Reproducibility Award Approach Description

Required files for an entry to be eligible for the Reproducibility Award:

- Zip file containing:
    1. the completed Reproducibility Award approach description
    2. complete documented code files

Approach

Please provide a detailed description of the approach used to calculate the point estimates for the selected countries. The description should contain (1) the data processing steps, (2) the methods and models used, (3) references to the scientific papers/sources that present the methods and models used, and (4) the time it took to calculate the point estimates.

Bear in mind that the approach will also be evaluated by its originality, interpretability, simplicity and quality of assumptions.

General Approach
Our approach uses gas flow data provided by the European Network of Transmission System Operators for Gas (ENTSOG). ENTSOG publicly reports the amount of gas that is transmitted to consumers. In principle, aggregating these reported numbers over a month should yield precise estimates of the total gas consumption in that month.

Data Processing
ENTSOG provides an API for downloading data automatically.
In most countries, several *distribution* and *final consumer* points exist. These points represent stations, where gas is distributed among smaller units (e.g., households) and single consumers of large amounts of gas (e.g., large industrial sites), respectively. To determine the total amount of gas delivered to consumers in each country, we aggregate the transmitted gas at distribution and final consumer points. On the last day of a particular month, we download the described data in daily resolution for all available days of the month in consideration. As a consequence, at least one day (the last day) is not available when performing the nowcast. In some cases, however, the information of more than one day is missing due to a delay in publication of official figures. To make up for that, we simply divide the total flow of the available days by the number of days, obtaining an average daily flow, and multiply this number by the total number of days of the month in consideration. This gives an estimate of the total flow over the month. Further, we convert the measurements from kWh to GWh.
In addition, we download the NRG_CB_GASM indicator published by Eurostat and use it without further processing (see below).

Note on Scalability
We do not provide nowcasts for all countries in the competition, since for some of them we encountered difficulties in identifying which measurement points should be used for aggregation.

However, ENTSOG provides measurements for all European countries, so with a better understanding of their data, it is without doubt possible to extend our method to the remaining countries.

Model

In principle, estimating the total gas flow to *distribution* and *final consumer* points (using the average flow on the available days) should already provide reasonably good estimates for the total consumption – except for a unit conversion. However, since this estimate may not account for all systemic factors (e.g., loss of gas during the transport, additional consumption sites that were not identified, …) we decided to fit a linear regression model with the described aggregated flows as predictors and the gas consumption indicator NRG_CB_GASM as response. Our proposed models only differ in the time window used for fitting the model: the first model uses data from April 2020 onwards, the second one from April 2022 onwards, and the third one uses data from two years before the month that is to be nowcasted. In all three cases, the training data ends with the last month for which the response indicator is available from Eurostat. (We submitted estimates from the first model in identical entries 1 and 2, in case we would find a reason to change the model later on.)

The estimated models do not differ much. The coefficient estimates indicate that the aggregated flows as described above are reasonable predictors: the estimated intercept of the model is always very small compared to the response and is not identified as significant. In addition, the estimated coefficients for the predictors are close to 3.6 in almost all cases, which is the conversion factor from GWh – the unit in which the input variables were measured – to TJ – the unit of the response.

Computation time

Our code takes between 4-5 seconds for obtaining a nowcast for a specific country though most of the time actually passes during the download of training data. The pre-processing of the data takes approximately one second, the actual fitting of the linear model less than 0.01 seconds.

References

A description of the data provided by ENTSOG can be found in the *ENTSOG Professional Data Warehouse System Documentation*.

Linear regression is a standard tool in Statistics and Data Analysis. It is, for example, described in chapter 12 of the book “Statistical Inference” (2002) by George Casella and Roger Berger.

Similarities/differences to State-of-the-Art techniques (optional)

Please provide a list of similarities and differences between the approach and the state-of-the-art techniques.

