

CIS 635 03 Term Project Proposal (GJKS)

Garrit Reynolds, Katherine Parker, Joseph Van Liew, Sam Kiel

Overview of the Project

Study Prices in Nations Reliant on Ukrainian Agricultural Products

Russia and Ukraine were the first and fifth largest wheat exporting countries in the world in 2021 (World Population Review, 2025). The conflict between these two nations has taken a toll on global food security, particularly since the beginning of the full-scale invasion. Our group will conduct a study in the economic domain to examine the effects of this conflict on the prices of agricultural products in the most affected nations. We aim to discover the impact of many events, including, but not limited to, the Black Sea Grain Initiative and the full-scale invasion.

We will calculate price changes across affected nations at the inception, conclusion (if applicable), and for the duration of relevant events. These price changes will be compared and aggregated to extract conclusions about the quantitative effect of these events on food security. The insights gained will provide actionable recommendations for economic policy makers to protect their constituents from future geopolitical crises.

Related Work

Previous studies have examined food security and the impact of the Russia-Ukraine conflict on global markets. For example:

Elleby et al. (2023) used simulation scenarios to assess the effect of the conflict on product prices in select countries. Fan et al. (2023) estimated that agriculture prices in countries reliant on Ukrainian grain imports could increase by 3%–18%. Hensel (2024) observed a substantial increase in the UN FAO food price indices after Russia’s invasion, with a decline corresponding to the Black Sea Initiative and other global efforts. Our study will extend these analyses by examining a wider range of years and comparing findings from nations most dependent on Ukrainian exports.

Data Plan

The primary data sources for this project are:

The Food Price Monitoring and Analysis Tool (FPMA) by the Food and Agriculture Organization of the United Nations. The BACI dataset, which provides import/export data for over 200 countries at the product level. We will focus on countries highly dependent on Ukrainian agricultural products (e.g. Egypt, Indonesia, Pakistan, Bangladesh, Lebanon, Tunisia, Yemen, Libya). The study covers up to 30 years, focusing on key geopolitical events, especially the full-scale invasion of 2022.

Key preprocessing steps include the following.

Standardizing food and agricultural product classifications (BACI uses various HS versions, while FPMA uses HS2017). Visualizing data to identify outliers, trends, and missing values.

Handling missing data (e.g., imputing with mean, median, or mode based on historical context). Removing duplicate entries and outliers. Normalization of data through Z-score normalization. Cross-referencing with reliable sources to verify data integrity.

Implementation Plan

Data Mining Pipeline

Data Acquisition:

Extract historical price data from FPMA and BACI. Classify agricultural products using HS2017 codes. Store raw data in Pandas DataFrames.

Data Preprocessing:

Standardize product classifications. Apply sklearn-based imputation and Z-score normalization.

Exploratory Data Analysis (EDA):

Generate descriptive statistics. Visualize distributions and time series trends.

Impact Analysis:

Conduct event studies to analyze price fluctuations before, during, and after key events. Compute percentage changes and moving averages.

Visualization and Reporting:

Develop interactive visualizations using Matplotlib, Seaborn, and HTML reports. Create summary tables with actionable insights.

Implementation Strategy:

Prototype in Google Colab. Use GitHub for version control and collaborative development. Employ Python libraries such as Pandas, Statsmodels, and sklearn.

Components and Libraries

Statsmodels (for time series analysis) Sklearn (StandardScaler, SimpleImputer) Matplotlib, Seaborn, and HTML for visualizations Google Colab for initial testing and development

Evaluation Plan

To evaluate our data mining algorithm, we will compare our conclusions with similar studies using percentage difference metrics. Our evaluation includes:

- **Single-Value Comparisons:** Calculate simple percent differences.
- **Time Series Comparisons:** Use average percent differences.
- **Handling Different Dates:** Apply linear projections where necessary.
- **Normalization:** Adjust comparisons between nations or units to account for scale differences.

Plan for Group Collaboration

Our group will typically meet weekly, on Fridays, and will communicate any changes in schedule as needed. A discord server is being utilized to communicate both asynchronously and synchronously by using text and voice channels.

We plan to collaborate to implement our data pipeline by managing our code and data via Github. Action items will be split among the group during each weekly meeting as we progress through the project. Effective deadlines will be determined for those tasks as they are likely to be dependent on each other. The timeline below establishes our goals for each week of the project.

Timeline

Week	Task	Goals
Week 8 (2/24)	Project proposal due; Meetings @ 2/24 (1:00pm) and 2/27 (1:00pm)	Finalize data plan, split proposal responsibilities
Week 9 (3/03)	No Meeting (Break)	—
Week 10 (3/10)	Meeting 3/14 @ 10am	Data acquisition & preprocessing
Week 11 (3/17)	Meeting 3/21 @ 10am	Exploratory analysis
Week 12 (3/24)	Progress report due; Meeting 3/28 @ 10am	Impact analysis of geopolitical events
Week 13 (3/31)	Meeting 4/4 @ 10am	Visualizations & evaluation
Week 14 (4/07)	Meeting 4/11 @ 10am	Write up findings
Week 15 (4/14)	Final report due; Meet- ing 4/18 @ 10am	Finalize project

References

1. Elleby, C., Dominguez, I. P., Genovese, G., Thompson, W., Adenauer, M., & Gay, H. (2023). A perfect or persistent storm for global agricultural markets: High energy prices and the Russia-Ukraine war. *Choices Magazine*, 38(2), 4–9. Retrieved February 28, 2025, from <https://research.ebsco.com/c/615vh5/viewer/pdf/rk3yvi5yuj>
2. Fan, F., Jia, N., & Lin, F. (2023). Quantifying the impact of Russia–Ukraine crisis on food security and trade pattern: Evidence from a structural general equilibrium trade model. *China Agricultural Economic Review*, 15(2), 241–258. <https://doi.org/10.1108/CAER-07-2022-0156>
3. Hensel, N. (2024). The Russia-Ukraine crisis: How regional conflicts impact the global economy. *PRISM Security Studies Journal*, 10(4), 102–122. Retrieved February 28, 2025, from <https://research.ebsco.com/c/615vh5/viewer/pdf/jcz5rabj7b>
4. World Population Review. (n.d.). *Wheat exports by country*. Retrieved February 28, 2025, from <https://worldpopulationreview.com/country-rankings/wheat-exports-by-country>