Multivariate Overlapping Batch Means for Confidence Region Generation

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Abstract

We propose a theoretical analysis of the multivariate overlapping batched means method by establishing a valid statistical limit with which to construct exact confidence regions. Properties of confidence regions generated using non-overlapping multivariate methods are well established. Recent advances in deriving the limiting distributions associated with overlapping batching methods have enabled exact confidence interval generation for univariate time series. We extend this past work to the multivariate overlapping setting to derive the corresponding Student's t distribution for confidence region generation. Our results assess the quality of these confidence regions via comparison of their volume to limiting volumes of consistent estimators. Additionally, we develop multivariate coverage functions which can be extended to the VAMP1RE metric. Altogether, we show the "something for nothing" advantages of overlapping batching using these exact results.

Keywords: batched means method, overlapping batching methods, coverage functions, coverage regions, functional central limit theorem