

Predicting Future Farm Product Prices

James Bootsma, Aditya Manickam Arumugam, Krishang Karir, Abdul Aziz Essam, Mohd Daiyaan Nasir

Description of Applied Problem

Accurate predictions of farm product prices are crucial for the agricultural sector. Therefore, this project aims to develop a predictive model using historical climate^[1, 2] and economic^[3] data to forecast future prices. Empowering stakeholders to make informed decisions, optimize productivity, and enhance resilience against economic fluctuations in the agricultural sector.

Description of Available Data

1. **Farm Product Price Data** - Monthly prices of various farm [products](#) across Canada.^[4]
2. **Historical Climate Data** - Monthly climate statistics including temperature, precipitation, and snowfall by weather station.^[5]
3. **Agricultural Gross Domestic Product** - GDP of crop and animal production.^[6, 7]
4. **Oil Prices** - Monthly average oil prices across Canadian cities.^[8]

Plan for Analysis and Visualization

1. **Data Preprocessing:**
 - The data sources climate and oil prices from multiple locations in each province and territory. We aggregated this data using the mean by province and territory.
 - Monthly GDP by province is calculated by distributing the monthly national agricultural GDP based on each province's annual agricultural GDP share.
2. **Feature Engineering:**
 - Develop features such as seasonal averages, extreme weather events, and lagged climate variables to capture their impact on farm product prices.
 - Calculate additional economic features (e.g., GDP growth rate, oil price changes) to incorporate economic context.
3. **Exploratory Data Analysis (EDA):**
 - Visualize the relationships between climate variables, economic indicators, and farm product prices using scatter plots, heat maps, and time series plots.
4. **Model Development:**
 - **Machine Learning Algorithms:**
 - Explore regression (e.g., Linear Regression, Random Forest Regression^[9], SVM) and time series models^[10] (e.g., ARIMA, LSTM) to predict future prices.
 - Use cross-validation to tune model parameters and assess performance.
 - **Model Evaluation:**
 - Evaluate performance using metrics such as MAE, RMSE, and R-squared.
 - Compare a model trained on data from all products with a model trained on a single product to determine which approach yields better predictions.
5. **Visualization and Reporting:**
 - Create dashboards for the user to track how different products are being predicted and how they react to various factors.

References:

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2. Lobell, D. B., & Field, C. B. (2007). Global scale climate–crop yield relationships and the impacts of recent warming. *Environmental Research Letters*, 2(1), 014002.
3. Fernando Avalos, (2014). Do oil prices drive food prices? The tale of a structural break, *Journal of International Money and Finance*, Volume 42, Pages 253-271, ISSN 0261-5606.
4. Statistics Canada. [Table 32-10-0077-01 Farm product prices, crops and livestock](#)
5. Government of Canada. (2024, June 27). [Monthly Climate Summaries. Climate.](#)
6. Statistics Canada. [Table 36-10-0434-01 Gross domestic product \(GDP\) at basic prices, by industry, monthly \(x 1,000,000\)](#)
7. Statistics Canada. [Table 36-10-0402-02 Gross domestic product \(GDP\) at basic prices, by industry, provinces and territories, growth rates \(x 1,000,000\)](#)
8. Statistics Canada. [Table 18-10-0001-01 Monthly average retail prices for gasoline and fuel oil, by geography](#)
9. Zheng, J., Xin, D., Cheng, Q., Tian, M., & Yang, L. (2024). The random forest model for analyzing and forecasting the US stock market under the background of Smart Finance. *Atlantis Highlights in Computer Sciences*, 82–90.
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products

(might select just a few)

- Barley
- Barley for animal feed
- Barley for malt and other human consumption
- Calves for feeding
- Calves for slaughter
- Canadian Wheat Board, barley excluding payments
- Canadian Wheat Board, barley including payments
- Canadian Wheat Board, durum excluding payments
- Canadian Wheat Board, durum including payments
- Canadian Wheat Board, selected barley excluding payments
- Canadian Wheat Board, selected barley including payments

- Canadian Wheat Board, wheat excluding payments
- Canadian Wheat Board, wheat including payments
- Canary seeds
- Canola (including rapeseed)
- Cattle for feeding
- Cattle for slaughter
- Chickens for meat
- Corn for grain
- Cows for slaughter
- Dry peas
- Durum wheat
- Eggs in shell
- Flaxseed
- Fresh potatoes
- Fresh potatoes for processing
- Fresh potatoes for seed
- Fresh potatoes for table consumption
- Heifers for feeding
- Heifers for slaughter
- Hogs
- Lambs
- Lentils
- Non-board wheat (except durum wheat)
- Oats
- Ontario wheat excluding payments
- Ontario wheat including payments
- Rye
- Soybeans
- Steers for feeding
- Steers for slaughter
- Turkeys for meat
- Unprocessed milk from bovine
- Wheat (except durum wheat)
- Wheat (except durum wheat), milling
- Wheat (except durum wheat), other