**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.

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| --- |
| 1. Filter and transform (scale) the data from eurostat 2. Use ARIMA models for every country and then predict out of sample. The order of the arima models is determined from a grid search through different parameter settings. 3. ARIMA models are quite well-known. Sources:  * “Analysis of Financial Time Series” (Tsay, 2005, <https://cpb-us-w2.wpmucdn.com/blog.nus.edu.sg/dist/0/6796/files/2017/03/analysis-of-financial-time-series-copy-2ffgm3v.pdf>) * Hyndman, R.J., & Athanasopoulos, G. (2018) Forecasting: principles and practice, 2nd edition, OTexts: Melbourne, Australia. OTexts.com/fpp2   (4) Coding: anywhere between half a day and a day, computation time: 3-5 minutes (parallelized calculation) |

## **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.

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## **Lessons Learned (optional)**

Please state any lessons learned during the competition.

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| Obtaining data from other sources is very time consuming. For this series, I wanted to use some transparency data for energy prices. In the end I did not have enough time to test this properly and hence I could not follow that approach. |

# **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.

**Country\_1: AT**

* Production volume in industry - PVI (Eurobase code: STS\_INPR\_M, INDIC\_BT: PROD, NACE\_R2: B-D, S\_ADJ:SCA, UNIT:I15) [https://ec.europa.eu/eurostat/databrowser/view/STS\_INPR\_M/default/table?lang=en]  
  **Number of data points collected from the data source (for each reference period)**

|  |  |
| --- | --- |
| September 2022 | 319 |
| October 2022 | 320 |
| November 2022 | 321 |
| December 2022 | 321 |
| January 2023 | 323 |
| February 2023 | 323 |
| March 2023 | 325 |
| April 2023 | 326 |

**Structure of the data used to predict the point estimates**

|  |  |
| --- | --- |
| **Attribute Name** | **Attribute Description** |
| target | Production volume in industry |

**Country\_2: BE**

* Production volume in industry - PVI (Eurobase code: STS\_INPR\_M, INDIC\_BT: PROD, NACE\_R2: B-D, S\_ADJ:SCA, UNIT:I15) [https://ec.europa.eu/eurostat/databrowser/view/STS\_INPR\_M/default/table?lang=en]  
  **Number of data points collected from the data source (for each reference period)**

|  |  |
| --- | --- |
| September 2022 | 271 |
| October 2022 | 272 |
| November 2022 | 273 |
| December 2022 | 273 |
| January 2023 | 275 |
| February 2023 | 275 |
| March 2023 | 277 |
| April 2023 | 278 |

**Structure of the data used to predict the point estimates**

|  |  |
| --- | --- |
| **Attribute Name** | **Attribute Description** |
| target | Production volume in industry |

**Country\_3: BG**

* Production volume in industry - PVI (Eurobase code: STS\_INPR\_M, INDIC\_BT: PROD, NACE\_R2: B-D, S\_ADJ:SCA, UNIT:I15) [https://ec.europa.eu/eurostat/databrowser/view/STS\_INPR\_M/default/table?lang=en]  
  **Number of data points collected from the data source (for each reference period)**

|  |  |
| --- | --- |
| September 2022 | 271 |
| October 2022 | 272 |
| November 2022 | 273 |
| December 2022 | 273 |
| January 2023 | 275 |
| February 2023 | 275 |
| March 2023 | 277 |
| April 2023 | 278 |

**Structure of the data used to predict the point estimates**

|  |  |
| --- | --- |
| **Attribute Name** | **Attribute Description** |
| target | Production volume in industry |

**Country\_4: CY**

* Production volume in industry - PVI (Eurobase code: STS\_INPR\_M, INDIC\_BT: PROD, NACE\_R2: B-D, S\_ADJ:SCA, UNIT:I15) [https://ec.europa.eu/eurostat/databrowser/view/STS\_INPR\_M/default/table?lang=en]  
  **Number of data points collected from the data source (for each reference period)**

|  |  |
| --- | --- |
| September 2022 | 271 |
| October 2022 | 272 |
| November 2022 | 273 |
| December 2022 | 273 |
| January 2023 | 275 |
| February 2023 | 275 |
| March 2023 | 277 |
| April 2023 | 278 |

