Econometric Seminar for Master Students

Forecasting Retail Data in Cooperation with Aldi Süd

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Winter Semester 2025

Participation Requirements

Minimum requirement: Successful completion of Master's level econometrics and time Series analysis courses. Previous attendance of the course "Statistical Learning" is helpful.

Topics

In the current semester, we discuss the application of forecasting methods, such as those from time series analysis or statistical learning, to real retail data provided by Aldi Süd. This cooperation offers an attractive insight into the professional practice of data analysts at one of the largest German companies. The seminar will be conducted in cooperation with Aldi Süd.

Possible topics include:

1. Forecasting for the Allocation of Special Buy Articles in Retail
2. Forecasting the Reorder Quantity of Special Buy Articles
3. Forecasting Core Range Articles in Retail
4. Analyzing Customer Behavior in Various Commodity Groups
5. Feature Engineering for Core Range Promotion Forecasts
6. Modeling and Selecting Relevant Seasonality Features for Retail
7. Forecasting Key Events for Retail, e.g., Easter, Christmas, or other holidays
8. Improving Forecast Accuracy with Preprocessing, e.g., Outlier Detection, Out-of-Stock and Intra-day Out-of-Stock
9. Analyzing the Influence of Weather on Customer Behavior in Retail

Different datasets will be available for the different topics.

Timeline and other Organizational Information

1. **Introductory Event:** Room R12 R06 A48, October 15, 2025, 10:00 - 12:00. Information on writing a term paper will be given. Please register for this event in advance by emailing christoph.hanck@vwl.uni-due.de.
2. **Binding Registration:** From now until October 20, 2025, with three prioritized topics (via email to Christoph Hanck); own topic suggestions are also possible and welcome. Topic assignment will be made shortly after. In the event of overbooking, participation will be determined based on grades in econometrics and, secondarily, the order of registration. Group work is possible depending on registration numbers. In this case, we will discuss suitable ways of making individual contributions transparent.
3. **Optional Consultation Appointments:** Please contact us in case of any questions. By November 10, 2025, a first outline of the topic must be submitted, including a table of contents as the bare minimum. The more you have done until then, the better we can give feedback!
4. **Submission Deadline for the Seminar Paper:** By January 10, 2026, at the latest, at the Chair. Additionally, submit all relevant files in electronic form via email/Dropbox link, etc., to christoph.hanck@vwl.uni-due.de.
5. **Block Seminar Date:** In January/February 2026. The exact dates will be announced in due course after consultation with the student group.
6. **Assessment:** Seminar paper (50%), quality/clarity of replication files/R code (10%), presentation (20%), discussion (10%), thesis paper (5%), and active participation in the discussion (5%). To pass the seminar, all components must be passed.
7. **Credits Awarded:** 6 ECTS.

Requirements

1. Participation in the Introductory Event.
2. Writing the seminar paper in German or English: Approximately 15 pages excluding tables, figures, appendices, etc.
3. Submission of raw Data and the source code of the statistical analysis. This should clarify which part of the program is responsible for which results ("reproducible research"). It must be executable without modifications, such as source directories. Tools like RMarkdown combine the seminar paper text and code in one document. The presentation is not created in PowerPoint (instead: LaTeX, RMarkdown, etc.). Appropriate templates are available at, e.g., `https://github.com/mca91/OekonThesisTemp`.
4. Optional attendance at consultation hours.
5. Presentation: A 20-25 minute presentation of the seminar paper will be held in a block event. This will be followed by a critical discussion in which active participation from seminar participants is expected. Attendance at the block seminar is mandatory.
6. Thesis Paper/handout: A one-page thesis paper must be prepared by all seminar participants for the oral presentation. The purpose of the thesis paper is to summarize the presentation for the other seminar participants. The thesis paper must be duplicated by the presenters themselves.

7. Discussion: A 5-minute short presentation summarizing and critically, but constructively, evaluating the work of a fellow student/group. Possible aspects: Which alternative methods could have been used? What further applications are possible for the methods used? The allocation of discussion papers can be jointly agreed upon but will ultimately be assigned by the Chair.
8. Formal Requirements: Please follow the instructions below when preparing the paper.

