

*The Hong Kong University of Science and Technology*

## *Seminar on Business Data Science*

*Department of ISOM*

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### **BOOTSTRAP DIAGNOSTIC TESTS**

**(joint with Luca Fanelli and Iliyan Georgiev)**

**by**

**Professor Giuseppe Cavaliere**

**University of Bologna**

**Date: 12 January 2026 (Monday)**

**Time: 11:00am – 12:00nn**

**Venue: Room 4047 (LSK Business Building)**

#### ***Abstract***

Violation of the assumptions underlying classical (Gaussian) limit theory often yields unreliable statistical inference. This paper shows that the bootstrap can detect such violations by delivering simple and powerful diagnostic tests that (a) induce no pre-testing bias, (b) use the same critical values across applications, and (c) are consistent against deviations from asymptotic normality. The tests compare the conditional distribution of a bootstrap statistic with the Gaussian limit implied by valid specification and assess whether the resulting discrepancy is large enough to indicate failure of the asymptotic Gaussian approximation. The method is computationally straightforward and only requires a sample of i.i.d. draws of the bootstrap statistic. We derive sufficient conditions for the randomness in the data to mix with the randomness in the bootstrap repetitions in a way such that (a), (b) and (c) above hold. We demonstrate the practical relevance and broad applicability of bootstrap diagnostics by considering several scenarios where the asymptotic Gaussian approximation may fail, including weak instruments, non-stationarity, parameters on the boundary of the parameter space, infinite variance data and singular Jacobian in applications of the delta method. An illustration drawn from the empirical macroeconomic literature concludes.

#### ***Bio***

Giuseppe Cavaliere is Full Professor of Econometrics at the University of Bologna (since 2006) and Distinguished Research Professor of Economics at the Exeter Business School. He has been affiliated with professorships at the University of Copenhagen and University of Aarhus. He is also Elected Fellow of the International Association for Applied Econometrics (IAAE), Fellow of the Journal of Econometrics and Research Fellow of the Granger Centre for Time Series Econometrics (University of Nottingham). He has acted as president of the Italian Econometric Association (SIdE). He has published in several international top journals, including *Econometrica*, the *Annals of Statistics*, the *Journal of the American Statistical Association*, *Econometric Theory* and the *Journal of Econometrics*. He is currently a co-editor of the *Journal of Econometrics* and associate editor of the *Journal of Time Series Analysis*.

All interested are welcome!

For details, please contact ISOM Department.