Our method exploits the fast availability of gas flow data by ENTSOG. This makes it possible to use mathematically very simple methods like a linear model (or even the mere summation) of the reported data instead of more involved approaches. Compared to other State-of-the-Art techniques, this leads to two main advantages:

1. *Interpretability:* How and why the method works is absolutely transparent. In addition, we make basically no modelling assumptions that need to be justified. Furthermore, the estimated coefficients allow for an intuitive interpretation (unit conversion factor).
2. *Sparseness:* For our linear model we have to estimate only two parameters, which leads to improved accuracy and computation time compared to more complex models.

Lessons Learned (optional)

Please state any lessons learned during the competition.

The simplicity and relatively good performance of our method leads to two key findings:

1. The quality of the available data is often at least as important as the choice of the model itself.
2. Simple models, especially the linear model, often produce good predictions, as their simplicity guarantees robustness and reduces the risk of overfitting.

List of Data Sources with Descriptions

For each country, list the data sources (and their description) that were used to calculate the point estimates for the selected country. Please use the template below to provide the information for each source. **If multiple data sources were used, please copy paste the template below and fill it in.**

Bear in mind that the data sources will also be evaluated based on its openness, availability, coverage and consistency.

BE

- ENTSOG Transparency Platform [https://transparency.entsog.eu/#/map]. ENTSOG publishes the amount of gas that flows between certain infrastructure points in Europe, including *distribution* points and *final consumer* points. For each of these points and each day, there is a separate data point.

Number of data points collected from the data source (for each reference period)

June 2023	2312 for fitting the model; 54 for prediction
July 2023	2372 for fitting the model; 60 for prediction
August 2023	2434 for fitting the model; 58 for prediction
September 2023	2496 for fitting the model; 58 for prediction
October 2023	2556 for fitting the model; 58 for prediction
November 2023	2618 for fitting the model; 58 for prediction
December 2023	2678 for fitting the model; 60 for prediction
January 2024	2740 for fitting the model; 60 for prediction
February 2024	2802 for fitting the model; 56 for prediction
March 2024	2860 for fitting the model; 60 for prediction

Structure of the data used to predict the point estimates

Attribute Name	**Attribute Description**
value	Physical gas flow through the pipeline per day, in kWh

- EUROSTAT indicator NRG_CB_GASM [https://ec.europa.eu/eurostat/databrowser/view/nrg_cb_gasm/default/table?lang=en]
  This measurement of the monthly gas consumption is the quantity that we should predict. We downloaded past data to use it for fitting the model.
- **Number of data points collected from the data source (for each reference period)**

June 2023	38 for fitting the model
July 2023	39 for fitting the model

August 2023	40 for fitting the model
September 2023	41 for fitting the model
October 2023	42 for fitting the model
November 2023	43 for fitting the model
December 2023	44 for fitting the model
January 2024	45 for fitting the model
February 2024	46 for fitting the model
March 2024	47 for fitting the model

Structure of the data used to predict the point estimates

Attribute Name	**Attribute Description**
OBS_VALUE	Amount of gas consumption, in TJ

BG

- ENTSOG Transparency Platform [https://transparency.entsog.eu/#/map]. ENTSOG publishes the amount of gas that flows between certain infrastructure points in Europe, including *distribution* points and *final consumer* points. For each of these points and each day, there is a separate data point.

Number of data points collected from the data source (for each reference period)

June 2023	2920 for fitting the model; 87 for prediction
July 2023	3010 for fitting the model; 90 for prediction
August 2023	3103 for fitting the model; 90 for prediction
September 2023	3196 for fitting the model; 87 for prediction
October 2023	3286 for fitting the model; 89 for prediction
November 2023	3379 for fitting the model; 87 for prediction
December 2023	3469 for fitting the model; 90 for prediction
January 2024	3562 for fitting the model; 90 for prediction
February 2024	3655 for fitting the model; 84 for prediction
March 2024	3742 for fitting the model; 89 for prediction

Structure of the data used to predict the point estimates

Attribute Name	**Attribute Description**
value	Physical gas flow through the pipeline per day, in kWh

- EUROSTAT indicator NRG_CB_GASM [https://ec.europa.eu/eurostat/databrowser/view/nrg_cb_gasm/default/table?lang=en]
  This measurement of the monthly gas consumption is the quantity that we should predict. We downloaded past data to use it for fitting the model.
- **Number of data points collected from the data source (for each reference period)**

