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General model selection estimation of a periodic regression with a Gaussian noise

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Abstract This paper considers the problem of estimating a periodic function in a continuous time regression model with an additive stationary Gaussian noise having unknown correlation function. A general model selection procedure on the basis of arbitrary projective estimates, which does not need the knowledge of the noise correlation function, is proposed. A non-asymptotic upper bound for $\mathcal{L}_2$-risk (oracle inequality) has been derived under mild conditions on the noise. For the Ornstein–Uhlenbeck noise the risk upper bound is shown to be uniform in the nuisance parameter. In the case of Gaussian white noise the constructed procedure has some advantages as compared with the procedure based on the least squares estimates (LSE). The asymptotic minimaxity of the estimates has been proved. The proposed model selection scheme is extended also to the estimation problem based on the discrete data applicably to the situation when high frequency sampling can not be provided.

Keywords Model selection procedure · Periodic regression · Oracle inequality · Non-parametric regression · Improved estimation