**Structure of the data used to predict the point estimates**

|  |  |
| --- | --- |
| **Attribute Name** | **Attribute Description** |
| target | Production volume in industry |

**Country\_5: CZ**

* Production volume in industry - PVI (Eurobase code: STS\_INPR\_M, INDIC\_BT: PROD, NACE\_R2: B-D, S\_ADJ:SCA, UNIT:I15) [https://ec.europa.eu/eurostat/databrowser/view/STS\_INPR\_M/default/table?lang=en]  
  **Number of data points collected from the data source (for each reference period)**

|  |  |
| --- | --- |
| September 2022 | 271 |
| October 2022 | 272 |
| November 2022 | 273 |
| December 2022 | 273 |
| January 2023 | 275 |
| February 2023 | 275 |
| March 2023 | 277 |
| April 2023 | 278 |

**Structure of the data used to predict the point estimates**

|  |  |
| --- | --- |
| **Attribute Name** | **Attribute Description** |
| target | Production volume in industry |

**Country\_6: DE**

* Production volume in industry - PVI (Eurobase code: STS\_INPR\_M, INDIC\_BT: PROD, NACE\_R2: B-D, S\_ADJ:SCA, UNIT:I15) [https://ec.europa.eu/eurostat/databrowser/view/STS\_INPR\_M/default/table?lang=en]  
  **Number of data points collected from the data source (for each reference period)**

|  |  |
| --- | --- |
| September 2022 | 379 |
| October 2022 | 380 |
| November 2022 | 381 |
| December 2022 | 381 |
| January 2023 | 383 |
| February 2023 | 383 |
| March 2023 | 385 |
| April 2023 | 386 |

**Structure of the data used to predict the point estimates**

|  |  |
| --- | --- |
| **Attribute Name** | **Attribute Description** |
| target | Production volume in industry |

**Country\_7: DK**

* Production volume in industry - PVI (Eurobase code: STS\_INPR\_M, INDIC\_BT: PROD, NACE\_R2: B-D, S\_ADJ:SCA, UNIT:I15) [https://ec.europa.eu/eurostat/databrowser/view/STS\_INPR\_M/default/table?lang=en]  
  **Number of data points collected from the data source (for each reference period)**

|  |  |
| --- | --- |
| September 2022 | 271 |
| October 2022 | 272 |
| November 2022 | 273 |
| December 2022 | 273 |
| January 2023 | 275 |
| February 2023 | 275 |
| March 2023 | 277 |
| April 2023 | 278 |

**Structure of the data used to predict the point estimates**

|  |  |
| --- | --- |
| **Attribute Name** | **Attribute Description** |
| target | Production volume in industry |

**Country\_8: EE**

* Production volume in industry - PVI (Eurobase code: STS\_INPR\_M, INDIC\_BT: PROD, NACE\_R2: B-D, S\_ADJ:SCA, UNIT:I15) [https://ec.europa.eu/eurostat/databrowser/view/STS\_INPR\_M/default/table?lang=en]  
  **Number of data points collected from the data source (for each reference period)**

|  |  |
| --- | --- |
| September 2022 | 271 |
| October 2022 | 272 |
| November 2022 | 273 |
| December 2022 | 273 |
| January 2023 | 275 |
| February 2023 | 275 |
| March 2023 | 277 |
| April 2023 | 278 |

**Structure of the data used to predict the point estimates**

|  |  |
| --- | --- |
| **Attribute Name** | **Attribute Description** |
| target | Production volume in industry |

**Country\_9: EL**

* Production volume in industry - PVI (Eurobase code: STS\_INPR\_M, INDIC\_BT: PROD, NACE\_R2: B-D, S\_ADJ:SCA, UNIT:I15) [https://ec.europa.eu/eurostat/databrowser/view/STS\_INPR\_M/default/table?lang=en]  
  **Number of data points collected from the data source (for each reference period)**

|  |  |
| --- | --- |
| September 2022 | 271 |
| October 2022 | 272 |
| November 2022 | 273 |
| December 2022 | 273 |
| January 2023 | 275 |
| February 2023 | 275 |
| March 2023 | 277 |
| April 2023 | 278 |

