Nonlin. Processes Geophys. Discuss., 2, C280–C282, 2015
www.nonlin-processes-geophys-discuss.net/2/C280/2015/

Nonlinear Processes in Geophysics
Discussions
Open Access

Interactive comment on "Efficient Bayesian inference for ARFIMA processes" *by* T. Graves et al.

M. Crucifix (Referee)

michel.crucifix@uclouvain.be

Received and published: 14 July 2015

The authors provide a Bayesian treatment of ARFIMA processes, covering model selection and coefficient estimates, based on a diffuse Gaussian prior on process mean, a root-inverse gamma for process sd, uniform distributions for the scale factor d as well as for the (reparameterised) poles of the corresponding ARMA process. The article provides the algorithmic details of the numerical resolution, essentially based on a MCMC approach, and a very quick (11 lines of text only!) application of the algorithm on Nile data.

The article is significant and probably fills a gap in the literature although I must to defer to the author's expertise here, as I can't claim to have a comprehensive view of the literature on time series analysis. It is overall technically correct but the notation

is here and there confusing and needs revision. Supporting code (in the form of a R package) would furthermore significantly improve the impact and interest of the article.

Editorial suggestions are below:

p. 578 : Introduce new line before "$\{X_t\}$ is said to be an auto-"

p. 579 : Before the "restriction |d|<1/2" ... : the condition sounds awkward given that the previous paragraphs concerns the ARMA process and not ARFIMA. Introduce a sentence clarifying that we return to the discussion of the more general ARFIMA process.

p. 581 : approximate expression after eq. 11 : there is a bit more than the Stirling's approximation involved here, since one also needs the asymptotic limit $d \ll k$.

p. 581, l. 19 : "And noting that" : add "in this case" (to be specific).

p. 582, l. 11 : This "f" introduced here is not the same as the spectral density function introduced eq. (5). Consider having distinct notations for the two quantities.

p. 582, l. 15 : You probably meant "there is *no* λ".

p. 583, l. 21 : Is this common practice to denote the statistical software "R" using the mathbb font $\mathbb{R}$? I have never seen this before.

p. 584, l. 1 : Make it clear that the likelihood is conditional on "x_A".

p. 584, l. 23 : The authors may want to further justify their prior choice for σ by observing that the asymptotic limit is equivalent to a log-uniform prior.

p. 585, ll. 19-20 : The variables μ and σ may be mistaken for the process mean and standard deviation. I would propose to introduce straight away the particular case $\mathcal{N}(d, \sigma_d^2)$ to avoid unnecessary confusion.

p. 585 eq 16 and following equations : the function ϕ introduced here seems to stand for exponential of the minus squared, and Φ the erf function. These symbols have

thus not the same meaning as in equation (4). Please clarify and change notation if needed. The use of ϕ as in eq. (4) is reestablished on page 588, further strengthening the possible confusion.

p. 586, l. 14 : "$P = n$ is sensible". Please explain.

p. 589 : words 'trivial' and 'clearly' may be felt as slightly annoying when trying to go into the details of a notation that is not always clear and trivial.

p. 589, l. 26 : again clarify the meaning of Φ here.

p. 589, l. 28 : 'since the normalization terms would cancel' : is that so obvious ? Normalisation terms to do not cancel on eq. 17 and I must confess that it is not clear to me why they cancel here.

p. 589, last sentence (wrapping on p. 590) : clumsy grammar

l. 592 l. 3 : "In other words" : withdraw

l. 594 : More explicit details need be given about how σ_θ and σ_ϕ (bold θ and σ) are determined. This is with this kind of detail in mind that one can see that supporting code will be welcomed by readers wishing to reproduce the algorithms proposed here, and use it for other applications.

l. 597 : "Those of Beran" clarify or add exact reference (papers by Beran are cited a couple of times, but one needs to be specific and informative here)

l. 599 : Provide the true value of d_l (sorry, if it is there I couldn't see it).

Figure 8 and 9: indicate true values of parameters when known (e.g.: d and α on Figure 9)

Interactive comment on Nonlin. Processes Geophys. Discuss., 2, 573, 2015.