COMMENT TO
Non-Gaussian OU based models and some of their uses in financial economics
by O. E. Barndorff-Nielsen and N. Shephard
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We take this opportunity to congratulate the authors on an impressive paper, demonstrating the potential of OU processes in modelling high-frequency financial data. The paper is most explicit about the theory of OU processes and the analytic tractability they provide when used to model volatility processes. Empirical issues are less deeply explored, and, in particular, no formal likelihood-based inference is conducted.

In this comment we will focus on formal inference with these models, cast in a Bayesian framework, exploring the suggestion provided in Subsection 5.4.2 in some detail. In particular, we use the parameterization in terms of the shocks $\{\eta_n\}$, and assume an OU process for the volatilities $\sigma^2(t)$ with $\Gamma(\nu, \alpha)$ marginals. In this case, the series representation is finite [see (32)] and no truncation is required to sample from the volatility process.

We analyse daily changes in the S&P500 stock price index over the years 1980 until 1987 ($T = 2023$). The same prefiltered series was used by *e.g.* Jacquier, Polson and Rossi (1994). Proper, but vague priors are used throughout. The MCMC scheme is simplified by analytically integrating out the parameter ν. An MCMC sampler on $(\mu, \beta, \alpha, \lambda, \eta_1, \ldots, \eta_T, \sigma^2(0))$ is then implemented, where values for $\sigma^2(0)$ are drawn from the prior marginal process.

Figure 1 graphs the posterior mean values for the volatilities σ_n^2, based on taking every 10^{th} value from a chain of 50,000 draws after a burn-in of 5000. Comparing these posterior means with the actual data clearly indicates high mean volatility in periods of large fluctuations. Posterior standard deviations for the volatilities are roughly one third of the means.

Figure 1. Posterior Volatility Means and Data

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We feel this testifies to the feasibility of formal likelihood-based inference in the context of stochastic volatility models based on Levy-driven OU processes. Extensions to superpositions of OU processes, non-Gamma marginals and inclusion of a leverage effect should be quite feasible.