Assessing the Impact of Environmental, Geopolitical, and Health Factors on Global Economic Stability

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Research Questions

- Modeling the impact of Climate Change on the British economy: How do greenhouse gas emissions affect GDP from 2022 to 2023? (do not count pandemic period)
- Modeling the economic impact of the UK leaving the EU: Was Brexit a good decision?
- Modeling the Effects of Global Pandemics on the British Economy: To what extent did death count affect productivity?

Motivation

Our primary motivation behind choosing these research questions is the significance of exploring economic dynamics and how they affect decision-making processes at national and international levels. Understanding the potential impacts of climate change policies on global trade, along with the consequences of the UK's relationship with the EU and the effects of global pandemics all contribute towards this. By analyzing and contextualizing the interplay between environmental, geopolitical, and health factors, this research contributes to enhancing our understanding of the dynamic nature of the global economy. The insights gained from this analysis can inform policymakers, businesses, and communities in devising strategies to mitigate risks, capitalize on opportunities, and foster sustainable and resilient economic growth

Data Setting

Environmental Environmental Account (Estimates of greenhouse gas emissions): experimental estimates of total greenhouse gas (GHG) and carbon dioxide (CO2) emissions, quarter 1 1998 to quarter 2 2022.
Economic output (GDP): the percentage change on growth of domestic product from 1955 to 2023 based on quarters.
Employment Rate: Employment rate in the UK aged 16-64 from 1992 APR to 2023 OCT.
Unemployment Rate: Unemployment rate aged 16+ from 1992 APR to 2023 OCT.
Inflation: Annual inflation rate of all times in the UK from 1989 to 2023.
Health and Social Care: weekly provisional figures of care home resident deaths regstered in England and Wales from 2021 to 2023.

Research Question and Related Datasets

1) Predicting the Economic Impact of Climate Change Policies on Global Trade
    - Datasets:
        - Environmental Accounts (Estimates of greenhouse gas emissions
        - Economic Output (GDP)
2) Predicting the impact of UK rejoining the EU
    - Datasets:
        - Employment, Unemployment
        - GDP
        - Inflation
3) Modeling the Effects of Global Pandemics on the British Economy
    - Datasets:
        - Health and Social Care (weekly provisional death count 2021-2023)
        - GDP

Types of Data Included:

Employment: (1992 APR - 2023 OCT), (Employment Rate)
Unemployment: (1992 APR - 2023 OCT), (Unemployment Rate)
Population: (1971 - 2021), (population number)
GDP: (1955 Q2 - 2023 Q3), (GDP Growth% (-20 - +20))
Inflation: (1989- 2023), (Inflation %)
Green gas emissions: (1998 Q1 - 2022 Q2), (total GHG emissions), (total CO2 emissions)
UK Pandemic Death: (week number), (week ended), (Total deaths England and Wales)

URL

- LFS Experimental: Employment rate: UK: All: Aged 16-64 (%): https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/timeseries/s2pw/lms
- LFS Experimental: ILO Unemployment rate: UK: All: Aged 16+ (%): https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/timeseries/s2pu/lms
- CPIH ANNUAL RATE 00: ALL ITEMS 2015=100 (Inflation): https://www.ons.gov.uk/economy/inflationandpriceindices/timeseries/l55o/mm23
- Gross Domestic Product: Quarter on Quarter growth: CVM SA %: https://www.ons.gov.uk/economy/grossdomesticproductgdp/timeseries/ihyq/qna
- United Kingdom population mid-year estimate: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/timeseries/ukpop/pop
- Environmental Accounts https://www.ons.gov.uk/economy/environmentalaccounts/datasets/experimentalestimatesofquarterlygreenhousegasemissions)
- Pandemic Weekly Deaths in UK https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/datasets/carehomeresidentdeathsregisteredinenglandandwalesprovisional

3 ways complicate/deepen analysis

- If the dataset was conducted before new research regarding climate change was released then it could affect the model. Additionally, the effects of climate change have been increasingly worse in recent years; data from more than 5 years ago would represent the current state of matters sufficiently enough
- If the census was conducted before Brexit, it would not give an accurate representation of employment, GDP etc. as generally the British economy was better before Brexit than after
- Missing or incomplete data entries, especially in the context of recent global pandemics, may require imputation or other preprocessing techniques to ensure comprehensive analysis.

Challenge Goals

- Multiple Datasets
    - Our analysis will integrate at least three distinct datasets, employing join/merge operations to assess the impact of climate policies, EU membership, and pandemics on economic dynamics.
- Machine Learning
    - We will utilize advanced machine learning algorithms beyond those available in the scikit-learn library, or compare multiple scikit-learn models with various hyperparameters, to analyze and predict economic outcomes based on our datasets.
    - We will also use new Machine Learning libraries, pytorch, scipy, tensorflow

Method

The analysis will proceed through several steps, each designed to address our research questions comprehensively:

- Data Preprocessing: Clean and prepare datasets for analysis, including normalization, handling missing values, and merging related datasets.
- Exploratory Data Analysis (EDA): Conduct EDA to identify trends, patterns, and anomalies within the datasets.
- Model Selection and Implementation: Choose appropriate machine learning models for predictive analysis. We'll explore models beyond scikit-learn for innovative approaches or compare multiple scikit-learn algorithms.
- Model Training and Testing: Train models using historical data and test their predictive accuracy on unseen data.
- Analysis and Interpretation: Analyze model outputs to draw conclusions regarding our research questions. Assess the economic impact of climate policies, the potential effects of the UK rejoining the EU, and strategies to mitigate economic disruptions from pandemics.
- Validation: Validate our findings through statistical testing or other methodologies to ensure accuracy and reliability.

Plan

1. Data Collection and Cleaning (20 hours): Gathering datasets and preparing them for analysis.
2. Exploratory Data Analysis (15 hours): Conducting initial analyses to understand the datasets better.
3. Model Selection and Training (30 hours): Choosing suitable models, tuning hyperparameters, and training the models.
4. Prediction and Validation (25 hours): Making predictions based on the models and validating the results.
5. Analysis and Reporting (20 hours): Interpreting the data, drawing conclusions, and compiling findings into a comprehensive report.