Friedrich-Alexander-Universität
Technische Fakultät

FAU

Analyzing the Correlation Between Temperature Changes and Food Price Inflation in Selected African Countries

Introduction

Background:

- In a rapidly changing world, understanding the complex interactions between climate change and economic factors is crucial.

Project Objective:

- To examine the relationships between temperature changes and food price inflation.
- Aiming to develop insights that could assist policymakers in mitigating the negative impacts of climate change on food security.

Key Topics of the Report:

1. How Have Temperature Changes and Food Price Inflation Varied Over the Years?
2. How Are Temperature Changes Correlated with Food Price Inflation?
3. Analysis of the Correlation Between Temperature Change and Food Price Inflation in Individual Countries.

Methods & Data Sources

Data-Source 1: World Bank

- **Why chosen?** Chosen for their extensive data on global economic indicators.
- **Reliability:** Known for reliable and comprehensive data.
- **Data Type:** CSV Monthly food price inflation estimates for 25 African countries.
- **Challenges:** Sporadic functionality of the download link; had to ensure extra care in data handling.

Transformations:

- Elimination of rows with zero values.
- Restriction to columns: Inflation, Country, Months, Year.

Methods & Data Sources

Data-Source 2: FAOSTAT

- **Why chosen?** Sourced for extensive climate-related datasets, particularly temperature data.
- **Reliability:** Consistent and uninterrupted access throughout the project.
- **Data Type:** CSV The FAOSTAT Temperature Data.

Transformations:

- Restriction to monthly data for alignment with World Bank data.
- Conversion of year data from columns to rows.
- Transformation of year values from strings to integers.

Technical Setup

Used Technologies:

- Python with Jupyter Notebook, Git, GitHub, Anaconda.
- **Libraries / Frameworks:** Pandas, PyTest, Requests, zipfile, io, SQLite

Architecture & Other:

- **pipeline.py:** A pipeline to load and store the needed data in a database.
- **test.py:** Contains unit- and system tests.
- **project-plan.md:** Used, in conjunction with GitHub's issues-feature, to plan and direct the project.
- **exploration.ipynb:** Used to explore the data / see if it is fitting
- **report.ipynb:** Contains the whole report / the results of the study.
- **test.sh, pipeline.sh:** Used as an entry point for the CI-Pipeline (realized with GitHub-Action).

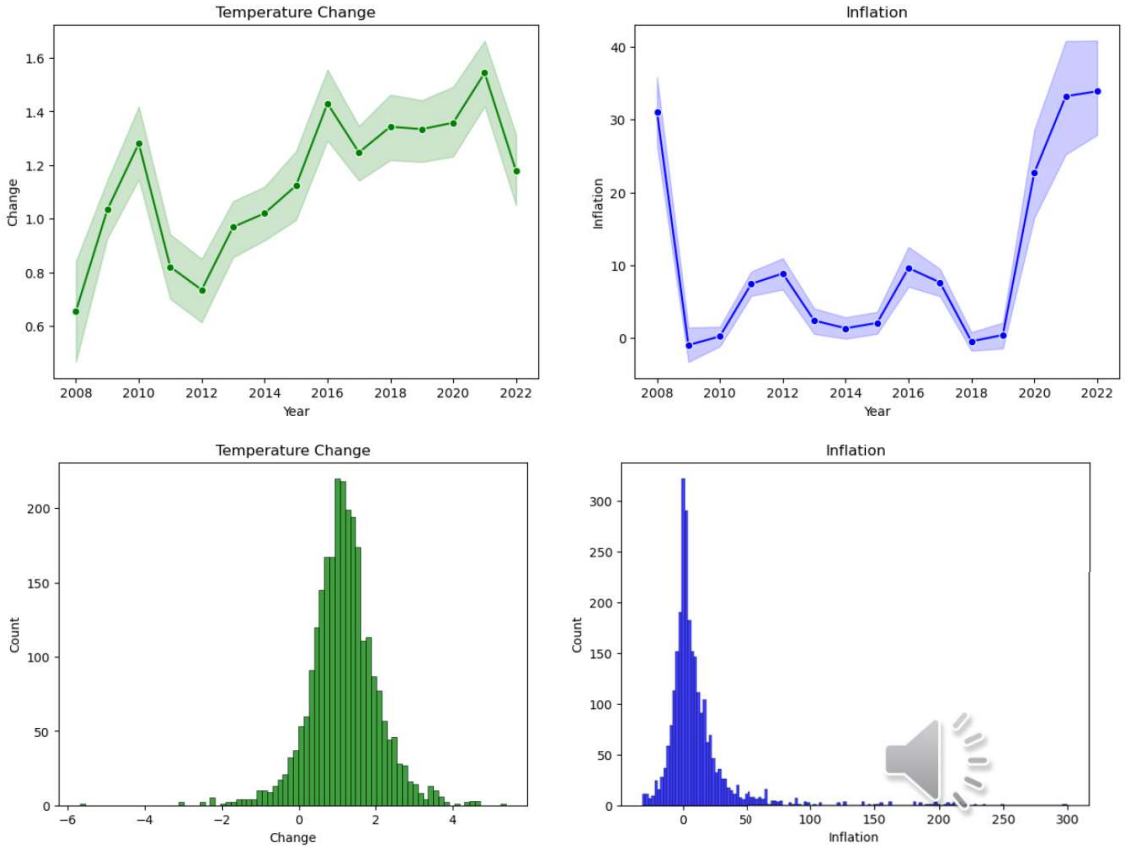
Results: How Have Temperature Changes and Food Price Inflation Varied Over the Years?

