

Fall 2025

Time Series for Economics, Business and Finance

CCMVV1727U.LA.E25

Copenhagen Business School
Department of Economics

WELCOME

Dear Students,

Welcome to the elective course in Time Series for Business, Economics and Finance! This letter provides some initial relevant information on the course. Soon more information including the first set of lecture slides will follow. I very much look forward to meeting you and working with you during the next couple of months!

Best,

Marta

INSTRUCTOR

Name:	Marta Boczoń
Email:	mbo.eco@cbs.dk
Office hours:	Mondays @ 8AM – 10AM (Sep 8, 15, 22, 29; Oct 6, 20, 27; Nov 3, 10) Friday, Nov 14, @ 8AM – noon Room: POR/16.A-1.34

OVERVIEW

Structure: The course starts in the week of September 1 and consists of 3 class hours each week for the period of 10 weeks.

Requirements: As we expect a fairly heterogeneous background among the students we strongly encourage you to engage in self-study with respect to the following: (i) matrix notation and operations (transpose, sum and difference, scalar multiplication, matrix multiplication, matrix-vector product, matrix inverse), and (ii) the first chapter of the course's main textbook, where the authors introduce financial time series and discuss their basic statistical properties. As such, in the lectures we will be able to focus on the more demanding topics in times series analysis that we believe you have not been studying before.

Main textbook: “Applied Econometric Time Series” 4th Edition by Walter Enders, Wiley, 2015 (selected chapters).

Supplementary textbooks:

- “Analysis of Financial Time Series” 3rd Edition by Ruey S. Tsay, Wiley, 2010.
- “Forecasting: Principles and Practice” 2nd Edition by R. J. Hyndman and G. Athanasopoulos, OTexts, 2018 (*note:* this book uses R).
- “New Introduction to Multiple Time Series Analysis” by Helmut Lütkepohl, Springer, 2006.

Software: This course relies on **R** and **RStudio**, which both can be downloaded for free. Both software are necessary to replicate in-class examples, solve practice problem sets, and submit the final project. Before the fist class you are expected to: (i) install R and RStudio on a computer you will use for the course in class and at home, (ii) make sure that the software is working properly. For problems with installation please contact the student IT support.

To get started with R see:

- “**A (Very) Short Introduction to R**” (available online).

- “R for Beginners” (available online).
- “A Little Book of R for Time Series” (available online).
- “An Introduction to the ‘gets’ Package” (available online).
- “Analysis of Integrated and Cointegrated Time Series with R” by Bernhard Pfaff, Springer 2008.

COURSE SCHEDULE

See the list of Modules on Canvas.

EXAM STRUCTURE

The exam will consist of two parts: a written product and an oral exam. To participate in the oral exam, you must submit your written product by the specified deadline (two weeks before the exam date). Hence, the synopsis should be developed alongside your elective. Your final grade will be determined by an overall assessment of both your written product and your performance in the oral exam. Please note that during the oral exam, you may be asked questions related to your synopsis as well as the entire course syllabus.

- Type of exam: Oral group exam based on a written synopsis.
- Group size: 2-4 students.
- Written product length:
 - For 2 students: Maximum of 5 pages (no appendix is allowed).
 - For 3-4 students: Maximum of 10 pages (no appendix is allowed).
- Oral exam duration: 10 minutes per student, including time for examiners to discuss and explain the grade.
- Grading scale: 7-point grading scale.
- Examiners: The exam will be assessed by an internal examiner and a second internal examiner.
- Exam period: Winter.
- Make-up exam/re-exam: The make-up or re-exam will follow the same format as the ordinary exam. If you miss the oral exam due to documented illness but have submitted your written product, you do not need to submit a new product for the re-take. If the entire group fails the oral exam, you must submit a revised product for the re-take. If one member of the group fails, the student will be examined based on the original product.
- Assignment topic: You are free to choose your subject, following the provided guidelines. To successfully complete the course you need to conduct a short empirical project **in R** with time series data of your own choice. In summary, you need to (i) find the data, (ii) apply and evaluate at least **two different models for the data from the course’s syllabus**, (iii) demonstrate understanding of the methods you chose to apply, (iv) justify the choices you have made regarding the data and the methods, (v) interpret the results appropriately. A good project will signal that you have mastered the right models for the data. Please note that some data sets may turn out to be not well suited for the more advanced models. In such a case, you may either choose a new data set or demonstrate how and why the data are not appropriate for the analysis in question. As part of the evaluation of your exam project, we will not consider how challenging the models you have used are but rather, whether the models are suitable for your data.

PROCESS OF WRITING

- Footnotes and permitted. Use them smartly to help the flow of your paper without missing out on reporting important details.
- When citing others work (inc. textbook) you need to clearly state the book chapter/paper and the exact page you’re referring to. Alternatively, you are allowed to use quotes.

- All tables and figures must have titles and be readable. Clearly label all the axis in your figures and columns/rows in your tables. Screen shots from R output are not permitted.
- While formatting your paper you need to number your pages.
- I will provide feedback during my office hours on a continuous basis throughout the semester until the final week of classes. I am also open to email correspondence until the final week of classes.
- I welcome all questions regarding the textbook and lecture material (including the use of R for solving the in-class exercises).
- Regarding your final project, I offer feedback in relation to your choice of topic, data, and methods. Moreover, I am able to assist you with questions that pertain to the structure and theory included in the exam paper. Note however that I will offer no feedback in relation to the use of R for your final project, nor will I assist you in interpreting your results.

STRUCTURE OF THE WRITTEN PRODUCT

1. Title page, including your research question as your project's title and table of content.
2. **Introduction:**
 - (a) State your research question.
 - (b) Explain why your research question is worth studying? Why what you do is important?
 - (c) Explain what have been done in the literature or by practitioners concerning your research question. To what extent what you do is new when compared to what have been already done?
3. **Data:**
 - (a) What data do you use? What's the data source, frequency, seasonal adjustment, and time range? Explain all your choices carefully.
 - (b) Provide data figures. Comment on missing data if present.
 - (c) Check for stationarity of the data. Upon testing, clearly state the null and alternative hypotheses, significance levels, test statistics, and critical values. Upon conducting a visual inspection, be clear about why the figure supports/does not support the claim of stationarity.
 - (d) Be precise about the exact data transformation you apply to non-stationary series if present. Justify your choice.
4. **Methods:**
 - (a) What models (i.e., ARIMA, VAR, ECM) will you apply, how and why?
 - (b) What diagnostic checks (test for serial autocorrelation in the residuals, recursive estimation, out-of-sample forecasting) will you apply, how and why?
5. **Estimation:**
 - (a) Show your regression results, comment on the overall fit, parameter significance, interpret the estimated coefficients, are the estimated coefficients small/big in the real-world sense, are they of expected sign? Are they in line with the existing literature? Make decisions regarding insignificant coefficients, if you decide to leave them in the model, explain why. Otherwise, re-estimate.
 - (b) Conduct diagnostic checks. Comment on your results and make adjustments to your modeling choices if necessary. If adjustments are needed but not made, explain how would you make such adjustments and what are the consequences of not addressing the problems you have identified for your analysis and the results at hand.
 - (c) Conclude your findings and determine the best model you have come across.
6. **Conclusion and interpretation:**

- (a) Using your best model (or the best models within each class of models) conduct a final analysis that answers your research question. Conclude how your findings relate to the literature/to what have been a common business practice so far. Would you strategy be useful to policymakers/business planers?

Good luck!