

CHANGES IN CONSUMER BEHAVIOR PRE-, DURING- AND 'POST' PANDEMIC

MEASURED BY CPI, BASKET WEIGHTS AND RETAIL PRICES

Project ideation by Fateme Aydin, with support from Laura G. Funderburk and Lisa Cao

PROJECT DESCRIPTION

This project aims to study [trends in consumer behavior](#) for various products and services [during the pandemic](#).

This project focusses on changes in [consumer price index](#), [basket weights](#) and [retail prices](#). We aim to investigate how shopping behavior has changed, how prices varied and whether there was a logical relationship between the two.

This project will help us understand what products and services we need to focus on during any pandemic and how we can prevent price increases for essential products and services.

DATA SOURCES

- Statistics Canada. Table 18-10-0006-01 Consumer Price Index, monthly, seasonally adjusted
- Statistics Canada. Table 18-10-0263-01 Monthly adjusted price index, provisional
- Statistics Canada. Table 18-10-0264-01 Monthly adjusted consumer expenditure basket weights
- Statistics Canada. Table 18-10-0002-01 Monthly average retail prices for food and other selected products

THANK YOU STATISTICS CANADA! 🍁

Link to Statistics Canada License:

<https://www.statcan.gc.ca/eng/reference/licence>

CPI

The Consumer Price Index (CPI) is an indicator of changes in consumer prices experienced by Canadians. It is obtained by comparing, over time, the cost of a fixed basket of goods and services purchased by consumers.

Project Breakdown

- Which areas were affected most during the pandemic?
- What were the trends on those products?
- What were the high-demand products during the pandemic?
- How did prices change on those products?
- Is there a logical relationship between price and purchases?

IMPORTANT DATES



.....

DEC/31/19

First Declared Case of
COVID-19 Worldwide



.....

MAR/16/20

Canadian Borders Closed



.....

JUL/19/21

Easing Border
Measures + Over 50%
of all Canadians fully
vaccinated against
COVID-19

Exploratory Data Analysis

1. VISUALIZATION

2. EXPLANATION

3. CONFIRMATION



TRENDS

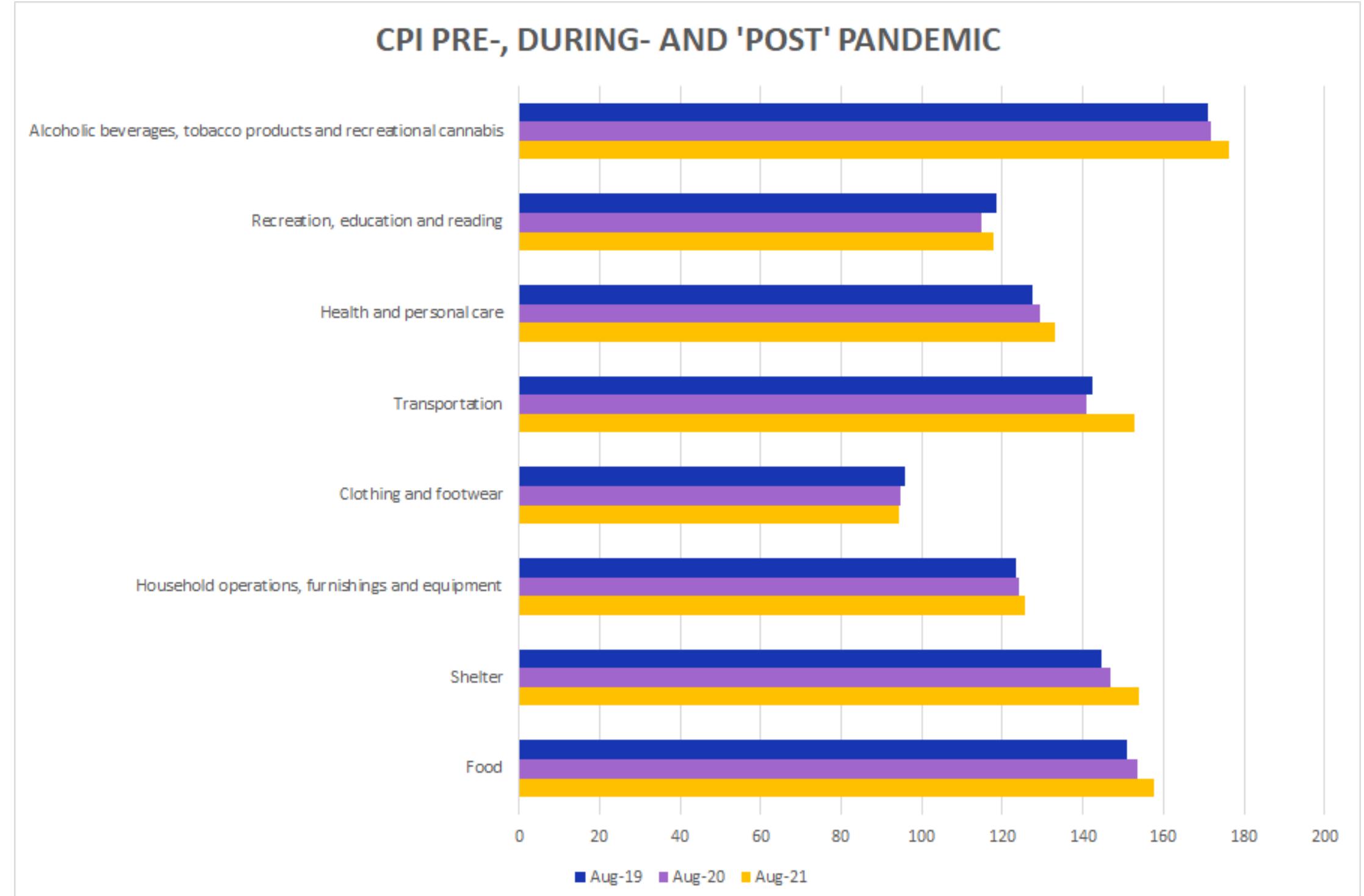
Exploratory Analysis



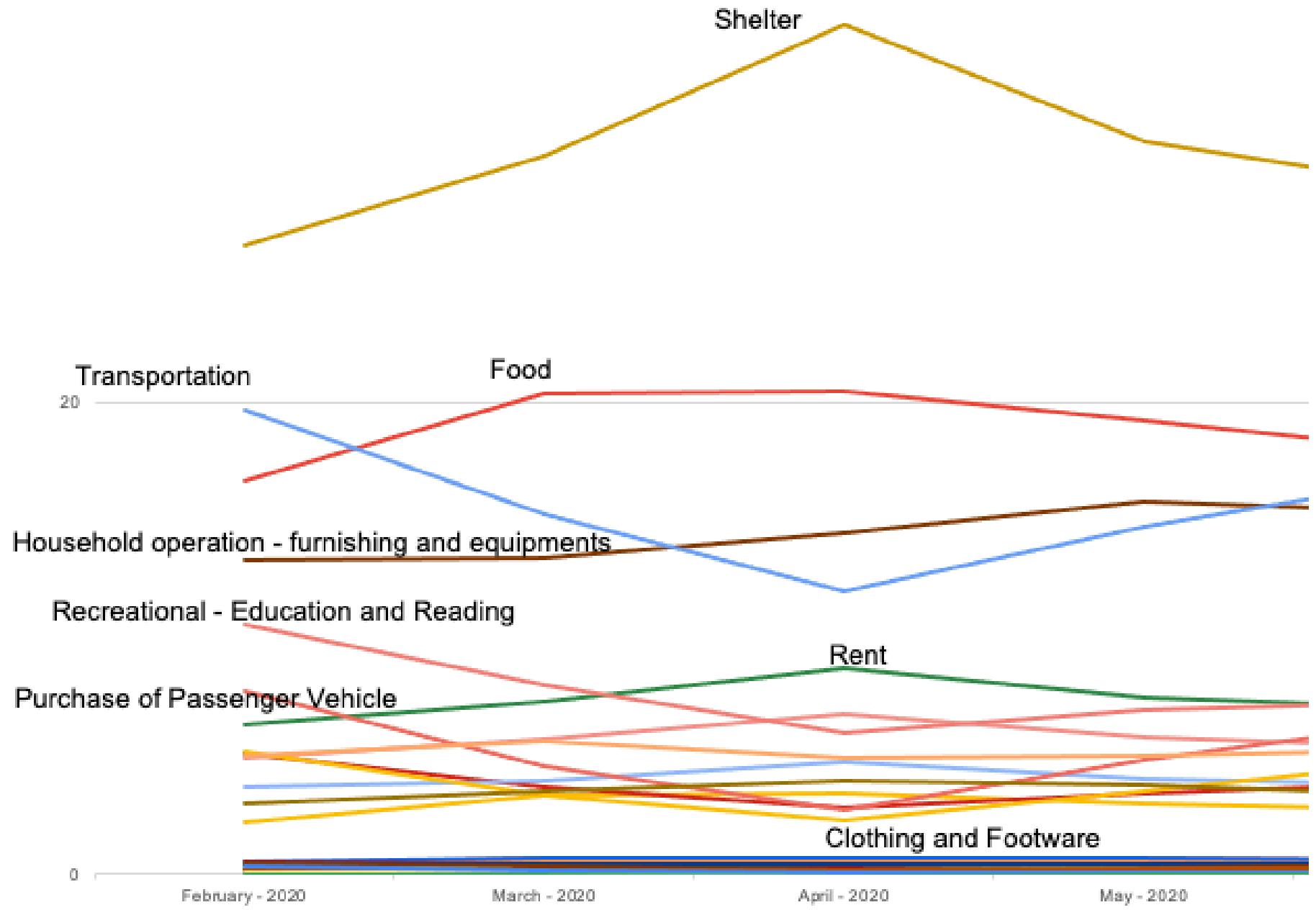
DURING PANDEMIC CPI TRENDS

08/20 compared to 08/19

- DECREASE IN TRANSPORATION
- DECREASE IN RECREATION, EDUCATION AND READING
- INCREASE IN HEALTH AND PERSONAL CARE
- INCREASE IN HOUSEHOLD OPERATIONS, FURNISHINGS AND EQUIPMENT
- INCREASE IN SHELTER
- INCREASE IN FOOD



