



University of Cologne

Department of Economics – Chair in Economics and Energy Economics

Seminar Empirical Methods in Energy Economics

Summer Term 2025

Determinants and Effects of Recent Fluctuations in Energy Markets: A Time Series Analysis

The recent years have been marked by unprecedented price movements in the energy markets. Take crude oil, the most traded energy commodity in the world, as an example. The West Texas Intermediate (WTI) oil prices reached a record near 135 USD/bbl in July 2008, but decreased sharply to 40 USD/bbl at the end of 2008 due to the financial crisis. Between mid-2014 and early 2016, there was a fall in oil prices from a peak of 105 USD/bbl in June 2014 to 30 USD/bbl in February 2016. More recently, the WTI prices averaged 81 USD/bbl in October 2021 after plunging to record lows in 2020 due to the global pandemic outbreak of COVID-19. Prices of other energy commodities, such as natural gas, are also volatile and characterized by abrupt movements.

Many studies have examined the effects of energy price shocks on the economic and financial system. It is evident that excessive fluctuations and volatility in energy markets significantly affect economic indicators, such as stock returns, asset prices, inflation, and unemployment rates, particularly in countries that are highly dependent on energy imports. Meanwhile, the more volatile energy prices become, the more uncertainty it creates, leading to instability in the global economy. Therefore, the question of what factors drive energy prices has attracted considerable attention. Generally, energy price fluctuations are influenced by many factors, including supply and demand shocks, exchange rate, macroeconomic conditions, major geopolitical events, and derivatives markets.

In this seminar, students will critically review the current state of literature that adopts time series analysis to model the drivers of energy prices and their fluctuations, as well as the interconnected dynamics within energy markets, and examine the effects of price volatility on economic activities.

Seminar objectives

The seminar aims to provide students with a comprehensive understanding of the key econometric methods used to analyze the determinants and effects of energy price fluctuations. Students will acquire both theoretical and practical knowledge of time series models commonly applied in energy economics research. They will explore how these models can be used to study the drivers of energy price fluctuations and their impacts on broader economic and financial systems. By the end of the seminar, students will develop the necessary skills to conduct independent research, formulate research questions, and apply advanced econometric tools to analyze energy markets, with potential applications for their thesis projects.

Schedule

09.04.2025 10:00-13:30	<i>Introductory meeting</i> - Organizational Issues - Seminar Introduction and Overviews of Topic
14.04.2025 10:00-13:30	<i>Methodological Focus:</i> Key concepts of univariate and multivariate time series analysis within the context of the seminar theme. (Part One)
16.04.2025 10:00-13:30	<i>Methodological Focus:</i> Key concepts of univariate and multivariate time series analysis within the context of the seminar theme. (Part Two)
22.04.2025 10:00-13:30	<i>Methodological Focus:</i> Key concepts of univariate and multivariate time series analysis within the context of the seminar theme. (Part Three)
23.04.2025 10:00-13:30	<i>Hands-On Session:</i> Practical training on applying time series analysis techniques using statistical software. <i>Presentation and Writing Skills:</i> Strategies for effectively presenting research findings and improving academic writing clarity.
24.04.2025 23:59	Deadline to Register or Withdraw from the Examination via KLIPS
Group Meetings (with Mentor) The meeting with the mentor will focus on discussing the main idea and goal of the presentation, as well as providing guidance on its structure and overall development.	
24.06.2025 10:00	Deadline Submission of Presentation Slides to ILIAS
25.06.2025 10:00-13:30	<i>Group Presentations</i> Mandatory
27.06.2025 10:00-13:30	<i>Group Presentations</i> Mandatory
30.08.2025 23:59	Deadline Submission of Final Seminar Paper and Research Proposal

Application

A maximum of 20 applicants can be admitted to the course. Please register for the seminar on KLIPS during the first registration period. After receiving a seat in the seminar, make sure to also register for the examination on KLIPS. Only those who have secured a seat in the seminar are eligible to register for the examination. Therefore, if you decide not to take the seminar, promptly deregister from the course. This allows your peers to enroll for any remaining spots before the exam registration phase ends. Once registered for the examination, your registration is binding. Students who fail to give a presentation or submit their seminar paper on time will receive a failing grade. Therefore, before registering for the course, please ensure that you can meet all requirements within the deadlines and attend the mandatory sessions.

