

# Smoothly Truncated Stable Distributions, GARCH-Models, and Option Pricing

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The classical discrete Black and Scholes model for the stock price/firm value process  $(S_t)_{t \in \mathbb{N}}$

$$\log(S_t) - \log(S_{t-1}) = r + \lambda\sigma + \sigma\epsilon_t, \quad \epsilon_t \stackrel{iid}{\sim} \mathcal{N}(0, 1)$$

is generalized in several ways:

- Introduction of a GARCH volatility process
- The use of alternative non Gaussian distributions for the innovation process, especially the class of “smoothly truncated stable distributions”.
- Allowing stochastic interest rates and a generalized GARCH-in-mean term in the dynamic of the conditional mean.

These extensions enhance the explanatory power of the model significantly: Empirically observed properties of financial time series, like heavy tails, volatility clustering and leverage effect can be explained.

The first part of the talk is dedicated to the introduction of the price process and the smoothly truncated stable distributions. In the second part applications of the price process in the area of credit risk and option pricing are presented.

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