June 2023	38 for fitting the model
July 2023	39 for fitting the model
August 2023	40 for fitting the model
September 2023	41 for fitting the model

October 2023	42 for fitting the model
November 2023	43 for fitting the model
December 2023	44 for fitting the model
January 2024	45 for fitting the model
February 2024	46 for fitting the model
March 2024	47 for fitting the model

Structure of the data used to predict the point estimates

Attribute Name	Attribute Description
OBS_VALUE	Amount of gas consumption, in TJ

DE

- ENTSOG Transparency Platform [https://transparency.entsog.eu/#/map]. ENTSOG publishes the amount of gas that flows between certain infrastructure points in Europe, including *distribution* points and *final consumer* points. For each of these points and each day, there is a separate data point.

  Number of data points collected from the data source (for each reference period)

June 2023	13595 for fitting the model; 342 for prediction
July 2023	13955 for fitting the model; 356 for prediction
August 2023	14327 for fitting the model; 355 for prediction
September 2023	14699 for fitting the model; 345 for prediction
October 2023	15059 for fitting the model; 349 for prediction
November 2023	15431 for fitting the model; 346 for prediction
December 2023	15791 for fitting the model; 358 for prediction
January 2024	16163 for fitting the model; 359 for prediction
February 2024	16535 for fitting the model; 334 for prediction
March 2024	16883 for fitting the model; 360 for prediction

Structure of the data used to predict the point estimates

Attribute Name	Attribute Description
value	Physical gas flow through the pipeline per day, in kWh

- EUROSTAT indicator NRG_CB_GASM [https://ec.europa.eu/eurostat/databrowser/view/nrg_cb_gasm/default/table?lang=en]
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- **Number of data points collected from the data source (for each reference period)**

June 2023	38 for fitting the model
July 2023	39 for fitting the model
August 2023	40 for fitting the model
September 2023	41 for fitting the model
October 2023	42 for fitting the model
November 2023	43 for fitting the model

December 2023	44 for fitting the model
January 2024	45 for fitting the model
February 2024	46 for fitting the model
March 2024	47 for fitting the model

Structure of the data used to predict the point estimates

Attribute Name	Attribute Description
OBS_VALUE	Amount of gas consumption, in TJ

ES

- ENTSOG Transparency Platform [https://transparency.entsog.eu/#/map]. ENTSOG publishes the amount of gas that flows between certain infrastructure points in Europe, including *distribution* points and *final consumer* points. For each of these points and each day, there is a separate data point.

Number of data points collected from the data source (for each reference period)

June 2023	1156 for fitting the model, 28 for prediction
July 2023	1186 for fitting the model, 29 for prediction
August 2023	1217 for fitting the model, 29 for prediction
September 2023	1248 for fitting the model, 29 for prediction
October 2023	1278 for fitting the model, 29 for prediction
November 2023	1309 for fitting the model, 29 for prediction
December 2023	1339 for fitting the model, 29 for prediction
January 2024	1370 for fitting the model, 30 for prediction
February 2024	1401 for fitting the model, 27 for prediction
March 2024	1430 for fitting the model, 29 for prediction

Structure of the data used to predict the point estimates

Attribute Name	Attribute Description
value	Physical gas flow through the pipeline per day, in kWh

- EUROSTAT indicator NRG_CB_GASM [https://ec.europa.eu/eurostat/databrowser/view/nrg_cb_gasm/default/table?lang=en]
  This measurement of the monthly gas consumption is the quantity that we should predict. We downloaded past data to use it for fitting the model.
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July 2023	39 for fitting the model
August 2023	40 for fitting the model
September 2023	41 for fitting the model
October 2023	42 for fitting the model
November 2023	43 for fitting the model
December 2023	44 for fitting the model
January 2024	45 for fitting the model

February 2024	46 for fitting the model
March 2024	47 for fitting the model

Structure of the data used to predict the point estimates

Attribute Name	Attribute Description
OBS_VALUE	Amount of gas consumption, in TJ

FR

- ENTSOG Transparency Platform [https://transparency.entsog.eu/#/map]. ENTSOG publishes the amount of gas that flows between certain infrastructure points in Europe, including *distribution* points and *final consumer* points. For each of these points and each day, there is a separate data point.

