

Department of Decision Sciences

Statistics Seminar

## Bootstrap Sequential Determination of the Co-integration Rank in VAR Models

**Giuseppe Cavaliere**

University of Bologna, Department of Statistical  
Sciences

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### Abstract

Determining the co-integrating rank of a system of variables has become a fundamental aspect of applied research in macroeconomics and finance. It is wellknown that standard asymptotic likelihood ratio tests for co-integration rank of Johansen (1996) can be unreliable in small samples with empirical rejection frequencies often very much in excess of the nominal level. As a consequence, bootstrap versions of these tests have been developed. To be useful, however, sequential procedures for determining the co-integrating rank based on these bootstrap tests need to be consistent, in the sense that the probability of selecting a rank smaller than (equal to) the true co-integrating rank will converge to zero (one minus the marginal significance level), as the sample size diverges, for general  $I(1)$  processes. No such likelihood-based procedure is currently known to be available. In this paper we fill this gap in the literature by proposing a bootstrap sequential algorithm which we demonstrate delivers consistent cointegration rank estimation for general  $I(1)$  processes. Finite sample Monte Carlo simulations show the proposed procedure performs well in practice.

Keywords: Co-integration; trace test; sequential rank determination; i.i.d. bootstrap; wild bootstrap.

J.E.L. Classifications: C30, C32.