

Ph.D. level course

Combined Statistical Tests and Composite Indicators, with Applications

24 hours

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1) Introduction

Does bad inference drive out good? Main theory of permutation tests.

2) Nonparametric combination of dependent tests

General aspects. A two-phase algorithm for nonparametric combination. Properties of combined tests.

3) Combined tests for location problems

Multiaspect tests for the two sample location problem.

4) Combined tests for comparing variability

Combination of Levene type tests. A test based on the interquantile range. Adaptive choice of scale tests in flexible two-stage designs

5) Combined tests for the general two sample problem

Combination of Kolmogorov–Smirnov, Cramer–Von Mises, and Anderson–Darling modified tests. The two sample location-scale problem. Is the Cucconi test for location-scale a combined test?

6) Combined tests for the multivariate location problem

Combination of tests based on interpoint distances.

7)(*) Composite indicators

How to design and disseminate robust composite indicators.

(*) if there is enough time

References

Books

1. F. Pesarin, L. Salmaso (2010) **Permutation Tests for Complex Data**, Wiley Series in Probability and Statistics: Chichester, UK.
2. S. Bonnini, L. Corain, **M. Marozzi**, L. Salmaso (2014) **Nonparametric Hypothesis Testing: Rank and Permutation Methods with Applications in R**, Wiley Series in Probability and Statistics: Chichester, UK.

Papers on tests

1. **M. Marozzi** (2004) *A Bi-Aspect Nonparametric Test for the Two-Sample Location Problem*, **Computational Statistics and Data Analysis**, 44, 639-648.
2. **M. Marozzi** (2007) *Multivariate Tri-Aspect Non-Parametric Testing*, **Journal of Nonparametric Statistics**, 19, 6, 269-282.
3. **M. Marozzi** (2009) *Some Notes on the Location-Scale Cucconi Test*, **Journal of Nonparametric Statistics**, 21, 5, 629-647.
4. **M. Marozzi** (2012) *A Combined Test for Differences in Scale Based on the Interquantile Range*, **Statistical Papers**, 53, 1, 61-72.
5. **M. Marozzi** (2012) *A Distribution Free Test for the Equality of Scales*, **Communications in Statistics – Simulation and Computation**, 41, 6, 878-889.
6. **M. Marozzi** (2013) *Adaptive Choice of Scale Tests in Flexible Two Stage Designs with Application in Experimental Ecology and Clinical Trials*, **Journal of Applied Statistics**, 40, 4, 747-762.
7. **M. Marozzi** (2014) *Multivariate Tests Based on Interpoint Distances with Application to Magnetic Resonance Imaging*, **Statistical Methods in Medical Research**, DOI: 10.1177/0962280214529104.
8. **M. Marozzi** (2014) *Combination of Distribution Free Tests for the General Two Sample Problem with Application to the Social Sciences*, **Communications in Statistics – Theory and Methods**, DOI: 10.1080/03610926.2014.919398.
9. **M. Marozzi** (2015) *Multivariate Multidistance Tests for High-dimensional Low Sample Size Case-control Studies*, **Statistics in Medicine**, 34, 1511-1526.
10. **M. Marozzi** (2015) *Does Bad Inference Drive out Good?*, **Clinical and Experimental Pharmacology and Physiology**, 42, 727-733.

Papers on composite indicators

11. **M. Marozzi** (2015) *Measuring Trust in European Public Institutions*, **Social Indicators Research**, 123, 879-895.

12. **M. Marozzi** (2015) *Construction, Robustness Assessment and Application of an Index of Perceived Level of Socio-economic Threat from Immigrants: A Study of 47 European Countries and Regions*, **Social Indicators Research**, DOI: 10.1007/s11205-015-1037-z.
13. **M. Marozzi**, M. Bolzan (2016) *Skills and Training Requirements of Municipal Directors: A Statistical Assessment*, **Quality and Quantity**, 50, 1093-1115.

Further reading

14. **M. Marozzi** (2002) *Some Notes on Nonparametric Inferences and Permutation Tests*, **Metron**, LX, 3-4, 139-151.
15. **M. Marozzi** (2003) *Applications in Business, Medical and Industrial Statistics of Bi-Aspect Nonparametric Tests for Location Problems*, **Statistical Methods and Applications**, 12, 187-194.
16. **M. Marozzi** (2004) *A Bi-Aspect Nonparametric Test for the Multi-Sample Location Problem*, **Computational Statistics and Data Analysis**, 46, 81-92.
17. **M. Marozzi** (2009) *A Composite Indicator Dimension Reduction Procedure with Application to University Student Satisfaction*, **Statistica Neerlandica**, 63, 3, 258-268.
18. **M. Marozzi** (2011) *Levene Type Tests for the Ratio of Two Scales*, **Journal of Statistical Computation and Simulation**, 81, 7, 815-826.
19. **M. Marozzi** (2012) *Tertiary Student Satisfaction with Socialization: a Statistical Assessment*, **Quality and Quantity**, 46, 1271-1278.
20. **M. Marozzi** (2012) *A Modified Hall-Padmanabhan Test for the Homogeneity of Scales*, **Communications in Statistics – Theory and Methods**, 41, 16-17, 3068-3078.
21. **M. Marozzi** (2012) *A Modified Cucconi Test for Location and Scale Change Alternatives*, **Colombian Journal of Statistics**, 35, 3, 369-382.
22. **M. Marozzi** (2013) *Nonparametric Simultaneous Tests for Location and Scale Testing: a Comparison of Several Methods*, **Communications in Statistics – Simulation and Computation**, 42, 6, 1298-1317.
23. **M. Marozzi** (2014) *The Multisample Cucconi Test*, **Statistical Methods and Applications**, 23, 209-227.
24. **M. Marozzi** (2014) *Construction, Dimension Reduction and Uncertainty Analysis of an Index of Trust in Public Institutions*, **Quality and Quantity**, 48, 939–953.

Statistical properties of the indicators are analysed and business tendencies revealed by their evolution are compared with the actual economic developments, as reflected by GDP and industrial production. Component variables entering the composite indicator are also checked against the statistical data on output and sales volumes in the respective sectors. As a matter of fact, we have developed and tested many CLI variants designed for. * This research was supported by a grant from the CERGE-EI Foundation under the program of the Global Development Network. Composite leading indicator combines a set of economic variables that precede cyclical changes in aggregate economic activity.