

As a power trader you are tasked with analysing the relationship between key commodities and power prices within the Polish electricity market. Based on your findings, you will develop various forecasts in order to develop trading strategies for the upcoming week.

The Polish power market is predominantly fueled by coal and gas-fired power plants, with a rapidly increasing share of renewable energy sources. Recent geopolitical events, including the war in Ukraine have led to heightened volatility in natural gas prices, which directly affect the marginal costs of gas-fired power plants. Moreover, the volatility in coal and CO2 allowance prices continue to influence the economics of coal-fired generation.

In order to complete the following tasks you are given a dataset for Poland, which includes:

1. Historical day-ahead power prices in hourly resolution
2. The prices of nat-gas, hard-coal and CO2 allowances
3. Hourly generation data by type
4. Hourly import/export positions
5. Total installed capacity of solar and wind power plants

The tasks are open-ended, that is, they do not have strictly correct or incorrect answers. Your job is to complete them in a way that you think could be beneficial for power trading. You can use any tools necessary to showcase your skills.

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## Tasks

1. Suppose that you want to understand the influence that key commodities, i.e., prices of natural-gas, coal, CO2 allowances have on day-ahead prices. Model and quantify these relationships, and suggest a potential trading strategy based on your findings.
2. Visualize the evolution of day-ahead power prices over time. Quantify the most obvious trends and provide possible explanations, e.g., seasonality, geopolitical factors etc. If possible, derive some non-trivial observations, that could inform traders better.
3. Develop a detailed analysis of the Polish electricity load profile by identifying distinct patterns and how they have changed throughout time. Visualize the typical weekday and weekend load profile. Moreover, given the aggregate hourly load data, isolate the power load profile of the Polish industrial sector.
4. By using the available dataset you are required to forecast the average day-ahead price for the time period 13.06.2024 – 19.06.2024, given the following conditions:
  - a. Solar output is expected to increase on average by 10% compared to the previous week (06.06.2024-12.06.2024)
  - b. A new wind turbine with an installed capacity of 300MW is set to come online on 13.06.2024, contributing a steady 70% capacity factor 210MW throughout the week
  - c. Meteorologists are certain of a cold-surge during one of the nights, that will increase power-demand by 15% in the period 00-06, however, they cannot pinpoint the exact day when this will happen
  - d. Everything else remains unchanged to the previous week