DOWN IS THE NEW UP



The Consumer basket weights for Food, Rent, and Shelter were on an *upward trend*, which persisted after the lockdown

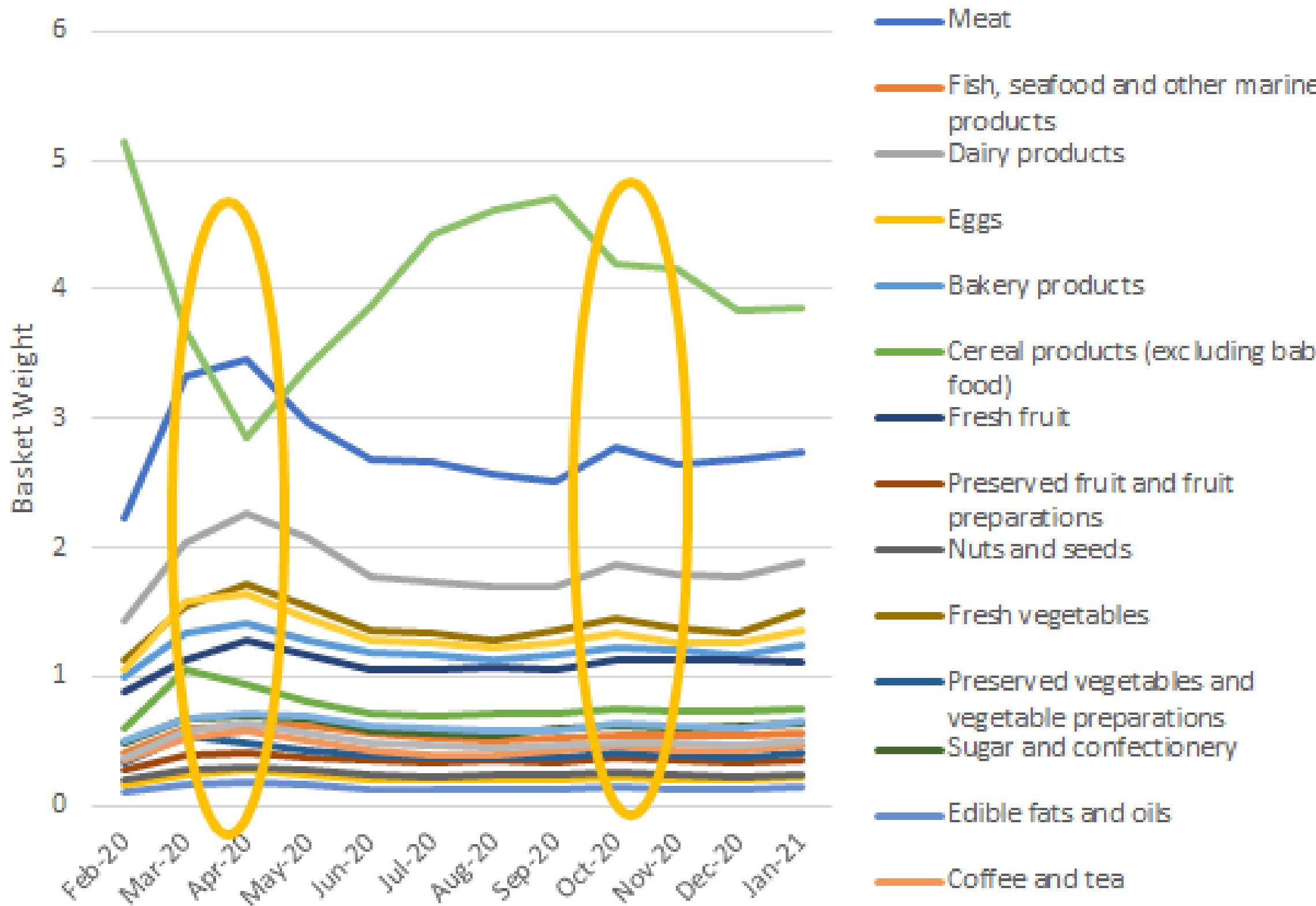
Transportation, recreation, and car purchases, on the other hand, were already on the **decline**, and they fell even more following the lockdown as more

As more Canadians began working from home. Household furniture and equipment, rent, and homeowner expenses **went up**.

BASKET WEIGHTS



MONTHLY ADJUSTED CONSUMER EXPENDITURE BASKET WEIGHTS



CORONAVIRUS | News

'Nobody was ready': Retail Council of Canada urges consumers to stop panicking as grocers stripped bare



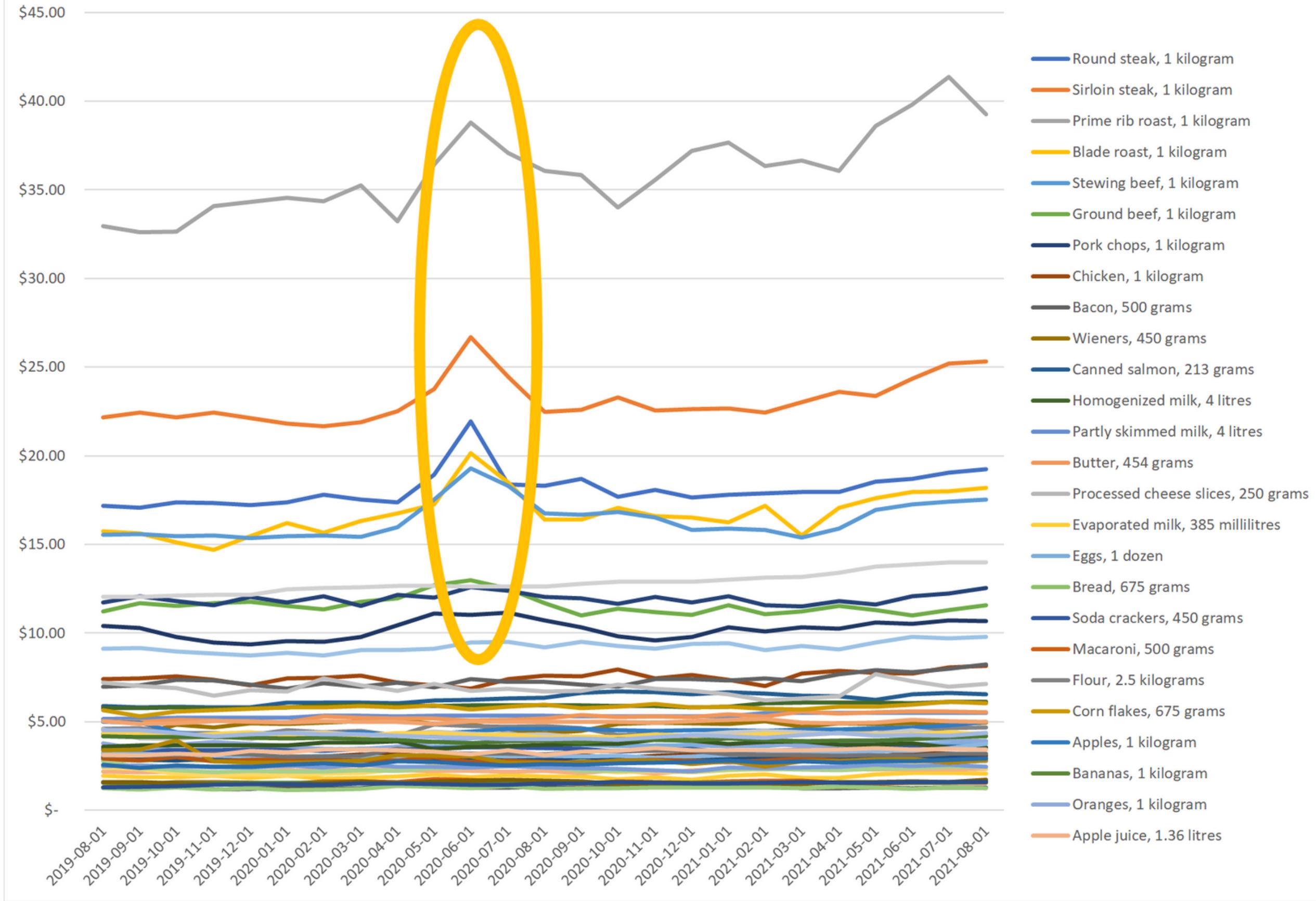
Nicole Bogart CTVNews.ca Writer
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Published Friday, March 13, 2020 11:58AM EDT
Last Updated Friday, March 13, 2020 1:08PM EDT

