Practical Econometrics II/II

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Course Overview

Location & website

The course is taught at Vilnius university Faculty of Mathematics and Informatics.

All the announcements, grading, lectures, examples & tasks will be available at the course website.

Aim of the course

This course provides the foundations of the theory and methods used in analyzing, modelling and forecasting time series data in econometrics.

Course Outline

Below are the main topics that will be covered in this course.

1. Statistical data and their models
2. Stationary time series: WN process, AR, MA and ARCH models
3. Time series with trend and seasonality components
4. Time series with unit root
5. Regressions with time lags
6. Regressions with time series variables
7. Multivariate models: Granger causality, VAR and VECM models
8. Endogeneity problem
9. Simultaneous equations
10. Panel data models

Grade assessment

The final grade will be comprised of the following parts:

- `tasks` will comprise 40% of the final grade;
- `midtermExam` will comprise 20% of the final grade;
- `finalExam` will comprise 40% of the final grade;
- `extraPoints` additional points that can be earned throughout the course.

NOTE: you **must** submit all of the tasks regardless of the deadline, otherwise the `tasks` part will be considered a 0.

Tasks & their submission

Submit the completed tasks to: andrius.buteikis@mif.vu.lt

Email subject: `[PE_2] Task_Number`

Email files:

- *.Rmd (or *.ipynb) file with your homework;
- *.pdf file generated from your *.Rmd (or *.ipynb) file;
- *.csv files with results or other files (if specified).

Submissions should be made from your university email!

Before generating any data (or using any methods that use random number generation), the following code should be included:

```
set.seed(student.code)
```

where `student.code` is your unique student code. This ensures that your results can be reproduced and are semi-unique.

Task requirements (1)

- In order to be eligible to get full points for each task please adhere to the deadlines, which will be announced alongside each task;
- Your solutions must contain your code, the relevant output from the code and your comments on the results or the methodology used;
- Tasks can be completed in either English of Lithuanian (any plot labels should be in the same language);
- Your code must also be clean and easy to read: please keep only necessary variables, make sure their names make sense and are not confusing. More info at Google's R Style Guide;
- Please only keep the necessary output instead of whole outputs from the functions! Otherwise it is not clear whether the task was understood;
- Make sure the plots are readable!

Task requirements (2)

Remember to double check your answers with your output! Always clear your code development environment with (e.g. `rm(list = ls())` in `R`), and regenerate the output and make sure that the results align with your interpretations.

Comment on the results (especially if the task requires it)! This most definitely includes tasks which require you to evaluate models, choose model predictors, carry out tests, plot the data and/or the forecasts. Not commenting on result(s) is equivalent to not understanding the task part(s).

P.S. do not be afraid to comment on the results even if they are not 'good', i.e. models with insignificant coefficients, questionable coefficient signs or test results which show that the data or the models need additional refinement. It is important for you to identify and acknowledge these cases.

Extra Points

`extraPoints` can be earned by extending tasks by carrying out a creative analysis which is different from the ones required by the task:

- A maximum of 3 pages can be used for this extra analysis.
- The decision on what kind of analysis to carry out is left to you. However, it should not repeat what was required by the task that it is extending, otherwise no `extraPoints` will be awarded. It should also make sense in the context of that task.
- There is no cap on the number of possible extensions (it can be done for each homework task) and their worth is dependent on the complexity of the extension.
- Requirements for these extensions are the same as the ones for the regular tasks.

Extensions should be added **after** the main tasks are completed.

Late homework submission

- For every late **workday** (Monday-Friday, excluding public holidays), the maximum amount of possible points for a late task will decrease by 20%.
- This means that after being late for 5 working days you will not get any points for your homework, but it still needs to be submitted!
- Carrying out a creative analysis/extension with will award `extraPoints` but they will most likely not cover the points lost from missing a deadline.

Midterm & Final Exams

Will be carried out primarily using statistical software. Any resulting models or transformations will need to be provided (if required by the exam tasks) along with any other results in a .pdf file (unless specified otherwise).

Software

The software used will be R along with RStudio. Python software is accuired via the Anaconda distribution.

Some useful links:

- RStudio Cheatsheets - useful summaries for various tasks, like data transformation, R Markdown, Data Visualization, etc.
- 'ctv' package - a useful package for downloading and updating many R packages at once (e.g. packages covering *Econometrics*).
- LaTeX - a document preparation system for high-quality typesetting. Used for the communication and publication of scientific documents. MiKTeX distribution.
- Anaconda - an open source distribution of Python (similarly to RStudio for R), which simplifies package management and deployment.

Core Literature

- R. Lapinskas, *Practical Econometrics II. Time Series Analysis (Lecture Notes)*, 2016
- R. Leipus, *Ekonometrija II*, 2016

Supplementary Literature

- P. J. Brockwell, R. A. Davis, *Introduction to Time Series and Forecasting*, 3^{rd} ed., Springer, 2016
- R. S. Tsay, *An Introduction to Analysis of Financial Data with R*, 1^{st} ed., Wiley, 2012