Weak stationarity of Ornstein-Uhlenbeck processes with stochastic speed of mean reversion

Abstract:
When modeling energy prices with the Ornstein-Uhlenbeck process, it was shown in Barlow, Gusev, and Lai [2] and Zapranis and Alexandris [16] that there is a large uncertainty attached to the estimation of the speed of mean-reversion and that it is not constant but may vary considerably over time. In this paper we generalise the Ornstein-Uhlenbeck process to allow for the speed of mean reversion to be stochastic. We suppose that the mean-reversion is a Brownian stationary process. We apply Malliavin calculus in our computations and we show that this generalised Ornstein-Uhlenbeck process is stationary in the weak sense. Moreover we compute the instantaneous rate of change in the mean and in the squared fluctuations of the generalised Ornstein-Uhlenbeck process given its initial position. Finally, we derive the chaos expansion of this generalised Ornstein-Uhlenbeck process.

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