RETAIL PRICES



MONTHLY AVERAGE RETAIL PRICES PRE-, DURING- AND 'POST' PANDEMIC



INVESTIGATIONS

As leaders warned of US meat shortages, overseas exports of pork and beef continued

Kyle Bagens

VANCOUVER | News

Published 11:25 a

Beef prices skyrocket, but expected to fall soon



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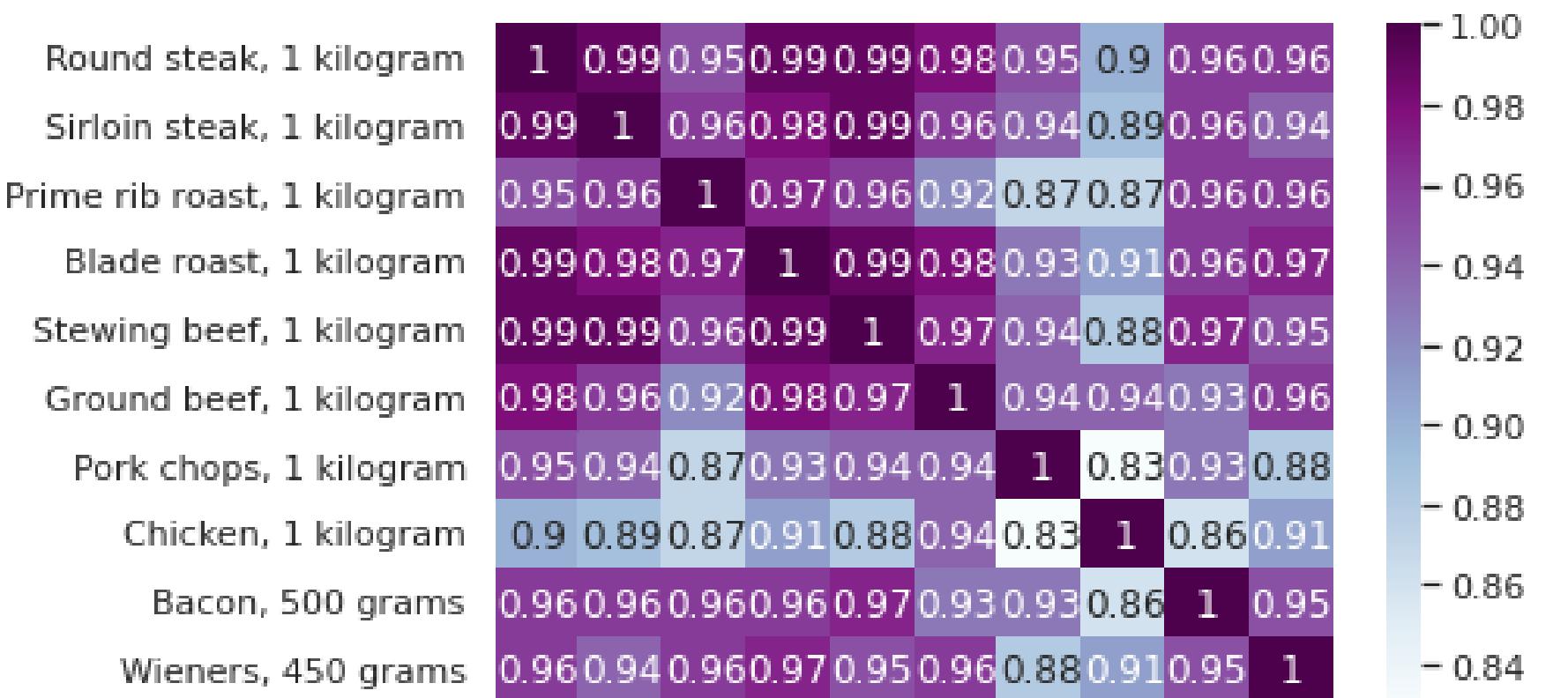
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Published Wednesday, June 10, 2020
Last Updated Wednesday, June 10, 2020

1. Synopsis

COVID-19 rattled the Canadian beef supply-chain by forcing a shutdown in many slaughterhouses and meat processing plants, pushing consumers to panic-buy beef in fear of a shortage. Consumers saw atypical increases in the prices of beef, while ranchers received lower prices for cattle sold.

