The Bock Iteration for the ODE Estimation Problem

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The Bock iteration provides a method for solving the ODE estimation problem in its simultaneous form where the discretised ODE is imposed as a system of constraints on the data fitting problem. This system is potentially unbounded in size as the scale of the discretization tends to 0. Constraints introduce Lagrange multipliers into the necessary conditions, and it is necessary to estimate them in order to carry out a convergence rate analysis. The multipliers can be shown to be $O\left(n^{-1/2}\right)$, $n \to \infty$ where typically n is the number of observations. This estimate is obtained by interpreting the necessary conditions as a discretization of a stochastic ODE system. It is necessary also to take account of the unbounded size of the constraint system by reducing the convergence rate questions to questions involving consideration of a matrix of fixed dimension independent of n.