General Structure of the Term Paper

- Title Page
- Table of Contents
- List of Symbols and Abbreviations (if applicable)
- List of Figures (if applicable)
- List of Tables (if applicable)
- Main Text (central part of the work)
- Appendix (if applicable)
- Bibliography

All pages after the title page must be consecutively numbered.

Title Page

The title page of the seminar paper should include the following information:

- Topic of the paper
- Designation as a seminar paper, current semester
- Information about the supervising Chair
- Author's details (name, email address, student ID number, number of semesters, and study program)
- Submission date

Table of Contents

The table of contents provides an overview of the paper. It lists the directories (list of symbols etc.) and sections (but not the table of contents itself!), each with page numbers. It is important that the chosen headings are informative and consistently related.

Figures, Tables, Symbols

Figures and tables should be inserted at appropriate places in the text. They should be consecutively numbered and labeled with a title placed above or below the corresponding figure/table (e.g., "Figure 1: Phillips Curve," "Table 1: Unit Root Tests") and listed with title and page number in a corresponding directory. If there is only one figure or table, a directory is not needed. Mathematical symbols used should be declared in a list of symbols. The same variable should not be denoted with different symbols throughout the text, and the same symbol should not be used for different meanings.

Appendix

An appendix is only necessary if figures and tables, due to their nature or extent, cannot be integrated into the main text. An appendix may include statistical analyses, tables, etc., which have a supplementary character to the main analysis. Usually, figures are included first, followed by tables (or vice versa). The numbering in the title often uses an "A" to indicate that the corresponding figure/table is in the appendix (e.g., "Figure A15: Unemployment Rate in OECD Countries" or "Table A10: Autocorrelation Tests"). Figures/tables listed in the appendix must be listed in the preceding directories. If the tables or figures in the appendix occupy only one page each, there is generally no reason to include them in an appendix.

Layout of the Paper

The paper, which should be prepared in A4 format, must be written in a standard font (e.g., Times New Roman 12 or Arial 10) and with approximately 1.5 line spacing. A correction margin of approximately 5 cm on the left and 2.5 cm on the right should be left on each page. Footnotes are placed on the pages to which they belong. Within footnotes, single-line spacing should be used.

Citations

Citing literal or paraphrased quotations are an important aspect of scientific work: it helps highlight your own performance and prevents plagiarism. We are happy to assist you in cases of doubt. Source citations are made in footnotes or—more common in the case of English texts—in parentheses immediately following the (literal or paraphrased) citation with the page number. Literal citations should additionally be enclosed in quotation marks. Footnotes are consecutively numbered. Footnote texts are on the same page as the footnote numbers.

Examples:

- Mustermann (1996, p. 12)
- Musterfrau et al. (2000, p. 10 ff)
- (Mustermann, 2002, p. 12)

Bibliographic Information

All used and cited literature sources are listed under "References" in alphabetical order. The authors' surnames must be listed, and first names are typically abbreviated.

Monographs must include the author, year of publication, title, edition (except for the first edition), and place of publication.

Journal articles require the following information: author, year of publication, title of the article, name, and volume of the journal (+ possibly volume or issue number).

Contributions in edited volumes require the following information: author, year of publication, title of the article, name of the editor of the edited volume, followed by "(ed.)," title of the edited volume, place of publication, publisher, and page numbers. If there are more than three editors, only the first is named, and the others are summarized with "et al."

Discussion papers, working papers, etc. should include the following information: author, year of publication, title of the article, name, and number of the series.

Examples:

- Mustermann, A., and Musterfrau, B. (1996): Book Title. Place of publication: Publisher.
- Mustermann, A., B. Musterfrau, and C. Mustermann (1996): Title of the Article. In: Title of the Journal, Volume (Issue No.), Page Numbers.
- Mustermann, A. (1996): Title of the Article. In: Musterfrau, B., and Mustermann, C. (eds.): Title of the Edited Volume. Place of publication: Publisher, Page Numbers.