Jan 2000 - Aug 2021

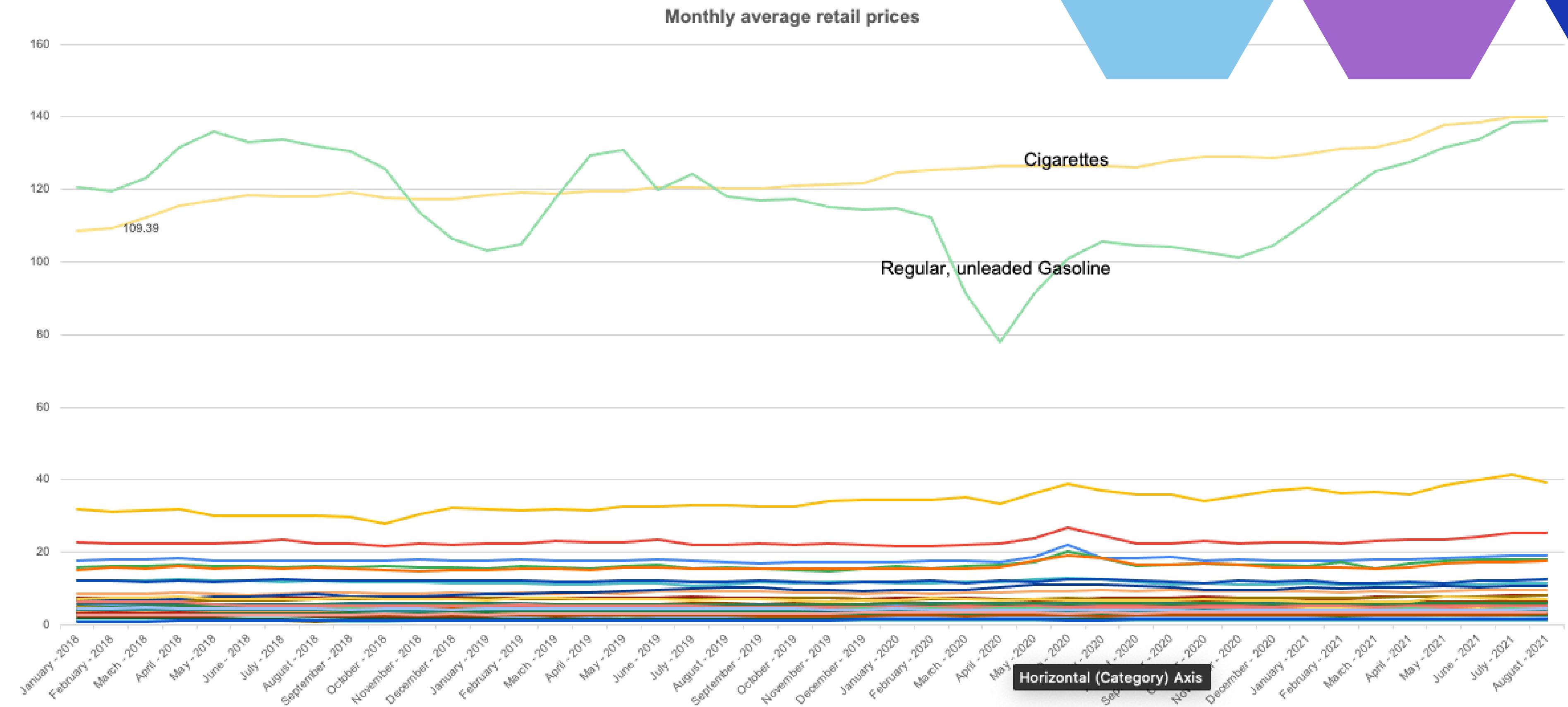


Aug 2019 - Aug 2021

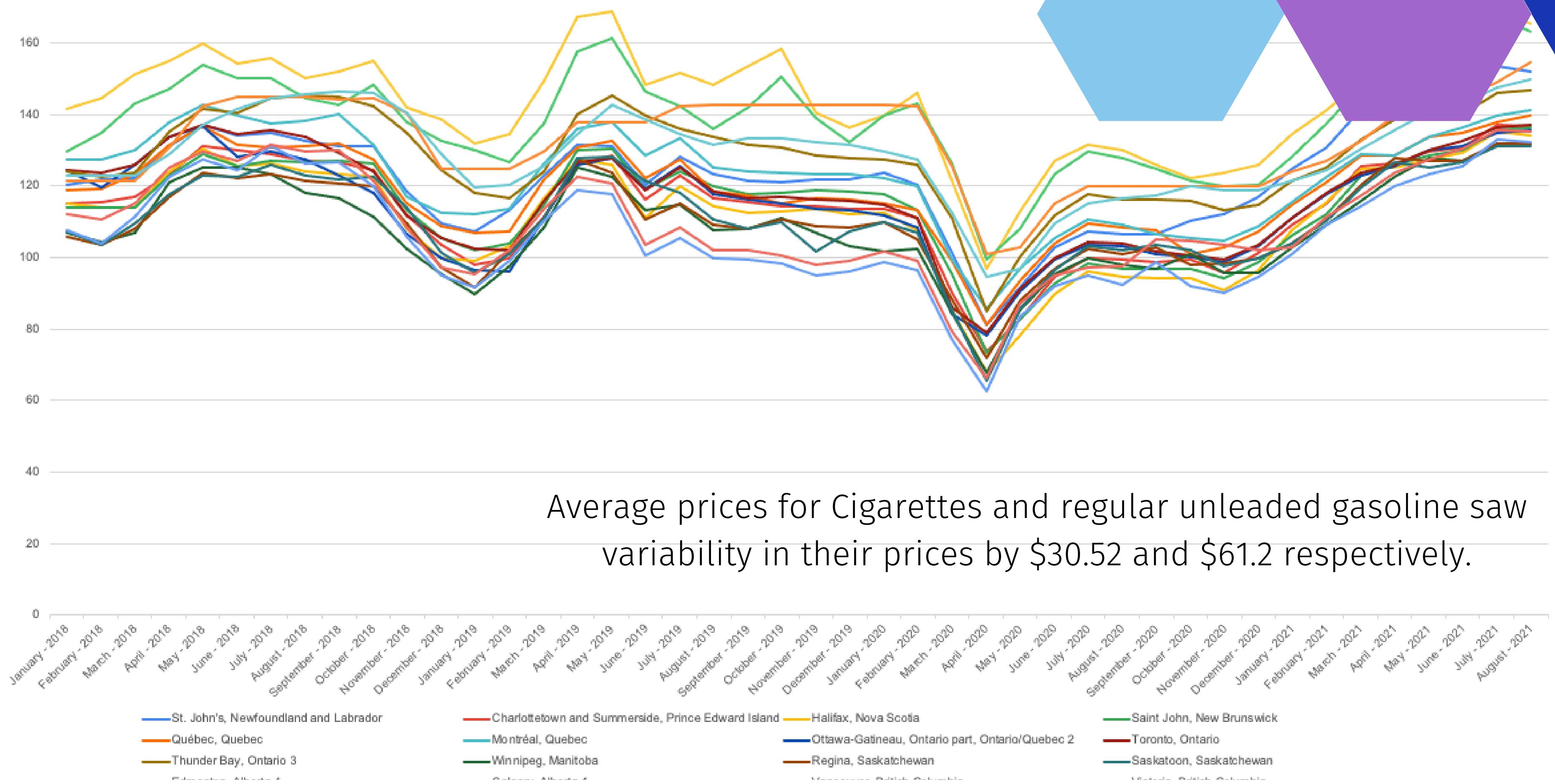


Prime rib roast, 1 kilogram	0.690.75 1 0.720.65 0 0.380.330.73 0.240.630.710.78 0.7 0.6 0.54 0.750.16 0.590.11 0.350.650.280.490.490.410.61 0.790.210.540.44-0.13 0.4 0.5-0.17 0.1 0.36 0.1 0.030.640.170.640.270.01-0.45 0.7 -0.280.33 0.5 0.84
Blade roast, 1 kilogram	0.840.870.72 1 0.9 0.41 0.6 0.040.460.210.460.540.560.310.520.420.570.01 0.570.260.480.440.210.460.610.23 0.3 0.730.680.33 0.7 0.420.130.590.31-0.270.110.190.180.060.410.350.36-0.230.18-0.220.45-0.44-0.4 0.3 0.56
Stewing beef, 1 kilogram	0.880.890.65 0.9 1 0.530.680.01 0.370.030.380.370.390.21 0.4 0.440.48-0.160.59 0.3 0.62 0.4 0.180.490.76-0.020.150.750.680.380.760.380.090.670.28-0.440.070.060.24-0.020.350.290.21-0.190.29-0.1 0.31-0.470.53 0.1 0.41
Ground beef, 1 kilogram	0.460.43 0 0.410.53 1 0.5 -0.5-0.220.030.340.190.170.460.180.06-0.16 0.1 0.230.490.47-0.070.290.03 0.2 -0.150.040.32-0.070.170.480.090.050.41-0.28-0.5 0.25-0.250.020.17-0.11 0.2 -0.350.040.140.19-0.210.330.320.31
Pork chops, 1 kilogram	0.610.650.38 0.6 0.68 0.5 1 -0.080.32-0.05 0.1 0.130.08 0 0.110.330.26-0.31 0.360.060.430.250.230.310.38-0.18 -0 0.5 0.450.310.520.34-0.040.55-0.020.380.070.040.190.210.31 0.2 -0.030.290.230.060.19-0.080.140.020.17
Chicken, 1 kilogram	-0.070.170.330.04 0.01 -0.5-0.08 1 0.52-0.010.410.520.450.630.270.07 0.5 -0.110.22-0.420.01 0.4 0.510.280.07 0.4 -0.040.090.490.040.020.11-0.07 0.2 0.38-0.010.13-0.190.28 -0.20.58-0.070.52-0.060.070.090.430.290.150.370.61
Bacon, 500 grams	0.41 0.6 0.730.460.37-0.220.320.52 1 0.28 0.4 0.720.74 0.7 0.49 0.5 0.67-0.210.46-0.170.120.44 0.4 0.520.310.410.220.410.620.160.310.33-0.090.32 0.4 -0.1 0.120.190.140.160.790.240.56-0.110.01-0.120.670.130.030.430.82
Wieners, 450 grams	0.1 0.090.240.21-0.030.030.050.010.28 1 0.220.360.410.330.42-0.020.290.17-0.130.37-0.470.42-0.490.28-0.190.450.09-0.280.080.560.270.120.35-0.320.110.33-0.110.28-0.010.180.080.260.540.03 0.2 -0.220.51 0.010.080.65 0.4
Canned salmon, 213 grams	0.350.370.630.460.38-0.34 0.1 0.41 0.4 0.22 1 0.580.630.720.750.14 0.8 -0.350.020.17-0.040.610.220.590.410.350.210.350.63-0.040.260.22 0.3 0.030.550.26-0.410.33-0.160.320.280.280.79-0.370.31-0.560.67-0.360.540.590.72
Homogenized milk, 4 litres	0.430.510.710.540.37-0.190.130.520.720.360.58 1 0.970.850.740.440.820.130.440.090.260.580.310.430.160.690.440.540.570.130.450.270.03 0.4 0.470.020.240.120.110.11 0.7 0.260.76-0.080.070.330.76 -0.2-0.150.63 0.9
Partly skimmed milk, 4 litres	0.450.540.780.560.39-0.170.080.450.740.410.630.97 1 0.860.790.390.850.08 0.4 0.160.180.56 0.2 0.460.230.710.430.520.560.040.420.290.010.310.520.070.120.21 0 0.1 0.640.28 0.8 -0.110.050.440.76-0.290.260.650.91
Butter, 454 grams	0.280.37 0.7 0.310.21-0.46 0 0.63 0.7 0.330.720.850.86 1 0.770.290.83-0.120.22 -0 -0.010.56 0.3 0.460.120.610.350.340.63-0.040.260.210.020.150.610.19-0.010.230.13-0.050.620.220.81-0.1 0.03-0.340.81-0.140.170.710.91
Processed cheese slices, 250 grams	0.4 0.39 0.6 0.52 0.4 -0.180.110.270.490.420.750.740.790.77 1 0.130.83-0.080.220.31-0.070.620.030.530.370.480.360.46 0.5 -0.030.370.190.410.170.460.34-0.320.290.01-0.1 0.270.570.78-0.1 0.35-0.430.78-0.5-0.51 0.7 0.73
Evaporated milk, 385 millilitres	0.320.450.540.420.440.060.330.07 0.5 -0.020.140.440.390.290.13 1 0.28-0.130.52-0.040.570.390.330.210.37 0.2 0.470.52 0.5 0.470.570.28-0.070.430.21-0.520.540.220.230.330.620.150.140.06-0.080.010.390.13-0.030.110.48
Eggs, 1 dozen	0.490.560.750.570.48-0.160.26 0.5 0.670.29 0.8 0.820.850.830.82 1 -0.2 0.340.060.140.650.220.640.370.530.280.490.68-0.040.450.280.170.320.540.11-0.16 0.1 -0.070.140.540.350.86-0.240.25-0.470.81-0.42-0.40.610.88
Bread, 675 grams	-0.010.220.160.010.16 0.1 -0.310.110.210.17-0.350.130.08-0.120.080.13-0.2 1 0.030.060.18-0.140.250.180.390.270.21-0.160.340.15-0.1 -0.1 0.120.16-0.240.070.39 0 0.21 0 -0.08-0.3-0.140.06-0.460.05-0.2-0.090.13-0.060.12
Soda crackers, 450 grams	0.52 0.6 0.590.570.590.230.360.220.46-0.130.020.44 0.4 0.220.220.520.340.03 1 -0.15 0.6 0.380.330.160.52 0.1 0.230.640.560.450.590.44-0.250.730.17-0.410.37-0.150.350.230.480.170.130.12-0.040.020.23-0.250.01 0.1 0.41
Macaroni, 500 grams	0.380.240.110.26 0.3 0.490.06-0.420.170.370.170.090.16 -0 0.31-0.040.060.06-0.15 1 0.060.18-0.440.280.110.180.230.16-0.110.010.23-0.010.44-0.030.180.030.210.210.230.01-0.130.280.110.140.21-0.05 0.2 -0.350.480.02-0.05
Flour, 2.5 kilograms	0.57 0.5 0.350.480.620.470.43-0.010.12-0.470.040.260.18-0.010.07 0.570.140.18 0.6 0.06 1 0.130.390.150.34-0.040.290.680.380.630.740.11-0.26 0.8 0.08-0.720.54-0.230.260.070.42-0.090.17 -0 -0.240.09-0.010.24-0.1-0.270.12
Corn flakes, 675 grams	0.320.340.650.44 0.4 -0.070.25 0.4 0.440.420.610.580.560.560.620.390.65-0.140.380.180.13 1 -0 0.480.420.370.29 0.3 0.430.020.240.290.250.250.21-0.05 -0 0.2 0.190.040.350.280.72-0.210.24-0.510.67-0.130.390.670.68
Apples, 1 kilogram	0.09 0.3 0.280.210.18-0.290.230.51 0.4 -0.490.220.31 0.2 0.3 0.030.330.22-0.250.33-0.440.39 -0 1 0.140.14 0.1 0.180.480.610.720.41-0.040.210.440.25-0.260.21-0.05 0.3 0 0.64-0.020.040.02-0.2 0.170.22 0.3 0.36-0.040.35
Bananas, 1 kilogram	0.520.510.490.460.49-0.030.310.280.520.280.590.430.460.530.210.640-0.180.160.280.150.480.14 1 0.430.160.120.180.48-0.010.240.05 0.270.290.17-0.1-0.390.160.01-0.170.470.220.53-0.050.35-0.260.57-0.150.350.310.53
Oranges, 1 kilogram	0.520.590.490.610.76 0.2 0.380.070.31-0.190.410.160.230.120.370.37-0.390.520.110.340.420.140.43 1 -0.220.010.560.540.350.470.290.110.420.33-0.240.190.130.08-0.130.110.32 0.2 -0.1 0.330.230.13-0.38-0.60.090.29
Apple juice, 1.36 litres	0.1 0.240.490.23-0.020.150.18 0.4 0.410.450.350.690.710.610.48 0.2 0.530.27 0.1 0.18-0.040.37 0.1 0.16-0.22 1 0.560.160.28-0.02 0.2 0.040.030.020.240.030.270.27-0.120.040.530.090.590.03-0.290.320.660.010.070.420.64
Orange juice, 1 litre	0.240.210.41 0.3 0.15-0.04 -0 -0.040.220.090.210.440.430.350.360.470.280.210.230.230.290.280.180.120.010.56 1 0.390.240.430.410.11 -0 0.240.39-0.080.250.420.050.230.350.070.170.14-0.330.21 0.5 -0.07 0.1 0.140.38
Carrots, 1 kilogram	0.630.710.610.730.750.32 0.5 0.090.41-0.280.350.540.520.340.460.520.49-0.160.640.160.68 0.3 0.480.180.560.160.39 1 0.670.680.920.350.040.710.39-0.350.24 -0 0.140.120.450.430.17-0.1 0.06-0.040.370.310.070.45
Mushrooms, 1 kilogram	0.580.740.790.680.68-0.070.450.490.62-0.080.630.570.560.63 0.5 0.568-0.340.560.110.380.430.610.480.540.280.240.67 1 0.390.670.44-0.010.550.54-0.180.080.220.24 -0.2 0.650.240.460.190.19-0.130.59 -0.2-0.24 0.3 0.72
Onions, 1 kilogram	0.260.370.210.330.380.170.310.040.16-0.560.040.130.04-0.040.030.47-0.040.150.45-0.010.630.020.72-0.010.35-0.020.430.680.39 1 0.640.060.080.560.11-0.480.340.020.270.15 0.4 0.13-0.280.18-0.240.280.060.140.18-0.3 0.05
Potatoes, 4.54 kilograms	0.640.710.54 0.7 0.760.480.520.020.31-0.270.260.450.420.260.370.570.45-0.1 0.590.230.740.240.410.240.47 0.2 0.410.920.670.64 1 0.290.110.75 0.3 -0.490.32-0.050.130.060.470.440.08-0.030.130.070.38-0.430.290.050.37
French fried potatoes, frozen, 1 kilogram	0.320.390.440.420.380.090.340.110.330.120.220.270.290.210.190.28-0.1 0.44-0.010.110.29-0.040.050.290.040.110.350.440.060.29 1 -0.080.370.290.070.090.25-0.050.090.130.110.18-0.350.19-0.170.17-0.210.220.130.31
Baked beans, canned, 398 millilitres	-0.030.050.130.130.09-0.05-0.040.070.09 0.3 0.030.010.020.41-0.070.17-0.120.250.44-0.260.25-0.210.270.110.02
Tomatoes, canned, 796 millilitres	0.550.59 0.4 0.590.670.410.55 0.2 0.32-0.320.03 0.4 0.310.150.170.430.320.160.73-0.03 0.8 0.250.440.290.420.0
Tomato juice, 1.36 litres	0.270.35 0.5 0.310.28-0.280.020.