**Structure of the data used to predict the point estimates**

|  |  |
| --- | --- |
| **Attribute Name** | **Attribute Description** |
| target | Production volume in industry |

**Country\_10: ES**

* Production volume in industry - PVI (Eurobase code: STS\_INPR\_M, INDIC\_BT: PROD, NACE\_R2: B-D, S\_ADJ:SCA, UNIT:I15) [https://ec.europa.eu/eurostat/databrowser/view/STS\_INPR\_M/default/table?lang=en]  
  **Number of data points collected from the data source (for each reference period)**

|  |  |
| --- | --- |
| September 2022 | 367 |
| October 2022 | 368 |
| November 2022 | 369 |
| December 2022 | 369 |
| January 2023 | 371 |
| February 2023 | 371 |
| March 2023 | 373 |
| April 2023 | 374 |

**Structure of the data used to predict the point estimates**

|  |  |
| --- | --- |
| **Attribute Name** | **Attribute Description** |
| target | Production volume in industry |

**Country\_11: FI**

* Production volume in industry - PVI (Eurobase code: STS\_INPR\_M, INDIC\_BT: PROD, NACE\_R2: B-D, S\_ADJ:SCA, UNIT:I15) [https://ec.europa.eu/eurostat/databrowser/view/STS\_INPR\_M/default/table?lang=en]  
  **Number of data points collected from the data source (for each reference period)**

|  |  |
| --- | --- |
| September 2022 | 331 |
| October 2022 | 332 |
| November 2022 | 333 |
| December 2022 | 333 |
| January 2023 | 335 |
| February 2023 | 335 |
| March 2023 | 337 |
| April 2023 | 338 |

**Structure of the data used to predict the point estimates**

|  |  |
| --- | --- |
| **Attribute Name** | **Attribute Description** |
| target | Production volume in industry |

**Country\_12: FR**

* Production volume in industry - PVI (Eurobase code: STS\_INPR\_M, INDIC\_BT: PROD, NACE\_R2: B-D, S\_ADJ:SCA, UNIT:I15) [https://ec.europa.eu/eurostat/databrowser/view/STS\_INPR\_M/default/table?lang=en]  
  **Number of data points collected from the data source (for each reference period)**

|  |  |
| --- | --- |
| September 2022 | 391 |
| October 2022 | 392 |
| November 2022 | 393 |
| December 2022 | 393 |
| January 2023 | 395 |
| February 2023 | 395 |
| March 2023 | 397 |
| April 2023 | 398 |

**Structure of the data used to predict the point estimates**

|  |  |
| --- | --- |
| **Attribute Name** | **Attribute Description** |
| target | Production volume in industry |

**Country\_13: HR**

* Production volume in industry - PVI (Eurobase code: STS\_INPR\_M, INDIC\_BT: PROD, NACE\_R2: B-D, S\_ADJ:SCA, UNIT:I15) [https://ec.europa.eu/eurostat/databrowser/view/STS\_INPR\_M/default/table?lang=en]  
  **Number of data points collected from the data source (for each reference period)**

|  |  |
| --- | --- |
| September 2022 | 295 |
| October 2022 | 296 |
| November 2022 | 297 |
| December 2022 | 297 |
| January 2023 | 299 |
| February 2023 | 299 |
| March 2023 | 301 |
| April 2023 | 302 |

**Structure of the data used to predict the point estimates**

|  |  |
| --- | --- |
| **Attribute Name** | **Attribute Description** |
| target | Production volume in industry |

**Country\_14: HU**

* Production volume in industry - PVI (Eurobase code: STS\_INPR\_M, INDIC\_BT: PROD, NACE\_R2: B-D, S\_ADJ:SCA, UNIT:I15) [https://ec.europa.eu/eurostat/databrowser/view/STS\_INPR\_M/default/table?lang=en]  
  **Number of data points collected from the data source (for each reference period)**

|  |  |
| --- | --- |
| September 2022 | 271 |
| October 2022 | 272 |
| November 2022 | 273 |
| December 2022 | 273 |
| January 2023 | 275 |
| February 2023 | 275 |
| March 2023 | 277 |
| April 2023 | 278 |

