Parameter estimation is an important part of the solution process for any inverse problem. Since such problems are ill-posed it is equally important to assess the uncertainties in the parameter estimates as to find the estimates themselves.

It is customary to use confidence regions or intervals to give the precision of the parameter estimates. The method most used, because of modest computational requirements, is linearized covariance analysis.

Monte Carlo analysis can be used to check the validity of the linearization for a particular model. However, performing a Monte Carlo analysis is clearly not practical as a standard procedure. Bates and Watts introduced nonlinearity measures as a diagnostic tool to help decide when the linearized analysis is applicable.

For an ODE model, Chavent and Liu, and Liu, 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 this paper we utilize the correlation between nonlinearity, scale, and sensitivity within assessment of parameter uncertainty. It is shown that care must be exercised when applying the nonlinearity measures of Bates and Watts as a diagnostic tool for the validity of linearized covariance analysis. For models within the class where there is a correlation between nonlinearity, scale, and sensitivity, a modified version of the nonlinearity measures is recommended for this purpose.