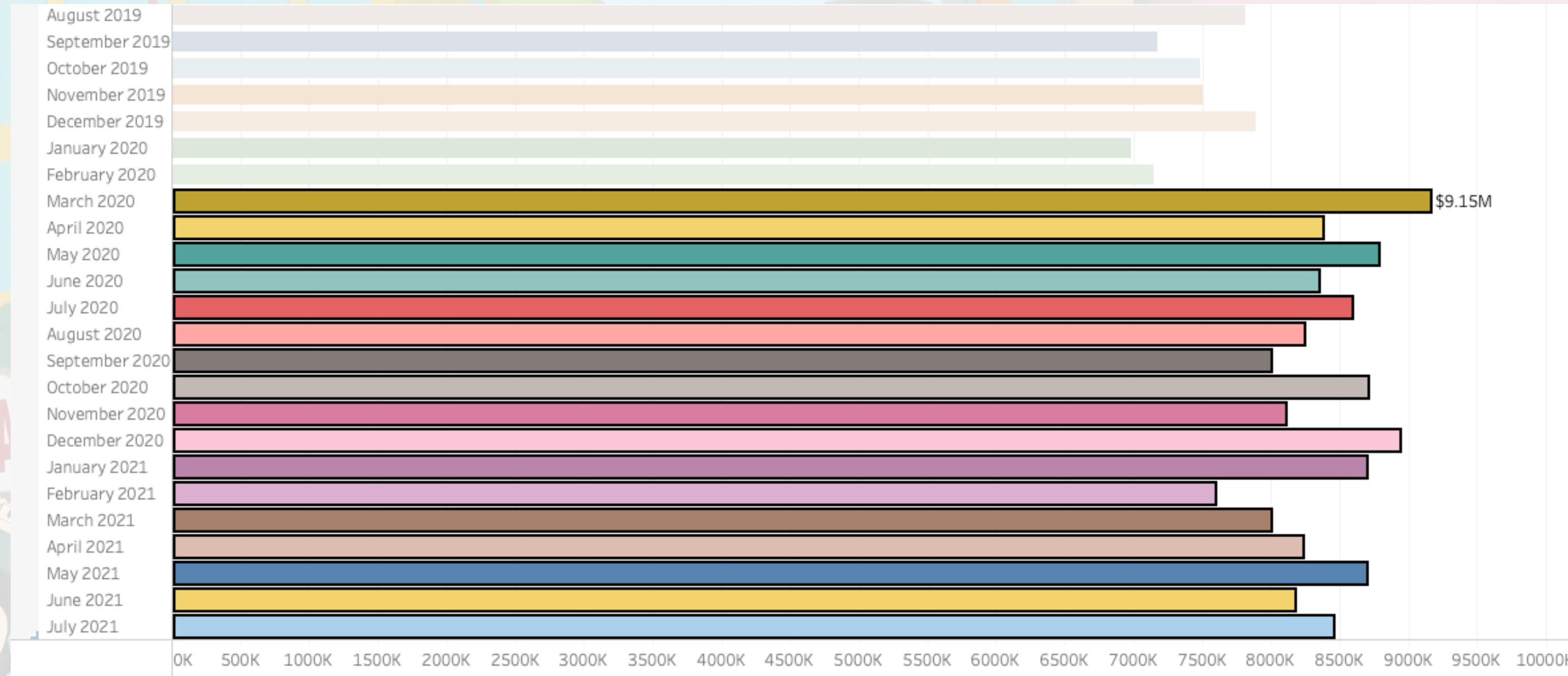
During the shutdown, fuel prices fell in all major Canadian cities.