**Structure of the data used to predict the point estimates**

|  |  |
| --- | --- |
| **Attribute Name** | **Attribute Description** |
| target | Production volume in industry |

**Country\_15: IT**

* Production volume in industry - PVI (Eurobase code: STS\_INPR\_M, INDIC\_BT: PROD, NACE\_R2: B-D, S\_ADJ:SCA, UNIT:I15) [https://ec.europa.eu/eurostat/databrowser/view/STS\_INPR\_M/default/table?lang=en]  
  **Number of data points collected from the data source (for each reference period)**

|  |  |
| --- | --- |
| September 2022 | 391 |
| October 2022 | 392 |
| November 2022 | 393 |
| December 2022 | 393 |
| January 2023 | 395 |
| February 2023 | 395 |
| March 2023 | 397 |
| April 2023 | 398 |

**Structure of the data used to predict the point estimates**

|  |  |
| --- | --- |
| **Attribute Name** | **Attribute Description** |
| target | Production volume in industry |

**Country\_16: LT**

* Production volume in industry - PVI (Eurobase code: STS\_INPR\_M, INDIC\_BT: PROD, NACE\_R2: B-D, S\_ADJ:SCA, UNIT:I15) [https://ec.europa.eu/eurostat/databrowser/view/STS\_INPR\_M/default/table?lang=en]  
  **Number of data points collected from the data source (for each reference period)**

|  |  |
| --- | --- |
| September 2022 | 295 |
| October 2022 | 296 |
| November 2022 | 297 |
| December 2022 | 297 |
| January 2023 | 299 |
| February 2023 | 299 |
| March 2023 | 301 |
| April 2023 | 302 |

**Structure of the data used to predict the point estimates**

|  |  |
| --- | --- |
| **Attribute Name** | **Attribute Description** |
| target | Production volume in industry |

**Country\_17: LV**

* Production volume in industry - PVI (Eurobase code: STS\_INPR\_M, INDIC\_BT: PROD, NACE\_R2: B-D, S\_ADJ:SCA, UNIT:I15) [https://ec.europa.eu/eurostat/databrowser/view/STS\_INPR\_M/default/table?lang=en]  
  **Number of data points collected from the data source (for each reference period)**

|  |  |
| --- | --- |
| September 2022 | 271 |
| October 2022 | 272 |
| November 2022 | 273 |
| December 2022 | 273 |
| January 2023 | 275 |
| February 2023 | 275 |
| March 2023 | 277 |
| April 2023 | 278 |

**Structure of the data used to predict the point estimates**

|  |  |
| --- | --- |
| **Attribute Name** | **Attribute Description** |
| target | Production volume in industry |

**Country\_18: MT**

* Production volume in industry - PVI (Eurobase code: STS\_INPR\_M, INDIC\_BT: PROD, NACE\_R2: B-D, S\_ADJ:SCA, UNIT:I15) [https://ec.europa.eu/eurostat/databrowser/view/STS\_INPR\_M/default/table?lang=en]  
  **Number of data points collected from the data source (for each reference period)**

|  |  |
| --- | --- |
| September 2022 | 271 |
| October 2022 | 272 |
| November 2022 | 273 |
| December 2022 | 273 |
| January 2023 | 275 |
| February 2023 | 275 |
| March 2023 | 277 |
| April 2023 | 278 |

**Structure of the data used to predict the point estimates**

|  |  |
| --- | --- |
| **Attribute Name** | **Attribute Description** |
| target | Production volume in industry |

**Country\_19: PL**

* Production volume in industry - PVI (Eurobase code: STS\_INPR\_M, INDIC\_BT: PROD, NACE\_R2: B-D, S\_ADJ:SCA, UNIT:I15) [https://ec.europa.eu/eurostat/databrowser/view/STS\_INPR\_M/default/table?lang=en]  
  **Number of data points collected from the data source (for each reference period)**

|  |  |
| --- | --- |
| September 2022 | 272 |
| October 2022 | 273 |
| November 2022 | 273 |
| December 2022 | 273 |
| January 2023 | 276 |
| February 2023 | 276 |
| March 2023 | 278 |
| April 2023 | 279 |

