Block Bootstrap HAC Robust Tests: The Sophistication of the Naive Bootstrap

Silvia Gonçalves
Département de sciences économiques, CIREQ and CIRANO, Université de Montréal

and

Timothy J. Vogelsang*
Department of Economics, Michigan State University

May 16, 2007

Abstract

This paper studies the properties of naive block bootstrap tests that are scaled by zero frequency spectral density estimators (long run variance estimators). The naive bootstrap is a bootstrap where the formula used in the bootstrap world to compute standard errors is the same as the formula used on the original data. Simulation evidence shows that the naive bootstrap can be much more accurate than the standard normal approximation. The larger the HAC bandwidth, the greater the improvement. This improvement holds for a large number of popular kernels, including the Bartlett kernel, and it holds when the i.i.d. bootstrap is used and yet the data are serially correlated. Using recently developed fixed-\(b\) asymptotics for HAC robust tests, we provide theoretical results that can explain the finite sample patterns. We show that the block bootstrap, including the special case of the i.i.d. bootstrap, has the same limiting distribution as the fixed-\(b\) asymptotic distribution. For the special case of a location model with a Bartlett kernel HAC variance estimator, we provide theoretical results that suggest the naive bootstrap is more accurate than the standard normal approximation. Our theoretical results lay the foundation for a bootstrap asymptotic theory that is an alternative to the traditional approach based on Edgeworth expansions.

*For helpful comments and suggestions we thank Lutz Kilian, Guido Kuersteiner, Nour Meddahi, Ulrich Mueller, Pierre Perron, Yixiao Sun, Hal White, and seminar participants at Boston University, Queen’s University, U. Toronto, Johns Hopkins Biostatistics, Chicago GSB, UCLA, UCSD, U. Michigan, U. Laval, U. Pittsburgh, U. Wisconsin, Cornell U. the 2005 Winter Meetings of the Econometrics Society in Philadelphia, the 2005 European Economic Association Meetings in Amsterdam and the 2004 Forecasting Conference at Duke University. Vogelsang thanks the Center for Analytic Economics at Cornell and gratefully acknowledges financial support from the NSF through grant SES-0525707.