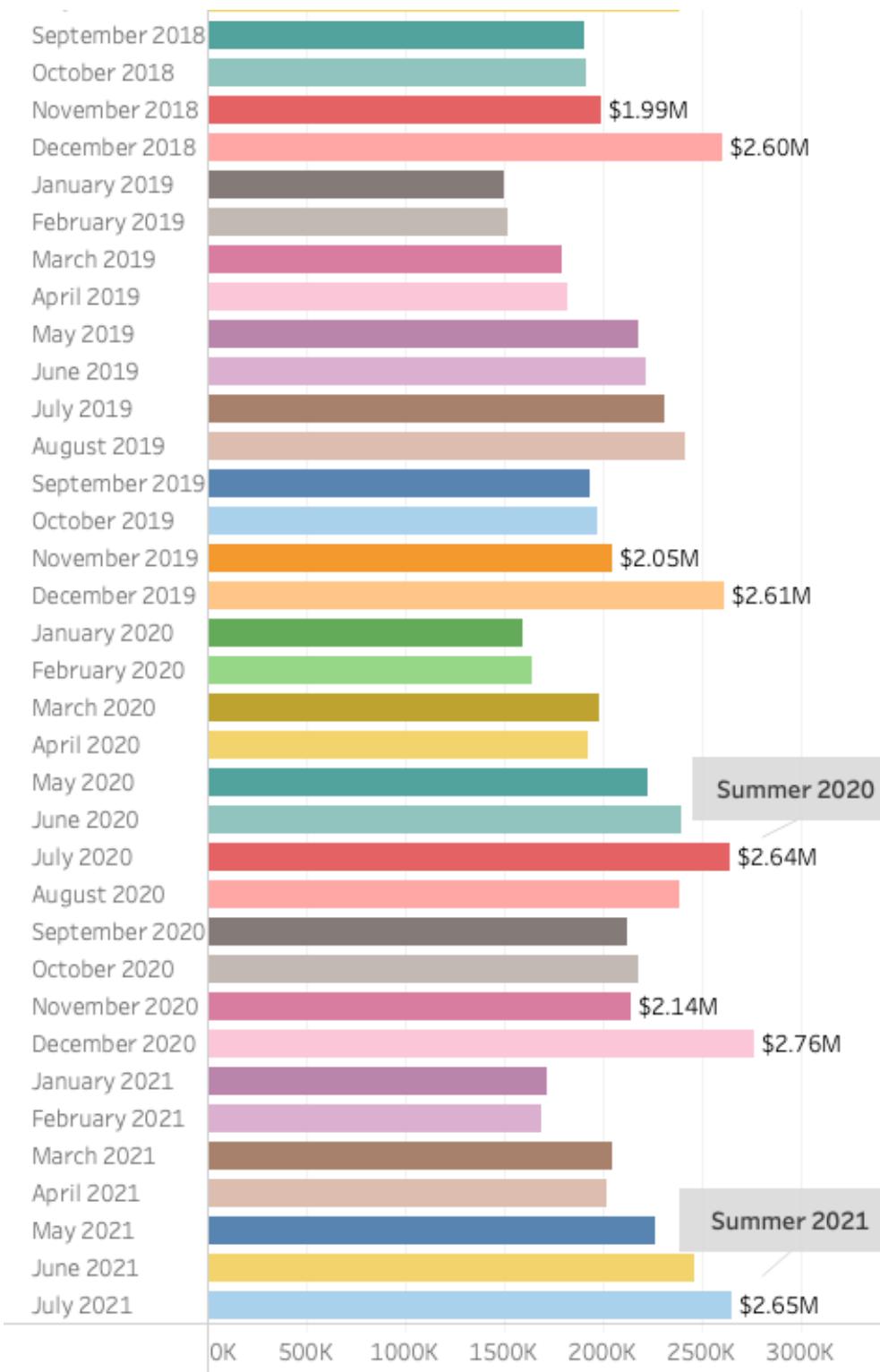
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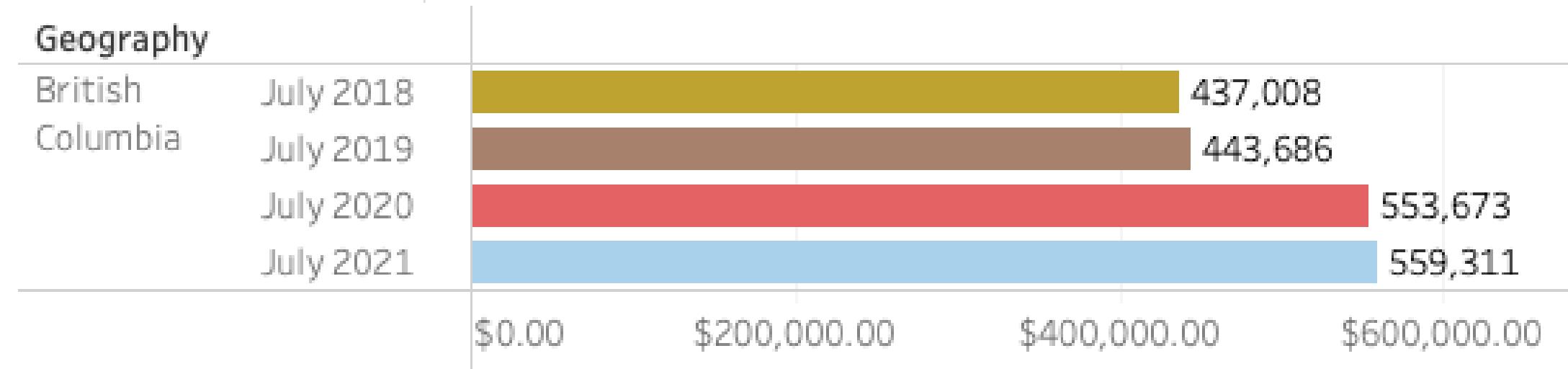
Canadians went berserk all across Canada and supermarkets observed a \$9.15M in sales for the month of March. Although, it continued during the lockdown but mostly due to increases in price and inflation.



Normally, beer, wine, and alcoholic liquor sales increase during the holiday season in November and December with Christmas and New Year, but Canadians decided to stop the holiday season in July 2020-21 whenever the lockdown rules were eased.



British Colombians went ahead helped with the numbers by ~27% (increase) compare to it's previous years



TIME SERIES ANALYSIS

Understanding trends in CPI of food in the past 10 years, drawing inferences and using a machine learning model to accurately predict how food CPI will look in the next 12 months to help consumers accurately plan their purchases

