Parameter estimation algorithms that rely on sensitivity information to calculate new parameter updates, are usually based on a linearization of the model function at the current parameter estimate. Hence, both sensitivity and nonlinearity are of importance for the efficiency of the estimation algorithm. Therefore, knowledge of a general nature on sensitivity and/or nonlinearity for some class of models can perhaps be utilized to improve the estimation efficiency for this class.

For an ODE model, Chavent and Liu [CL], and Liu [L], reported a correlation between high nonlinearity, low sensitivity, and small-scale perturbations, at a point in parameter space corresponding to a constant function. Recently, Grimstad and Mannseth confirmed the existence of such a relation for a large class of nonlinear models, including the above ODE model. They found the correlation to be stronger for points in parameter space corresponding to slowly varying functions, and weaker for other points.

In [CL, L] it was found that representing the unknown function by a multi-scale Haar basis lead to faster convergence than use of a single-scale local basis, when applying a quasi-Newton optimizer. This was explained referring to the above-mentioned correlation between nonlinearity, scale, and sensitivity. Based on this, a hierarchical scale-by-scale approach was suggested in [L]. Recently, Brusdal and Mannseth considered use of a systematic rescaling of the norms of the individual elements in the Haar basis, for the same ODE model and optimizer as in [CL, L].

In this paper we further investigate into utilization of the correlation between nonlinearity, scale, and sensitivity within parameter estimation. Rescaling is considered with alternative optimizers, including three variants of the Levenberg-Marquardt algorithm. Results from numerical experiments on ODE and PDE models are presented.