Number of data points collected from the data source (for each reference period)

June 2023	2312 for fitting the model, 57 for prediction
July 2023	2372 for fitting the model, 59 for prediction
August 2023	2434 for fitting the model, 59 for prediction
September 2023	2496 for fitting the model, 58 for prediction
October 2023	2556 for fitting the model, 57 for prediction
November 2023	2618 for fitting the model, 57 for prediction
December 2023	2678 for fitting the model, 59 for prediction
January 2024	2740 for fitting the model, 60 for prediction
February 2024	2802 for fitting the model, 55 for prediction
March 2024	2860 for fitting the model, 60 for prediction

Structure of the data used to predict the point estimates

Attribute Name	Attribute Description
value	Physical gas flow through the pipeline per day, in kWh

- EUROSTAT indicator NRG_CB_GASM [https://ec.europa.eu/eurostat/databrowser/view/nrg_cb_gasm/default/table?lang=en]
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August 2023	40 for fitting the model
September 2023	41 for fitting the model
October 2023	42 for fitting the model
November 2023	43 for fitting the model
December 2023	44 for fitting the model
January 2024	45 for fitting the model
February 2024	46 for fitting the model
March 2024	47 for fitting the model

Structure of the data used to predict the point estimates

Attribute Name	Attribute Description
OBS_VALUE	Amount of gas consumption, in TJ

HR

- ENTSOG Transparency Platform [https://transparency.entsog.eu/#/map]. ENTSOG publishes the amount of gas that flows between certain infrastructure points in Europe, including *distribution* points and *final consumer* points. For each of these points and each day, there is a separate data point.

Number of data points collected from the data source (for each reference period)

June 2023	1156 for fitting the model, 27 for prediction
July 2023	1186 for fitting the model, 28 for prediction
August 2023	1217 for fitting the model, 28 for prediction
September 2023	1248 for fitting the model, 27 for prediction
October 2023	1278 for fitting the model, 28 for prediction
November 2023	1309 for fitting the model, 27 for prediction
December 2023	1339 for fitting the model, 28 for prediction
January 2024	1370 for fitting the model, 28 for prediction
February 2024	1401 for fitting the model, 26 for prediction
March 2024	1430 for fitting the model, 28 for prediction

Structure of the data used to predict the point estimates

Attribute Name	Attribute Description
value	Physical gas flow through the pipeline per day, in kWh

- EUROSTAT indicator NRG_CB_GASM [https://ec.europa.eu/eurostat/databrowser/view/nrg_cb_gasm/default/table?lang=en]
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July 2023	39 for fitting the model
August 2023	40 for fitting the model
September 2023	41 for fitting the model
October 2023	42 for fitting the model
November 2023	43 for fitting the model
December 2023	44 for fitting the model
January 2024	45 for fitting the model
February 2024	46 for fitting the model
March 2024	47 for fitting the model

Structure of the data used to predict the point estimates

Attribute Name	Attribute Description
OBS_VALUE	Amount of gas consumption, in TJ

HU

- ENTSOG Transparency Platform [https://transparency.entsog.eu/#/map]. ENTSOG publishes the amount of gas that flows between certain infrastructure points in Europe, including *distribution* points and *final consumer* points. For each of these points and each day, there is a separate data point.

Number of data points collected from the data source (for each reference period)

June 2023	1156 for fitting the model, 29 for prediction
July 2023	1186 for fitting the model, 30 for prediction
August 2023	1217 for fitting the model, 30 for prediction
September 2023	1248 for fitting the model, 29 for prediction
October 2023	1278 for fitting the model, 30 for prediction
November 2023	1309 for fitting the model, 29 for prediction
December 2023	1339 for fitting the model, 30 for prediction
January 2024	1370 for fitting the model, 30 for prediction
February 2024	1401 for fitting the model, 28 for prediction
March 2024	1430 for fitting the model, 30 for prediction