Analysis Using Visualizations:

- Line plots show average yearly temperature and inflation with variability ranges.
- Histograms reveal the distribution of temperature changes and inflation rates.

Key Observations:

- Noticeable rise in average temperatures in recent years, reflecting ongoing climate change.
- Inflation trending upwards, particularly from 2020-2022, potentially influenced by market factors and global events like the pandemic.
- Temperature changes typically between 1.0°C to 2.5°C, with extreme drops to -6°C indicating unusual weather events.
- Inflation rates usually at 10-20%, with spikes up to 300% signaling severe economic shocks.



Results: Correlation Between Temperature Changes & Food Price Inflation

Statistical Tools Used:

Heatmap visualization to display correlation.

Pearson's r coefficient to quantify correlation strength.

Understanding Pearson's r:

Ranges from -1 (perfect negative) to +1 (perfect positive).

Values near 0 indicate a weak or no correlation.

Analytical Approach:

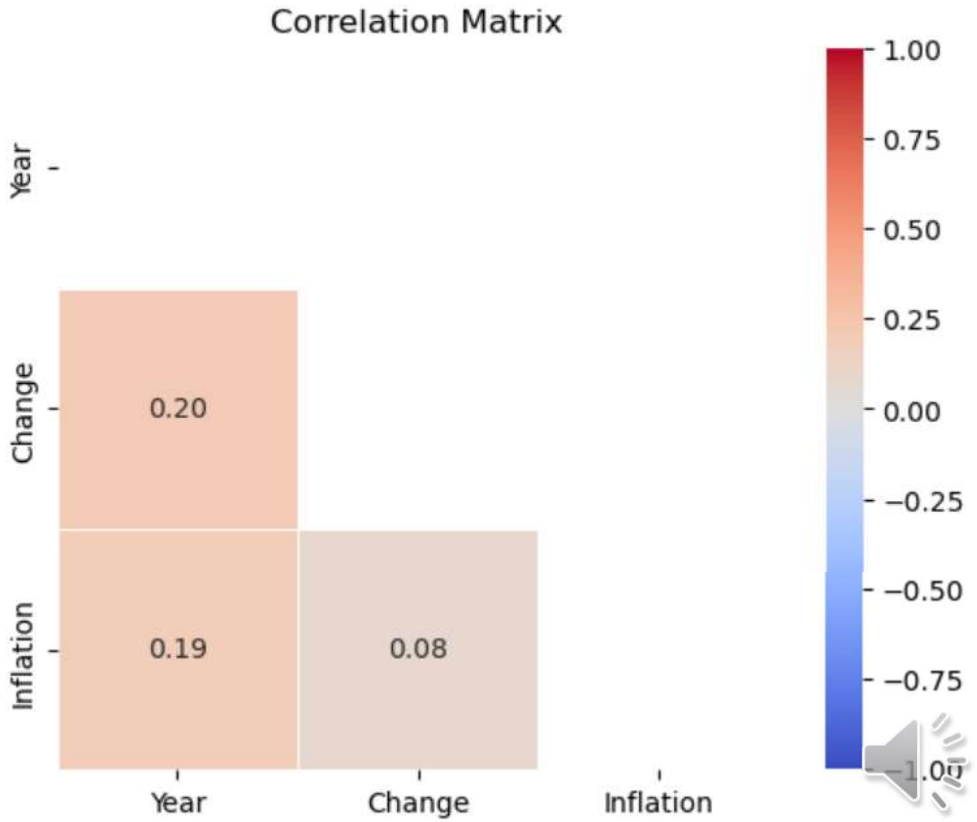
Calculated the correlation matrix for the dataset.

Applied a mask to the upper triangle of the heatmap for clarity.

Key Findings:

No significant continental-scale correlation between temperature and inflation.

Yearly changes in temperature and inflation show no consistent pattern.



Results: Country-Specific Correlation Between Temperature & Food Price Inflation

Localized Analysis Approach:

- Segment dataset by country for focused analysis.
- Use line plots and Pearson's r to measure country-specific correlations.