Methodologies and Skills Sessions

Over the course of four sessions, this seminar will offer a comprehensive introduction to key concepts and methodologies in time series analysis, including their practical applications within the context of energy price fluctuations and the seminar theme. The first three sessions will provide an in-depth exploration of the theoretical foundations and empirical methods. The seminar will then shift to a more interactive format with a hands-on session. Additionally, this part of the seminar will focus on developing presentation and academic writing skills.

Examination

The final grade consists of an oral and two written examination parts. To pass the examination, students are required to participate in all parts of the examination.

The final grade for this course will be a weighted average of (the quality of):

- A) presentation of overall topic (51% - 10 minutes - individual grade)
- B) individual seminar paper (35% - 4.000 words)
- C) research proposal (14% - <https://energie.uni-koeln.de/sites/energie/user/Lehre/Lehrstuhl/ProposalTry1.pdf>)

Participation in all examination parts and dates is mandatory in order to complete the course successfully.

Examination part A: a presentation (April – June):

This is the oral part of the examination, aimed at providing and receiving a general overview of the various aspects of the seminar theme. Students will be assigned a specific topic within the seminar's scope and placed into groups. The Chair in Energy Economics will have sole discretion over topic and group allocations. In June, students are expected to present their topics to their peers and engage in discussions with industry experts. Each presentation should offer a comprehensive overview of the assigned topic, critically analyze the current state of the literature (including relevant sources and methods), identify compelling research questions, and examine

potential future developments in the field. Students must effectively structure their topic, divide the presentation components among group members, and ensure that the presentation slides are coherent and consistent. Each student is required to present for 8-10 minutes. Grading will be based on individual performance. For assistance in preparing the presentation, a mentor will be available to help the group.

Examination part B: a seminar paper (June – August):

The aim of this part is for students to become experts in a specific topic within the empirical literature covered in this seminar. Individual seminar topics will be assigned after the group presentations in June. The Chair in Energy Economics holds the sole discretion over topic allocation. Each student will receive a seminar topic different from their presentation topic, enabling them to explore two distinct aspects of the literature, both of which fall under the overarching seminar theme. The written paper should be approximately 4,000 words, with a 10% margin above or below this word count. Students are expected to refine their paper's focus by selecting a research question, providing a comprehensive literature overview, and conducting an in-depth critical analysis of their chosen question. Additionally, each student will have access to a mentor for guidance and support in composing their seminar paper.

Examination part C: a research proposal (June – August):

The aim of this part is to submit a research proposal that may serve as a blueprint for your master's thesis. In your proposal, you should clearly define the research question and its motivation, explain who will be interested in this research and why, outline the contribution to existing literature, describe the methods and data to be used, and highlight any potential empirical or methodological challenges. Please use the template provided by the chair to write the proposal: <https://energie.uni-koeln.de/sites/energie/user/Lehre/Lehrstuhl/ProposalTry1.pdf>

General Requirements

The seminar is designed to prepare students for a master's thesis in the Empirical Analysis of Energy Economics. Participants are expected to independently gain in-depth insights into their topic. Therefore, we expect students to have a solid foundation in Energy Economics and Introductory Econometrics (i.e., have taken other courses in the Energy specialization and Introductory Econometrics) prior to enrolling in the seminar. Should a student not meet these prerequisites, they are encouraged to contact the seminar organizer to discuss alternative arrangements or preparatory options. A deep knowledge of time series models is not required, as the seminar includes two dedicated sessions to introduce and explain this concept to students.

While the seminar topics will be distributed by the chair, students are expected to determine the main focus of their presentations and seminar paper themselves. The emphasis within the own topic as well as the draft structure of the paper, shall be discussed with the mentor at an early stage. Furthermore, students should deal critically with the contributions of other participants.

Active participation in the seminar discussion is expected. Attendance during all presentation days is therefore required.

We provide a guideline for the preparation of seminar papers. This includes all design requirements: (https://energie.uni-koeln.de/sites/energie/pdf/Guideline_English.pdf).

Further Information

Allocated Modules	SpM Energy and Climate Change III
Credits	6
Language	English
Examiner	Markos Farag (mfarag1@uni-koeln.de)
Mentoring and Organization	Markos Farag
Administration	Monike Rätke (raethe@wiso.uni-koeln.de)