Structure of the data used to predict the point estimates

Attribute Name	Attribute Description
value	Physical gas flow through the pipeline per day, in kWh

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July 2023	39 for fitting the model
August 2023	40 for fitting the model
September 2023	41 for fitting the model
October 2023	42 for fitting the model
November 2023	43 for fitting the model
December 2023	44 for fitting the model
January 2024	45 for fitting the model
February 2024	46 for fitting the model
March 2024	47 for fitting the model

Structure of the data used to predict the point estimates

Attribute Name	Attribute Description
OBS_VALUE	Amount of gas consumption, in TJ

IT

- ENTSOG Transparency Platform [https://transparency.entsog.eu/#/map]. ENTSOG publishes the amount of gas that flows between certain infrastructure points in Europe, including *distribution* points and *final consumer* points. For each of these points and each day, there is a separate data point.

  Number of data points collected from the data source (for each reference period)

June 2023	1156 for fitting the model, 29 for prediction
July 2023	1186 for fitting the model, 29 for prediction
August 2023	1217 for fitting the model, 29 for prediction
September 2023	1248 for fitting the model, 29 for prediction
October 2023	1278 for fitting the model, 29 for prediction
November 2023	1309 for fitting the model, 29 for prediction
December 2023	1339 for fitting the model, 30 for prediction
January 2024	1369 for fitting the model, 30 for prediction
February 2024	1402 for fitting the model, 29 for prediction
March 2024	1431 for fitting the model, 30 for prediction

  Structure of the data used to predict the point estimates

Attribute Name	**Attribute Description**
value	Physical gas flow through the pipeline per day, in kWh

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September 2023	41 for fitting the model
October 2023	42 for fitting the model
November 2023	43 for fitting the model
December 2023	44 for fitting the model
January 2024	45 for fitting the model
February 2024	46 for fitting the model
March 2024	47 for fitting the model

  Structure of the data used to predict the point estimates

Attribute Name	**Attribute Description**
OBS_VALUE	Amount of gas consumption, in TJ

LU

- ENTSOG Transparency Platform [https://transparency.entsog.eu/#/map]. ENTSOG publishes the amount of gas that flows between certain infrastructure points in Europe, including *distribution* points and *final consumer* points. For each of these points and each day, there is a separate data point.

  Number of data points collected from the data source (for each reference period)

June 2023	1156 for fitting the model, 29 for prediction
July 2023	1186 for fitting the model, 30 for prediction
August 2023	1217 for fitting the model, 29 for prediction
September 2023	1248 for fitting the model, 6 for prediction
October 2023	1254 for fitting the model, 6 for prediction
November 2023	1281 for fitting the model, 6 for prediction
December 2023	1311 for fitting the model, 6 for prediction
January 2024	1342 for fitting the model, 6 for prediction
February 2024	1372 for fitting the model, 6 for prediction
March 2024	1401 for fitting the model, 6 for prediction

  Structure of the data used to predict the point estimates

Attribute Name	**Attribute Description**
value	Physical gas flow through the pipeline per day, in kWh

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  This measurement of the monthly gas consumption is the quantity that we should predict. We downloaded past data to use it for fitting the model.
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August 2023	40 for fitting the model
September 2023	41 for fitting the model
October 2023	42 for fitting the model
November 2023	43 for fitting the model
December 2023	44 for fitting the model
January 2024	45 for fitting the model
February 2024	46 for fitting the model
March 2024	47 for fitting the model

  Structure of the data used to predict the point estimates

Attribute Name	**Attribute Description**
OBS_VALUE	Amount of gas consumption, in TJ

LV

- ENTSOG Transparency Platform [https://transparency.entsog.eu/#/map]. ENTSOG publishes the amount of gas that flows between certain infrastructure points in Europe, including *distribution* points and *final consumer* points. For each of these points and each day, there is a separate data point.