You can also choose another recognized citation style (e.g., from a particular professional journal) as long as you apply it consistently. However, you may not mix different citation styles within a single bibliography. A tool such as BibTeX can be very helpful in this regard.

Content and Structure of the Paper

The paper could be structured as follows. However, it is your task to think about whether a different structure might be appropriate given your topic.

- **Abstract:** Brief summary of the paper.
- **Introduction:** Motivation, objectives.
- **Problem Statement:** What methods are used/presented? Which economic theory is empirically investigated?
- **Literature Review:** Embedding the work in existing literature.
- **Data:** Exact definition, source(s).
- **Empirical Analysis/Simulation Study/Theoretical Summary of the Latest Developments:** Results, interpretation, etc.
- **Summary and Conclusion**
- **Bibliography**

Despite the importance of the above-mentioned formal requirements, the content naturally constitutes the most relevant aspect for the evaluation of the paper.

Evaluation of the Paper

Below are some guidelines for evaluating the paper. If you find these indications somewhat vague, you are probably right: it is difficult to say precisely what makes a good paper, but you know it when you read it.

Some general indications can nevertheless be made:

1. **Relevance and/or Originality of the Topic:** There is a certain trade-off here: an empirical paper that analyzes the relationship between inflation and unemployment is certainly relevant but not very original. Your paper should be at least one of the two.

2. **Plausibility:** You are under no obligation in an empirical paper to produce statistically significant results or spectacular outcomes in a simulation study. However, there should be a plausible hypothesis behind your work. Do you motivate this hypothesis adequately?

3. **Depth:** Is your work "quick-and-dirty," or do you examine the topic from multiple perspectives, some of which you may only mention in a footnote?

4. **Correctness:** Are all methods correctly described and/or applied? Do you model the properties of your data adequately, or do you use specific techniques only because your software package provides a command for them?

5. **Interpretation:** Do you clearly explain what your results mean—both economically and econometrically—or do you just print tables with computer output? The same applies to theoretical work. Do you simply write down formulas, or do you discuss their relevance?

6. **Conciseness:** Do you focus on the key results, or does the paper provide much ancillary output, e.g., from a regression, that is not really relevant to the topic? Does the paper have long paragraphs where a clear sentence would have sufficed? Do you have three graphics, each with a time series, or do you combine them into one if appropriate? Do you focus on what you have done, or is your essay almost entirely composed of quotations?

7. **Completeness:** There is some tension with the previous point: Have you applied/considered all relevant techniques that are important for your topic?

8. **Language:** Is the paper clearly and correctly written? Is your style professional, or does it resemble a social media post? Use a spell checker, but do not rely on it alone!

9. **Structure:** Does the paper read smoothly? Do you immediately make clear what your paper is about? Have you revised the wording in your paper several times, or is the first version also the final version (e.g., because the time until the submission deadline was not well planned)? Do you make clear why you are taking certain steps, or does the paper just list what you have done over the semester for the seminar? Do you focus on key results, or does the paper resemble a diary like, "...and then I loaded the data into R, then I looked at the graphs, but found nothing interesting, then..."? I am exaggerating, but a professional paper does not include such content.

10. **Layout:** Does the paper look like a professional article from a journal, or does it just copy results from (e.g.) R? Is the formatting consistent, or can you find three different ways of presenting tables, regression results, or graphics? Think carefully about how to design graphics given the statement you want to make, or does the paper always use the first option provided by the software package?

Presentation Guidelines

Even for the presentation, general guidelines are difficult to provide (many hints can also be found online). See also `https://github.com/jens-klenke/ude_slides` for a possible template.

1. Ideally, present as freely as possible.
2. Make eye contact with your audience, not with the projector.
3. Full slides are bad slides.
4. Pay attention to the layout, but do not overdo it.
5. In the presentation, focus on the core message and do not get lost in technical details. Look for concrete examples.
6. You should be able to explain everything on the slides.
7. Plan the timing of the presentation. Practicing with other students is not embarrassing, but professional!
8. You can create an appendix for anticipated questions, e.g. more in-depth questions about your methods, which can be explained more easily using slides.