic volatility

- Variance curve models (second generation of stochastic volatility models)

- The smile of variance curve models

- Local stochastic volatility

- The particle method for smile calibration

- Path-dependent volatility

- Rough volatility

- Multi-asset volatility modeling: local volatility/correlation, stochastic volatility/correlation, pathdependent volatility/correlation, cross-dependent volatility/correlation