Number of data points collected from the data source (for each reference period)

June 2023	1156 for fitting the model, 28 for prediction
July 2023	1186 for fitting the model, 29 for prediction
August 2023	1217 for fitting the model, 29 for prediction
September 2023	1248 for fitting the model, 29 for prediction
October 2023	1278 for fitting the model, 29 for prediction
November 2023	1309 for fitting the model, 29 for prediction
December 2023	1339 for fitting the model, 29 for prediction
January 2024	1370 for fitting the model, 30 for prediction
February 2024	1401 for fitting the model, 27 for prediction
March 2024	1430 for fitting the model, 29 for prediction

Structure of the data used to predict the point estimates

Attribute Name	**Attribute Description**
value	Physical gas flow through the pipeline per day, in kWh

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  This measurement of the monthly gas consumption is the quantity that we should predict. We downloaded past data to use it for fitting the model.
- **Number of data points collected from the data source (for each reference period)**

June 2023	38 for fitting the model
July 2023	39 for fitting the model
August 2023	40 for fitting the model
September 2023	41 for fitting the model
October 2023	42 for fitting the model
November 2023	43 for fitting the model
December 2023	44 for fitting the model
January 2024	45 for fitting the model
February 2024	46 for fitting the model
March 2024	47 for fitting the model

Structure of the data used to predict the point estimates

Attribute Name	**Attribute Description**
OBS_VALUE	Amount of gas consumption, in TJ

NL

- ENTSOG Transparency Platform [https://transparency.entsog.eu/#/map]. ENTSOG publishes the amount of gas that flows between certain infrastructure points in Europe, including *distribution* points and *final consumer* points. For each of these points and each day, there is a separate data point.

  Number of data points collected from the data source (for each reference period)

June 2023	1491 for fitting the model, 58 for prediction
July 2023	1551 for fitting the model, 60 for prediction
August 2023	1613 for fitting the model, 60 for prediction
September 2023	1675 for fitting the model, 58 for prediction
October 2023	1735 for fitting the model, 60 for prediction
November 2023	1797 for fitting the model, 58 for prediction
December 2023	1857 for fitting the model, 60 for prediction
January 2024	1919 for fitting the model, 60 for prediction
February 2024	1981 for fitting the model, 56 for prediction
March 2024	2039 for fitting the model, 60 for prediction

  Structure of the data used to predict the point estimates

Attribute Name	**Attribute Description**
value	Physical gas flow through the pipeline per day, in kWh

- EUROSTAT indicator NRG_CB_GASM [https://ec.europa.eu/eurostat/databrowser/view/nrg_cb_gasm/default/table?lang=en]
  This measurement of the monthly gas consumption is the quantity that we should predict. We downloaded past data to use it for fitting the model.
- **Number of data points collected from the data source (for each reference period)**

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October 2023	42 for fitting the model
November 2023	43 for fitting the model
December 2023	44 for fitting the model
January 2024	45 for fitting the model
February 2024	46 for fitting the model
March 2024	47 for fitting the model

Structure of the data used to predict the point estimates

Attribute Name	**Attribute Description**
OBS_VALUE	Amount of gas consumption, in TJ

PL

- ENTSOG Transparency Platform [https://transparency.entsog.eu/#/map]. ENTSOG publishes the amount of gas that flows between certain infrastructure points in Europe, including *distribution* points and *final consumer* points. For each of these points and each day, there is a separate data point.

  Number of data points collected from the data source (for each reference period)

June 2023	2312 for fitting the model, 58 for prediction
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August 2023	2434 for fitting the model, 60 for prediction
September 2023	2496 for fitting the model, 58 for prediction
October 2023	2556 for fitting the model, 60 for prediction
November 2023	2618 for fitting the model, 58 for prediction
December 2023	2678 for fitting the model, 60 for prediction
January 2024	2740 for fitting the model, 60 for prediction
February 2024	2802 for fitting the model, 56 for prediction
March 2024	2860 for fitting the model, 56 for prediction

  Structure of the data used to predict the point estimates

Attribute Name	**Attribute Description**
value	Physical gas flow through the pipeline per day, in kWh

- EUROSTAT indicator NRG_CB_GASM [https://ec.europa.eu/eurostat/databrowser/view/nrg_cb_gasm/default/table?lang=en]
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September 2023	41 for fitting the model
October 2023	42 for fitting the model
November 2023	43 for fitting the model
December 2023	44 for fitting the model
January 2024	45 for fitting the model
February 2024	46 for fitting the model
March 2024	47 for fitting the model

  Structure of the data used to predict the point estimates

Attribute Name	**Attribute Description**
OBS_VALUE	Amount of gas consumption, in TJ

PT

- ENTSOG Transparency Platform [https://transparency.entsog.eu/#/map]. ENTSOG publishes the amount of gas that flows between certain infrastructure points in Europe, including *distribution* points and *final consumer* points. For each of these points and each day, there is a separate data point.

