

Simplified quasi-likelihood analysis for a locally asymptotically quadratic random field

Nakahiro Yoshida¹

Received: 30 December 2021 / Revised: 14 April 2024 / Accepted: 17 April 2024 / Published online: 14 September 2024 © The Institute of Statistical Mathematics, Tokyo 2024

Abstract

The IHK program is a general framework in asymptotic decision theory, introduced by Ibragimov and Hasminskii and extended to semimartingales by Kutoyants. The quasi-likelihood analysis (QLA) asserts that a polynomial type large deviation inequality is always valid if the quasi-likelihood random field is asymptotically quadratic and if a key index reflecting the identifiability is non-degenerate. As a result, following the IHK program, the QLA gives a way to inference for various nonlinear stochastic processes. This paper provides a reformed and simplified version of the QLA and improves accessibility to the theory. As an example of the advantages of the scheme, the user can obtain asymptotic properties of the quasi-Bayesian estimator by only verifying non-degeneracy of the key index.

Keywords Ibragimov-Has'minskii theory \cdot Quasi-likelihood analysis \cdot Polynomial type large deviation \cdot Random field \cdot Asymptotic decision theory \cdot Non-ergodic statistics

This work was in part supported by Japan Science and Technology Agency CREST JPMJCR14D7, JPMJCR2115; Japan Society for the Promotion of Science Grants-in-Aid for Scientific Research Nos. 17H01702, 23H03354 (Scientific Research); and by a Cooperative Research Program of the Institute of Statistical Mathematics.

Nakahiro Yoshida nakahiro@ms.u-tokyo.ac.jp

¹ Graduate School of Mathematical Sciences, University of Tokyo, 3-8-1 Komaba, Meguro-ku, Tokyo 153-8914, Japan