Examples on lag distributed models subject to nonnegative divided differences of orders 2, 3 and 4

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Abstract

We consider noisy measurements from a time series that follow a linearly distributed lag model. It is usual to assume that the lag coefficients lie on some curve and then specify the curve by a least squares calculation. However, we define the r-th order smoothness priors by requiring nonnegative divided differences of order r for the lag coefficients. Such priors do not imply any parameterization of the lag curve and provide a more accurate representation of the prior knowledge. For the calculation of the solution we propose an algorithm that gives the least squares change to the data subject to nonnegative divided differences of the lag coefficients of order r, where r is a prescribed positive integer. The problem is a strictly convex quadratic programming calculation, where each of the constraints functions depends on r+1 adjacent components of the smoothed values of the lag coefficients. We take account of this special structure and use a special active set method that is more efficient than general quadratic programming algorithms. In fact we construct a basis that reduces the equality-constrained minimization calculations that appear during the quadratic programming iterations to unconstrained minimization ones, which depend on much fewer variables. Finally, we present an example that illustrates our approach.

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