**Structure of the data used to predict the point estimates**

|  |  |
| --- | --- |
| **Attribute Name** | **Attribute Description** |
| target | Production volume in industry |

**Country\_20: RO**

* Production volume in industry - PVI (Eurobase code: STS\_INPR\_M, INDIC\_BT: PROD, NACE\_R2: B-D, S\_ADJ:SCA, UNIT:I15) [https://ec.europa.eu/eurostat/databrowser/view/STS\_INPR\_M/default/table?lang=en]  
  **Number of data points collected from the data source (for each reference period)**

|  |  |
| --- | --- |
| September 2022 | 271 |
| October 2022 | 272 |
| November 2022 | 273 |
| December 2022 | 273 |
| January 2023 | 275 |
| February 2023 | 275 |
| March 2023 | 277 |
| April 2023 | 278 |

**Structure of the data used to predict the point estimates**

|  |  |
| --- | --- |
| **Attribute Name** | **Attribute Description** |
| target | Production volume in industry |

**Country\_21: SE**

* Production volume in industry - PVI (Eurobase code: STS\_INPR\_M, INDIC\_BT: PROD, NACE\_R2: B-D, S\_ADJ:SCA, UNIT:I15) [https://ec.europa.eu/eurostat/databrowser/view/STS\_INPR\_M/default/table?lang=en]  
  **Number of data points collected from the data source (for each reference period)**

|  |  |
| --- | --- |
| September 2022 | 271 |
| October 2022 | 272 |
| November 2022 | 273 |
| December 2022 | 273 |
| January 2023 | 275 |
| February 2023 | 275 |
| March 2023 | 277 |
| April 2023 | 278 |

**Structure of the data used to predict the point estimates**

|  |  |
| --- | --- |
| **Attribute Name** | **Attribute Description** |
| target | Production volume in industry |

**Country\_22: SI**

* Production volume in industry - PVI (Eurobase code: STS\_INPR\_M, INDIC\_BT: PROD, NACE\_R2: B-D, S\_ADJ:SCA, UNIT:I15) [https://ec.europa.eu/eurostat/databrowser/view/STS\_INPR\_M/default/table?lang=en]  
  **Number of data points collected from the data source (for each reference period)**

|  |  |
| --- | --- |
| September 2022 | 295 |
| October 2022 | 296 |
| November 2022 | 297 |
| December 2022 | 297 |
| January 2023 | 299 |
| February 2023 | 299 |
| March 2023 | 301 |
| April 2023 | 302 |

**Structure of the data used to predict the point estimates**

|  |  |
| --- | --- |
| **Attribute Name** | **Attribute Description** |
| target | Production volume in industry |

**Country\_23: SK**

* Production volume in industry - PVI (Eurobase code: STS\_INPR\_M, INDIC\_BT: PROD, NACE\_R2: B-D, S\_ADJ:SCA, UNIT:I15) [https://ec.europa.eu/eurostat/databrowser/view/STS\_INPR\_M/default/table?lang=en]  
  **Number of data points collected from the data source (for each reference period)**

|  |  |
| --- | --- |
| September 2022 | 271 |
| October 2022 | 272 |
| November 2022 | 273 |
| December 2022 | 273 |
| January 2023 | 275 |
| February 2023 | 275 |
| March 2023 | 277 |
| April 2023 | 278 |

**Structure of the data used to predict the point estimates**

|  |  |
| --- | --- |
| **Attribute Name** | **Attribute Description** |
| target | Production volume in industry |

# **Hardware Specifications**

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

**Machine 1**

|  |  |
| --- | --- |
| CPUs | 8x Intel Core i7-7700HQ CPU @ 2.80 GHz, 16GB RAM |
| GPUs | none used |
| TPUs | none used |
| Disk space | 636 MB |

# **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.

|  |
| --- |
| Christian Url, Data Scientist, MSc in Statistics, christian.url@protonmail.com |