  Number of data points collected from the data source (for each reference period)

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October 2023	1278 for fitting the model, 30 for prediction
November 2023	1309 for fitting the model, 29 for prediction
December 2023	1339 for fitting the model, 30 for prediction
January 2024	1370 for fitting the model, 30 for prediction
February 2024	1401 for fitting the model, 28 for prediction
March 2024	1430 for fitting the model, 30 for prediction

  Structure of the data used to predict the point estimates

Attribute Name	**Attribute Description**
value	Physical gas flow through the pipeline per day, in kWh

- EUROSTAT indicator NRG_CB_GASM [https://ec.europa.eu/eurostat/databrowser/view/nrg_cb_gasm/default/table?lang=en]
  This measurement of the monthly gas consumption is the quantity that we should predict. We downloaded past data to use it for fitting the model.
- **Number of data points collected from the data source (for each reference period)**

June 2023	38 for fitting the model
July 2023	39 for fitting the model
August 2023	40 for fitting the model
September 2023	41 for fitting the model
October 2023	42 for fitting the model
November 2023	43 for fitting the model
December 2023	44 for fitting the model
January 2024	45 for fitting the model
February 2024	46 for fitting the model
March 2024	47 for fitting the model

Structure of the data used to predict the point estimates

Attribute Name	**Attribute Description**
OBS_VALUE	Amount of gas consumption, in TJ

RO

- ENTSOG Transparency Platform [https://transparency.entsog.eu/#/map]. ENTSOG publishes the amount of gas that flows between certain infrastructure points in Europe, including *distribution* points and *final consumer* points. For each of these points and each day, there is a separate data point.

  Number of data points collected from the data source (for each reference period)

June 2023	1156 for fitting the model, 28 for prediction
July 2023	1186 for fitting the model, 29 for prediction
August 2023	1217 for fitting the model, 29 for prediction
September 2023	1248 for fitting the model, 29 for prediction
October 2023	1278 for fitting the model, 29 for prediction
November 2023	1309 for fitting the model, 28 for prediction
December 2023	1339 for fitting the model, 29 for prediction
January 2024	1370 for fitting the model, 30 for prediction
February 2024	1401 for fitting the model, 27 for prediction
March 2024	1430 for fitting the model, 30 for prediction

Structure of the data used to predict the point estimates

Attribute Name	**Attribute Description**
value	Physical gas flow through the pipeline per day, in kWh

- EUROSTAT indicator NRG_CB_GASM [https://ec.europa.eu/eurostat/databrowser/view/nrg_cb_gasm/default/table?lang=en]
  This measurement of the monthly gas consumption is the quantity that we should predict. We downloaded past data to use it for fitting the model.
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Structure of the data used to predict the point estimates

Attribute Name	**Attribute Description**
OBS_VALUE	Amount of gas consumption, in TJ

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Structure of the data used to predict the point estimates

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Structure of the data used to predict the point estimates

Attribute Name	**Attribute Description**
OBS_VALUE	Amount of gas consumption, in TJ

Hardware Specifications

Please describe the hardware specifications of the machines that were used to calculate the point estimates.

Machine 1

CPUs	11th Gen Intel® Core™ i5-11600 @ 2.80GHz, 6 Cores
GPUs	Intel® UHD Graphics 750
TPUs	None
Disk space	300 MB for each method, for all months combined

Short description of the team and all team members – area of expertise (optional)

Please provide a description of the team, all team members, their area of expertise and contact information.

Maximilian Ofner and Daniel Strenger both hold MSc's in Mathematics and are currently PhD students at the Institute of Statistics at Graz University of Technology.