Visualization Techniques:

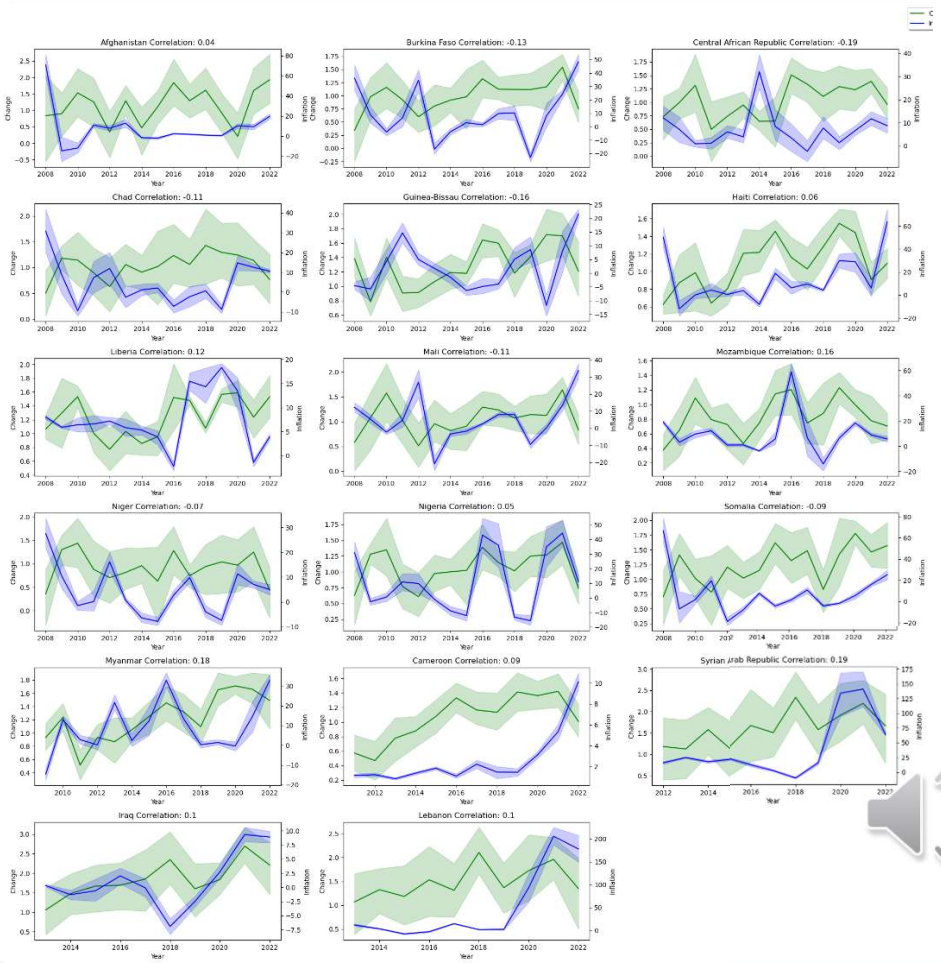
- Subplot line plots for temperature change ('Change') and inflation for each country.
- Dual-axis representation for clear comparison of variables.

Correlation Evaluation:

- Pearson's r calculated for each country to quantify the correlation.
- Correlation results are displayed on each subplot for immediate reference.

Overall Findings:

- No substantial correlation detected within individual countries.
- Indicates that factors other than temperature may be more crucial in driving food price inflation.



Conclusion

Regional Overview:

- No significant correlation found between temperature changes and food price inflation across the 25 African countries studied.
- Suggests other factors have a more pronounced impact on food price inflation.

Year-to-Year Variations:

- No consistent correlation between annual temperature changes and inflation rates.
- Indicates the influence of various factors beyond temperature on food prices.

Country-Specific Analysis:

- Analysis of individual countries confirms the regional trend: no significant correlation observed.
- Reinforces the idea that factors other than temperature are determining inflation.

Broader Implications:

- Highlights the complexity of food markets and their susceptibility to multiple influences.
- Emphasizes the need for a multifaceted approach in addressing food price stability and economic resilience.

Limitations

Data Completeness:

- Presence of missing values in the temperature dataset which could affect correlation accuracy.

Geographic Data Scope:

- Food price data limited to 25 African countries, excluding major global economies.
- A broader dataset could enhance understanding of the global correlation.

Influence of Confounding Variables:

- Other factors like socio-economic policies and global market dynamics were not extensively examined.
- Such variables could significantly impact food prices and potentially skew correlation results.

Data Accessibility:

- Potential issues with data availability from the World Bank were preempted by early local data download.

Future Research Directions:

- Necessity for more expansive and inclusive data collection.
- Need to consider a wider array of influencing factors in subsequent studies.

Questions for Further Research

Additional Influencing Factors:

- Investigate the impact of socio-economic policies, supply chain dynamics, regional conflicts, and global market trends on food price inflation.

Geographic Data Expansion:

- Seek food price inflation data from major economies and emerging markets to enrich the study's global perspective.
- Examine how incorporating broader geographic data affects our understanding of price dynamics.

Climate Change Policies:

- Analyze the influence of climate change policies on food price inflation across different regions.
- Study the effects of environmental regulations and sustainability practices on agriculture and food markets.

Thank you for your attention!

https://github.com/Zylesto/made-template/tree/main