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Regression estimation via best L_2-approximation on spaces of step functions with two jumps

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In general regression models the equation $Y = m(X) + \epsilon$ holds, where X, Y and ϵ are random variables, $m(X) = \mathbb{E}[Y|X]$ and the regression function m is unknown.
The approach by Nadine Albrecht, 2020, uses step functions with one jump, e.g. binary decision trees, as an approximation of m in L_2 and assumes the unique existence of optimal step function parameters for the approximation. With given independent, identically distributed samples $(X_i, Y_i)_{i\in\mathbb{N}}$ it is possible to formulate the empirical equivalent of the approximation via step functions. As a consequence stochastic processes appear in the multivariate Skorokhod space $D(\mathbb{R}^d)$.
Our research interest is the extension to multiple step functions with arbitrary, finite jumps. Under certain conditions first results, similarly to the case with one jump, are examined for step functions with two jumps, including stochastic boundedness, convergence in distribution of the empirical processes and consistency of the estimators. By the usage of the Arginf theorems introduced by Dietmar Ferger, 2015, confidence regions for the parameters in the step functions can be constructed.

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