

# Derivative Pricing and Hedging with GARCH Models and their Continuous-Time Limits

## Tentative Lecture Plan

**Lecture 1:** Introduction to GARCH models and their continuous-time limits (stylized facts, GARCH models and extensions, estimation, weak diffusion limits etc.)

**Lecture 2 - 4:** Stochastic discount factors and option pricing and hedging with GARCH models and their diffusion limits ((generalized) local-risk neutral valuation relationship, extended Girsanov principle, conditional Esscher transform, variance dependent pricing kernel, relationship with CCAPM models, Girsanov's theorem, etc.) Variance swap (VS) pricing and convergence (derivation of closed-form solutions for VS prices under affine and non-affine GARCH models, convergence of VS prices to continuous-time counterparts, etc.)

**Lecture 5:** Numerical examples and calibration to observed market quotes of various GARCH option pricing models under different pricing rules (e.g. Monte-Carlo simulation of non-affine GARCH prices, semi-closed form computation for affine GARCH models, joint and sequential calibration to observed market prices, convergence to bivariate-diffusion option prices)

## Selected Bibliography

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