

Universidade Federal de Minas Gerais - Programa de Pós-Graduação em
Engenharia Elétrica

EEE945 - INTRODUÇÃO AOS PROCESSOS ESTOCÁSTICOS

FINAL PROJECT PROPOSAL

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Consider the following model for the price S_k of some security:

$$\begin{aligned}S_{k+1} &= \mu S_k + S_k \sqrt{\nu_k} w_k \\ \nu_{k+1} &= \alpha \nu_k + (1 - \alpha) \bar{\nu} + \sqrt{\nu_k} v_k\end{aligned}$$

where ν_k is the stochastic volatility, w_k and v_k are i.i.d. normal random variables, and the parameters $\mu > 1$, $\alpha < 1$, $\bar{\nu} > 0$ are known. The prices S_k are observable but the volatility ν_k and the noises w_k and v_k are not. Simulate this model for a set of parameters of your choice in order to generate a set of observations $\{S_k\}_{k=0}^N$. Next, apply some particle filter algorithm to estimate the stochastic volatility from the observations. Examples of particle filters may be found on Section VI of the reference below.

CHEN, ZHE, *Bayesian filtering: From Kalman filters to particle filters, and beyond*, Statistics, vol. 182, number 1, pp. 1 – 69, 2003.