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Efficient Two-Step Estimation via Targeting

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Abstract

The standard description of two-step extremum estimation amounts to plugging-in a first-step estimator of nuisance parameters to simplify the optimization problem and then deducing a user friendly, but potentially inefficient, estimator for the parameters of interest. In this paper, we consider a more general setting of two-step estimation where we do not necessarily have 'nuisance parameters' but rather awkward occurrences of the parameters of interest. The efficiency problem associated with two-step estimators in this context is more difficult than with standard nuisance parameters as even if the true unknown value of the parameters were plugged-in to alleviate the awkward occurrences of the parameters, the resulting second-step estimator may not be efficient. In addition, standard approaches to restore efficiency for two-step procedures may not work due to a consistency issue. To alleviate this potential issue, we propose a new computationally simple two-step estimation procedure that relies on targeting and penalization to enforce consistency, with the second-step estimators maintaining asymptotic efficiency. We compare this new method with existing iterative methods in the framework of copula models and asset pricing models. Simulation results illustrate that this new method performs better than existing iterative procedures and is (nearly) computationally equivalent.

Keywords: Targeting, Penalization, Multivariate Time Series Models, Asset Pricing.

1 Introduction

The standard treatment of two-stage estimation (see, e.g., Pagan, 1986 or Newey and McFadden, 1994, Section 6) is generally motivated by the following sequence of arguments as coined by Pagan (1986):

(i) Econometricians are often faced with the troublesome problem that "in order to estimate the parameters they are ultimately interested in, it becomes necessary to quantify a number of

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