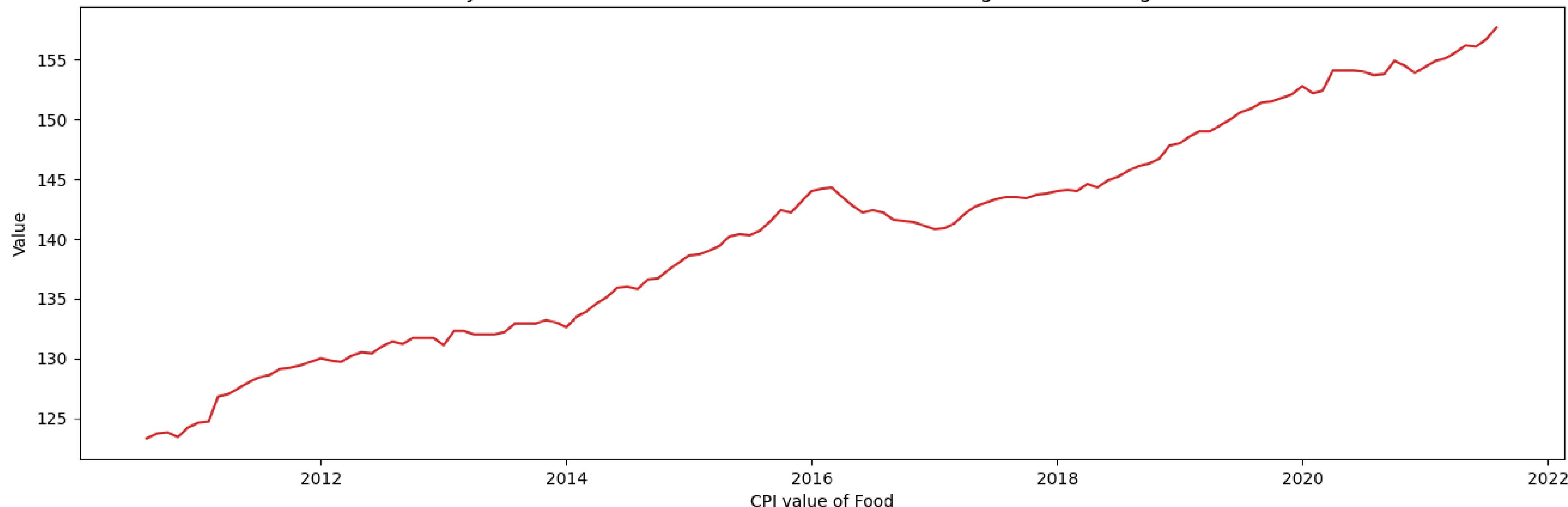
CPI



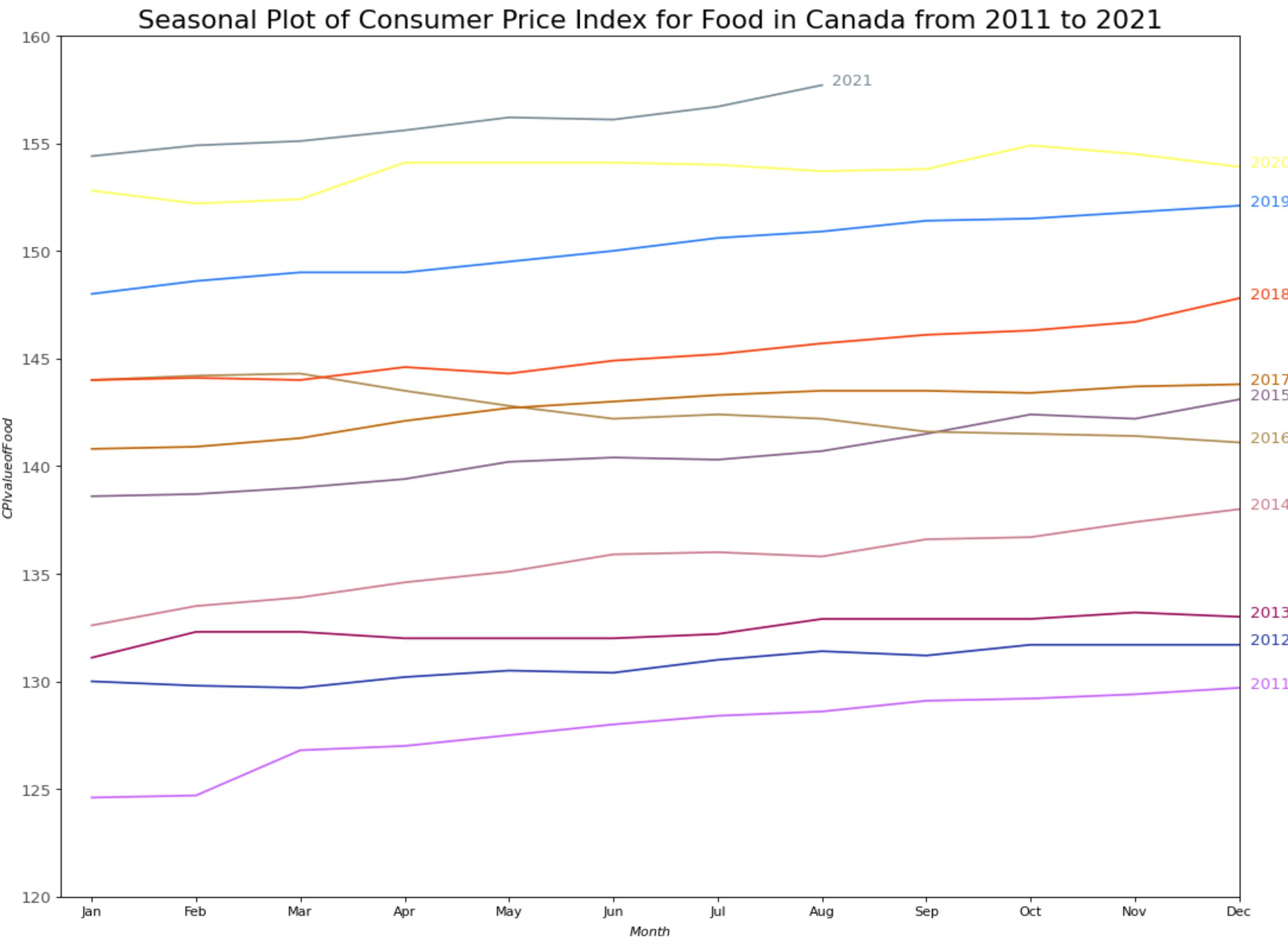
CPI GROWTH IN CANADA

throughout 2011 - 2021 period

Monthly Consumer Price Index for Food in Canada from August 2010 to August 2021.

