University of Duisburg-Essen Faculty of Business Administration and Economics

Chair of Econometrics



P-Approximation

Seminar in Econometrics

Term Paper

Submitted to the Faculty of
Business Administration and Economics
at the
University of Duisburg-Essen

from:

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Reviewer: Christoph Hanck

Deadline: Jan. 17th 2020

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Study Path: M.Sc. Economics M.Sc. Economics

Semester: $5^{\rm th}$

Graduation (est.): Winter Term 2020 Winter Term 2020

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List of Abbreviations

1 Introduction

Meta tests have been shown to be a powerful tool when testing for the null of non-cointegration. The distribution of their test statistic, however, is mostly not available in closed form. This might pose difficulties when implementing the meta tests in econometric software packages, as one has to include tables of critical values and p-values for each combination of the underlying tests. Software package size limitations are therefore quickly exceeded.

In this paper, we propose supervised Machine Learning Algorithms to approximate the p-values of the meta test by Bayer and Hanck (2012), which tests for the null of non-cointegration. This approach might reduce the size of associated software packages considerably. The algorithms are trained on simulated data for various specifications of the aforementioned test.

2 Main

References

Bayer, C., & Hanck, C. (2012). Combining non-cointegration tests. *Journal of Time Series Analysis*. doi:10.1111/j.1467-9892.2012.814.x

Software-References

- Breiman, L., Cutler, A., Liaw, A., & Wiener., M. (2018). Randomforest:

 Breiman and cutler's random forests for classification and regression.

 R package version 4.6-14. Retrieved from https://CRAN.R-project.

 org/package=randomForest
- Croissant, Y., Millo, G., & Tappe, K. (2019). *Plm: Linear models for panel data*. R package version 2.1-0. Retrieved from https://CRAN.R-project.org/package=plm
- Friedman, J., Hastie, T., Tibshirani, R., Simon, N., Narasimhan, B., & Qian, J. (2019). Glmnet: Lasso and elastic-net regularized generalized linear models. R package version 2.0-18. Retrieved from https://CRAN.R-project.org/package=glmnet
- Greenwell, B., Boehmke, B., Cunningham, J., & Developers, G. (2019). Gbm: Generalized boosted regression models. R package version 2.1.5. Retrieved from https://CRAN.R-project.org/package=gbm
- Henry, L., & Wickham, H. (2019). Purrr: Functional programming tools. R package version 0.3.2. Retrieved from https://CRAN.R-project.org/package=purrr
- Hlavac, M. (2018). Stargazer: Well-formatted regression and summary statistics tables. R package version 5.2.2. Retrieved from https://CRAN.Rproject.org/package=stargazer
- Izrailev, S. (2014). Tictoc: Functions for timing r scripts, as well as implementations of stack and list structures. R package version 1.0. Retrieved from https://CRAN.R-project.org/package=tictoc
- Kuhn, M., Wing, J., Weston, S., Williams, A., Keefer, C., Engelhardt, A., ... Hunt., T. (2019). Caret: Classification and regression training. R package version 6.0-84. Retrieved from https://CRAN.R-project.org/package=caret
- Lumley, T., & Miller, A. (2017). Leaps: Regression subset selection. R package version 3.0. Retrieved from https://CRAN.R-project.org/package=leaps
- Mevik, B.-H., Wehrens, R., & Liland, K. H. (2019). Pls: Partial least squares and principal component regression. R package version 2.7-1. Retrieved from https://CRAN.R-project.org/package=pls

- Milborrow, S. (2019a). *Plotmo: Plot a model's residuals, response, and partial dependence plots.* R package version 3.5.5. Retrieved from https://CRAN.R-project.org/package=plotmo
- Milborrow, S. (2019b). Rpart.plot: Plot 'rpart' models: An enhanced version of 'plot.rpart'. R package version 3.0.7. Retrieved from https://CRAN. R-project.org/package=rpart.plot
- R Core Team. (2019). R: A language and environment for statistical computing. R Foundation for Statistical Computing. Vienna, Austria. Retrieved from https://www.R-project.org/
- Ripley, B. (2019a). Class: Functions for classification. R package version 7.3-15. Retrieved from https://CRAN.R-project.org/package=class
- Ripley, B. (2019b). Mass: Support functions and datasets for venables and ripley's mass. R package version 7.3-51.4. Retrieved from https://CRAN.R-project.org/package=MASS
- Ripley, B. (2019c). Tree: Classification and regression trees. R package version 1.0-40. Retrieved from https://CRAN.R-project.org/package=tree
- RStudio Team. (2019). Rstudio: Integrated development environment for r. Version 1.2.1541. RStudio, Inc. Boston, MA. Retrieved from http://www.rstudio.com/
- Rushworth, A. (2019). Inspect of: Inspection, comparison and visualisation of data frames. R package version 0.0.4. Retrieved from https://CRAN.R-project.org/package=inspect of
- Sievert, C., Parmer, C., Hocking, T., Chamberlain, S., Ram, K., Corvellec, M., & Despouy, P. (2019). *Plotly: Create interactive web graphics via 'plotly.js'*. R package version 4.9.0. Retrieved from https://CRAN.R-project.org/package=plotly
- Therneau, T., & Atkinson, B. (2019). Rpart: Recursive partitioning and regression trees. R package version 4.1-15. Retrieved from https://CRAN.R-project.org/package=rpart
- Ushey, K., Allaire, J., Wickham, H., & Ritchie, G. (2019). *Rstudioapi:* Safely access the rstudio api. R package version 0.10. Retrieved from https://CRAN.R-project.org/package=rstudioapi

- Wickham, H. (2019). Stringr: Simple, consistent wrappers for common string operations. R package version 1.4.0. Retrieved from https://CRAN.R-project.org/package=stringr
- Wickham, H., François, R., Henry, L., & Müller, K. (2019). *Dplyr: A grammar of data manipulation*. R package version 0.8.0.1. Retrieved from https://CRAN.R-project.org/package=dplyr
- Wickham, H., & Henry, L. (2019). Tidyr: Easily tidy data with 'spread()' and 'gather()' functions. R package version 0.8.3. Retrieved from https://CRAN.R-project.org/package=tidyr
- Xie, Y. (2019). Knitr: A general-purpose package for dynamic report generation in r. R package version 1.23. Retrieved from https://CRAN.R-project.org/package=knitr

A Appendices

Better sorting of the Appendix

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Essen, den	
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