Supplement of Geosci. Model Dev., 12, 2009–2032, 2019
https://doi.org/10.5194/gmd-12-2009-2019-supplement

Geoscientific Model Development
Open Access
EGU

Supplement of

Bayesian inference and predictive performance of soil respiration models in the presence of model discrepancy

Ahmed S. Elshall et al.

Correspondence to: Ming Ye (mye@fsu.edu)

Table S1. Summary of the data models, their parameters, and corresponding likelihood functions

Residual Assumptions	Likelihood function	Data model	Residuals	Variance	Data model parameters
	Generic data model	$a_t = \frac{\varepsilon_t}{\sigma_t} \quad a_t \sim X$	ε_t	σ_t	
Independent, normally distributed, and homoscedastic	Standard least square (SLS)	$a_t = \frac{\varepsilon_t}{\sigma_0} \quad a_t \sim N(0,1)$	$\varepsilon_t = d_t - Y_t$	$\sigma_t = \sigma_0$	Constant σ_0
Independent, and homoscedastic	Skew exponential power (SEP)	$a_t = \frac{\varepsilon_t}{\sigma_0} \quad a_t \sim SEP(0,1,\xi,\beta)$	$\varepsilon_t = d_t - Y_t$	$\sigma_t = \sigma_0$	Constant σ_0 Skewness ξ, Kurtosis β
Independent and normally distributed	Weighted least square (WLS)	$a_t = \frac{\varepsilon_t}{\sigma_0 + \sigma_1 Y_t} \quad a_t \sim N(0,1)$	$\varepsilon_t = d_t - Y_t$	$\sigma_t = \sigma_0 + \sigma_1 Y_t$	Heteroscedasticity model parameters σ_0, σ_1
Independent	Weighted skew exponential power (WSEP)	$a_t = \frac{\varepsilon_t}{\sigma_0 + \sigma_1 Y_t} \quad a_t \sim SEP(0,1,\xi,\beta)$	$\varepsilon_t = d_t - Y_t$	$\sigma_t = \sigma_0 + \sigma_1 Y_t$	Heteroscedasticity model parameters σ_0, σ_1 Skewness ξ, Kurtosis β
Normally distributed, and homoscedastic	Standard least square with auto-correlation (SLS-AC)	$a_t = \frac{\varepsilon_t - \sum_{i=1}^{p} \phi_i \varepsilon_{t-i}}{\sigma_0} \quad a_t \sim N(0,1)$	$\varepsilon_t - \sum_{i=1}^{p} \phi_i \varepsilon_{t-i}$	$\sigma_t = \sigma_0$	Constant σ_0, Autoregressive model parameters ϕ_i
Homoscedastic	Skew exponential power with auto-correlation (SEP-AC)	$a_t = \frac{\varepsilon_t - \sum_{i=1}^{p} \phi_i \varepsilon_{t-1}}{\sigma_0} \quad a_t \sim SEP(0,1,\xi,\beta)$	$\varepsilon_t - \sum_{i=1}^{p} \phi_i \varepsilon_{t-i}$	$\sigma_t = \sigma_0$	Constant σ_0, Autoregressive model parameters ϕ_i Skewness ξ ,Kurtosis β
Normally distributed	Weighted least square with auto-correlation (WLS-AC)	$a_t = \frac{\varepsilon_t - \sum_{i=1}^{p} \phi_i \varepsilon_{t-1}}{\sigma_0 + \sigma_1 Y_t} \quad a_t \sim N(0,1)$	$\varepsilon_t - \sum_{i=1}^{p} \phi_i \varepsilon_{t-i}$	$\sigma_t = \sigma_0 + \sigma_1 Y_t$	Heteroscedasticity model parameters σ_0, σ_1 Autoregressive model parameters ϕ_i
	Generalized likelihood function (WSEP-AC)	$a_t = \frac{\varepsilon_t - \sum_{i=1}^{p} \phi_i \varepsilon_{t-1}}{\sigma_0 + \sigma_1 Y_t} \quad a_t \sim SEP(0,1,\xi,\beta)$	$\varepsilon_t - \sum_{i=1}^{p} \phi_i \varepsilon_{t-i}$	$\sigma_t = \sigma_0 + \sigma_1 Y_t$	Heteroscedasticity model parameters σ_0, σ_1 Autoregressive model parameters ϕ_i, Skewness ξ ,Kurtosis β

Figure S1. Workflow scheme