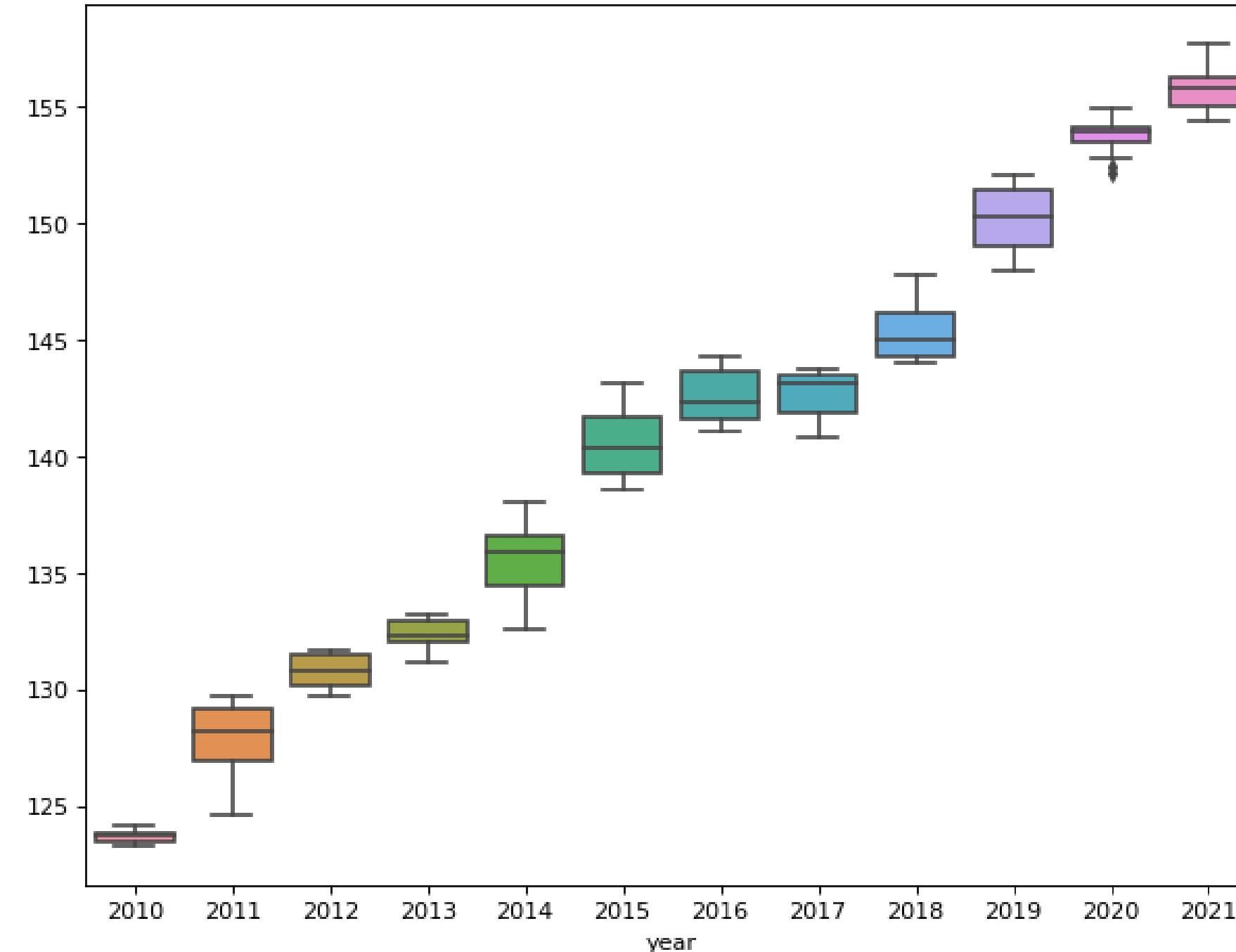


CPI GROWTH BY YEAR

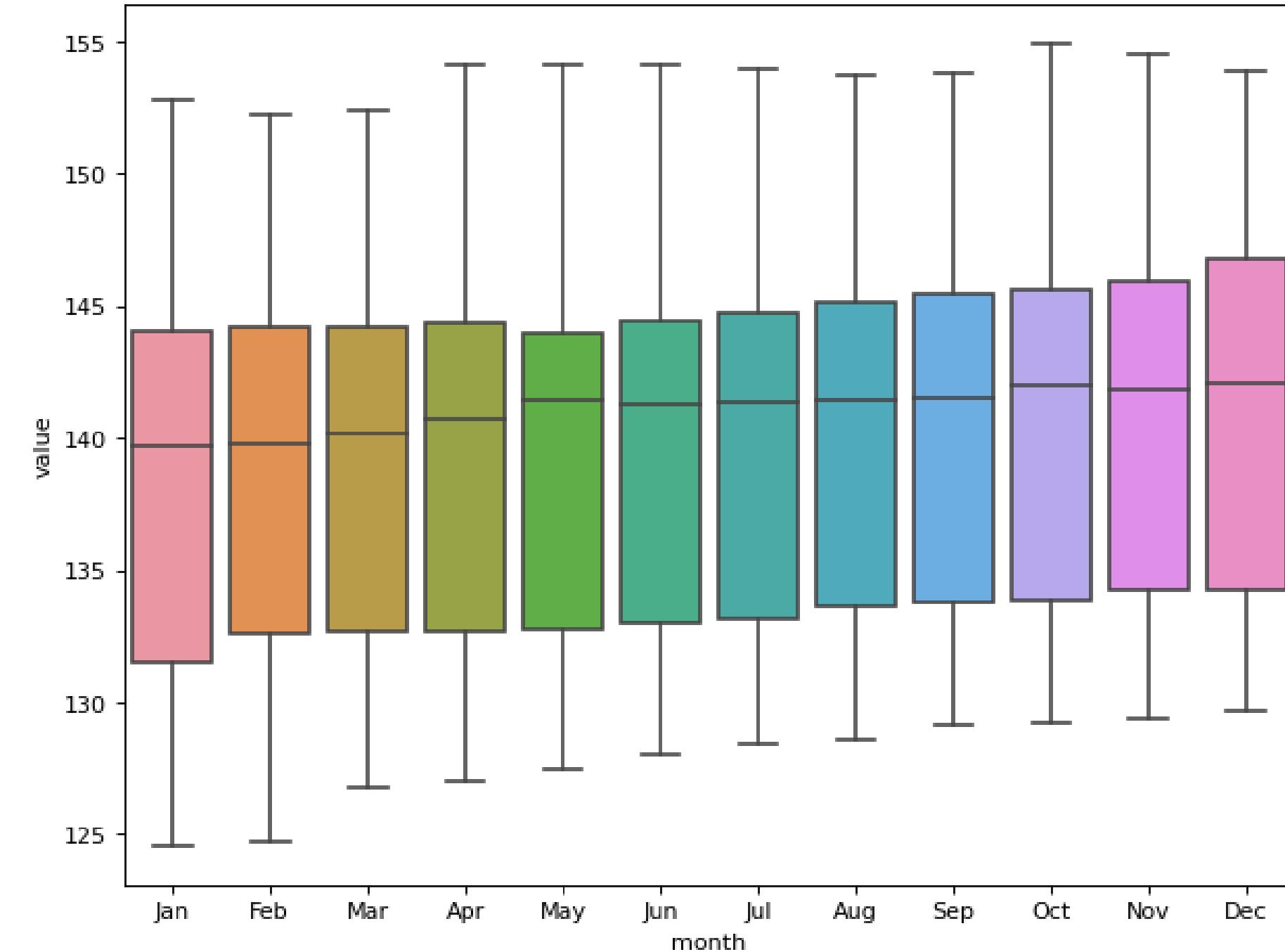


UNDERSTANDING MONTHLY & YEARLY TRENDS

Year-wise Box Plot
(The Trend)



Month-wise Box Plot
(The Seasonality)



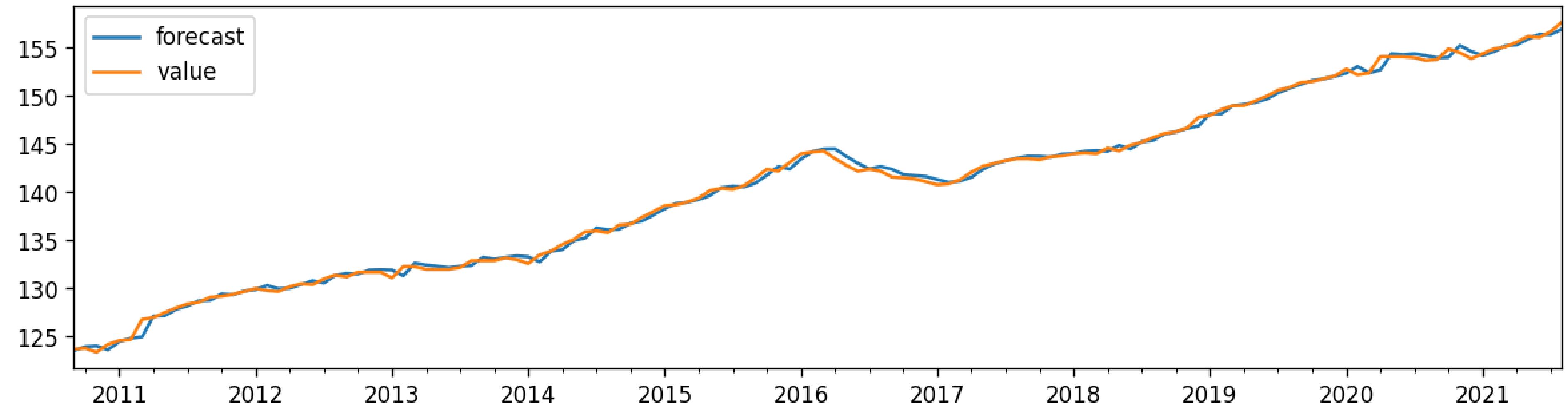
Inferences from the last 3 graphs:

- CPI growth has shown **consistent growth**, rising to 3.3% in 2021
- **2020** recorded **lowest levels of CPI growth** compared to last 3 years
- **CPI growth shrunk greatly in 2020** but **expected to rise in 2021**
- **Seasonality** shows **high CPI values** in the **winter months** of Nov, Dec and **low CPI values** in the **summer months** of May, June indicating the **rise in retail prices in winter months compared to summer ones**

USING ARIMA MODEL

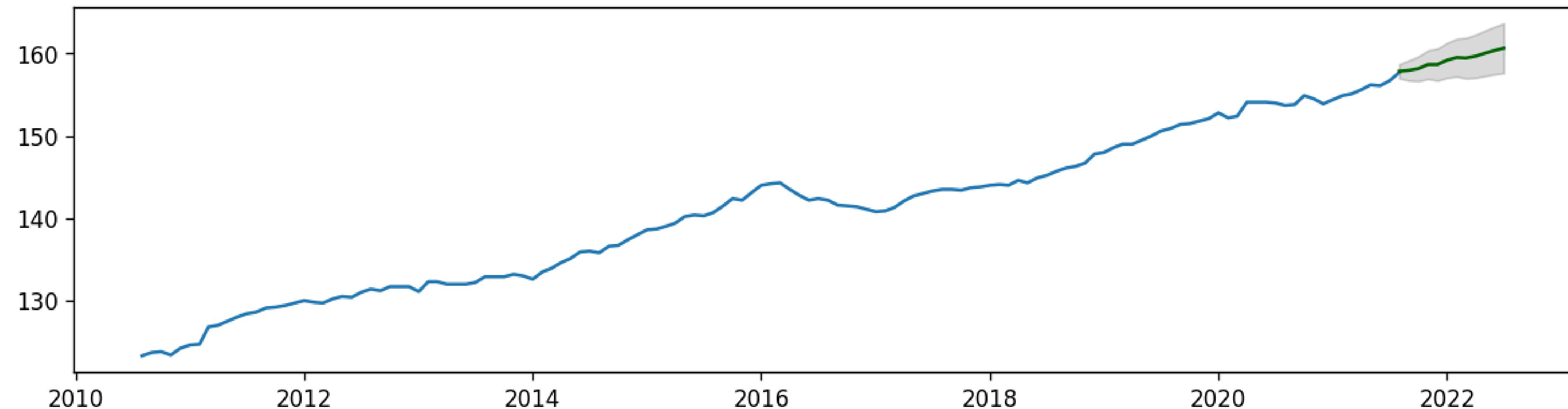
(Autoregressive Integrated Moving Averages)

TO FIT OUR DATA



FORECASTING CPI TRENDS USING ARIMA MODEL

SARIMA - Final Forecast of CPI for food (September 2021 to August 2022)



PITCH DECK

Trisca Laghari

Chief Executive Officer

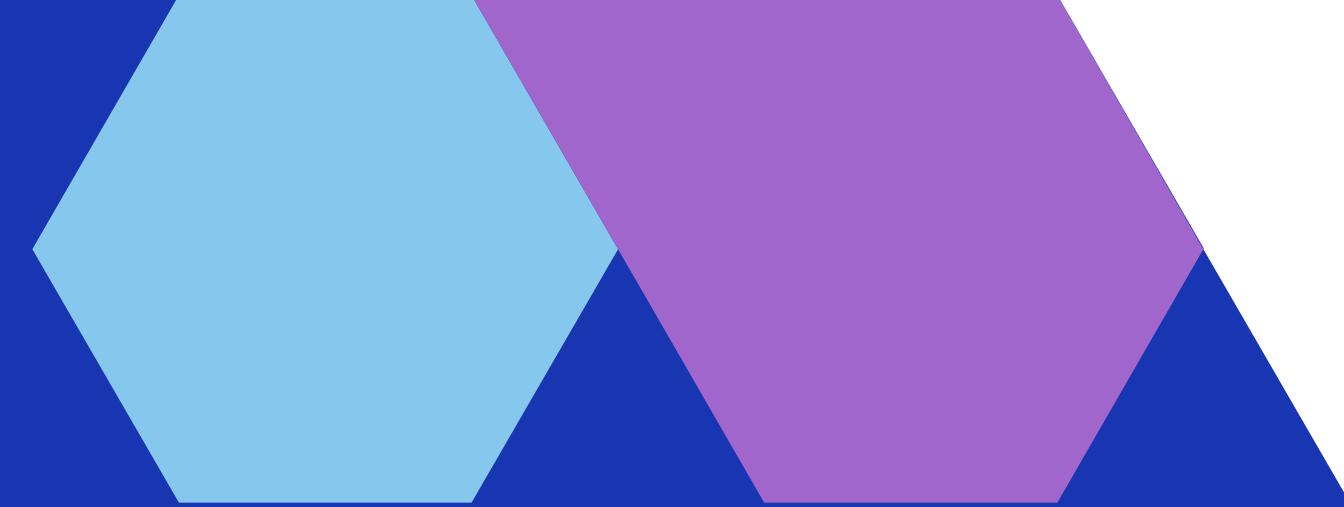
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Austen Tech



LIMITATIONS

We were unable to find a detailed dataset that provides the prices for raw materials