



~~The Trouble with~~ Nowcasting

Tracking Economic Activity During a Pandemic

TABE Webinar

May 26, 2020

Overview

- **What is nowcasting and why is it useful?**
- **What makes up a nowcast?**

Variables to estimate (e.g. GDP, unemployment rate, CPI)

Models used to estimate the chosen variables

Data to populate the models

- **How have nowcasting models performed during the pandemic?**
- **Conclusion**

Nowcasting is a guide to recent economic activity



Nowcasting refers to a set of forecasting models that are used to predict the current state of the economy as well as the recent past.

The usefulness of nowcasting is in its ability to aggregate disparate information into a coherent estimate of current economic activity. But nowcasting is only as good as the models and data used.

What variables do economists nowcast? Real GDP growth and its components

North American examples include:

United States

Atlanta Fed
(GDPNow)

New York Fed

St. Louis Fed
(Economic News Index)

Private companies
(e.g. Macroeconomic Advisors)

Commercial banks

Canada

Think tanks/academics
(e.g. Nowcast Canada)

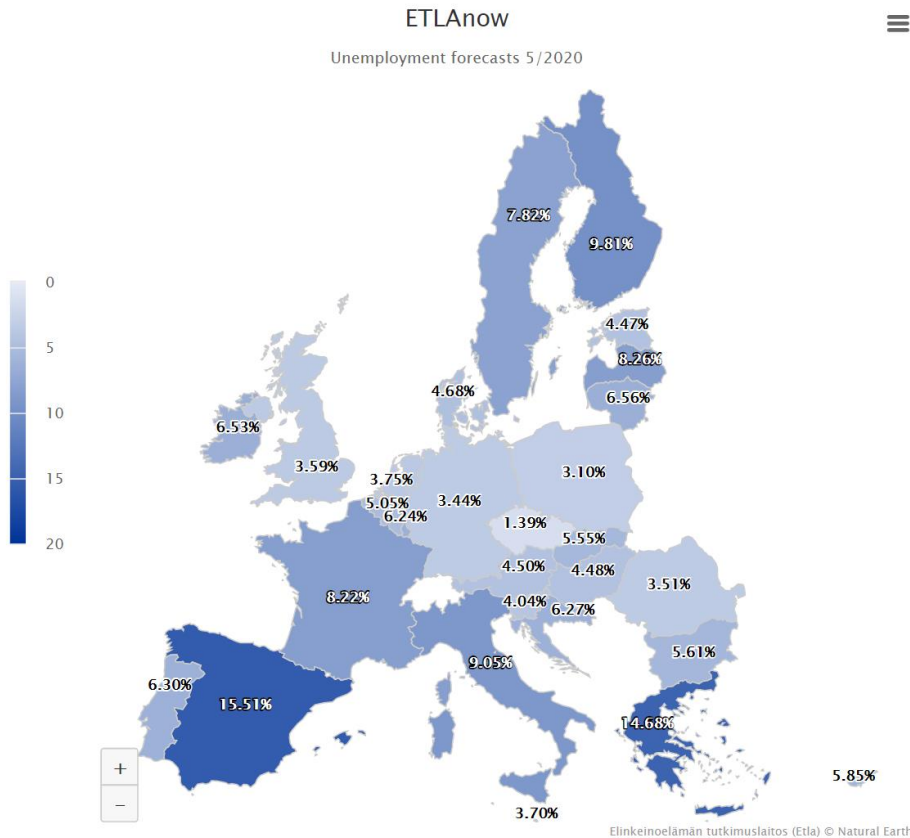
Commercial banks
(e.g. Scotiabank)

Bank of Canada

Statistics Canada

What variables do economists nowcast? Unemployment rate

Europe – ETLANow



Canada - IFSD



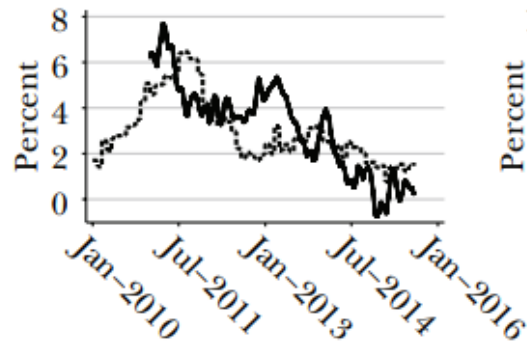
“ETLANow: A Model for Forecasting with Big Data – Forecasting Unemployment with Google Searches in Europe”

What variables do economists nowcast? CPI inflation

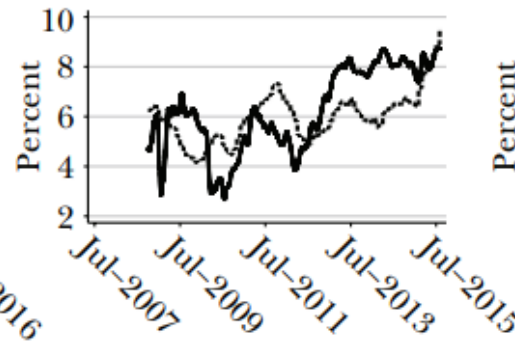
Global – Billion Prices Project

Online versus Consumer Price Index (CPI) Annual Inflation Rates

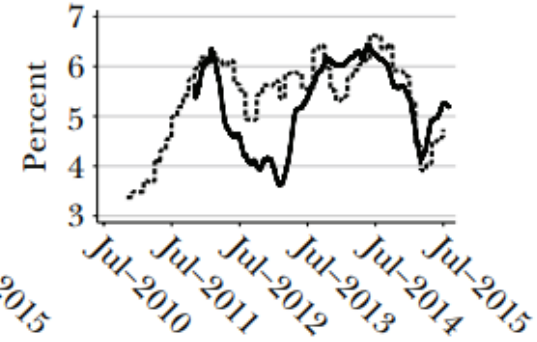
A: China



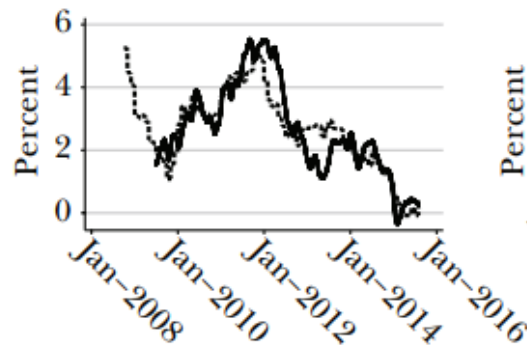
B: Brazil



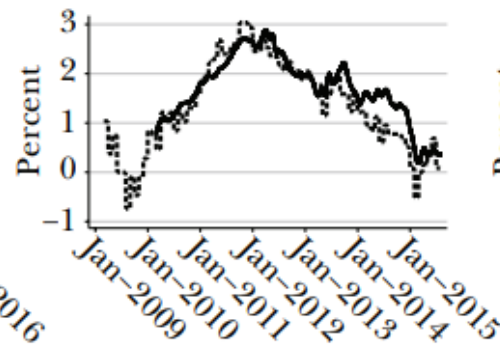
C: South Africa



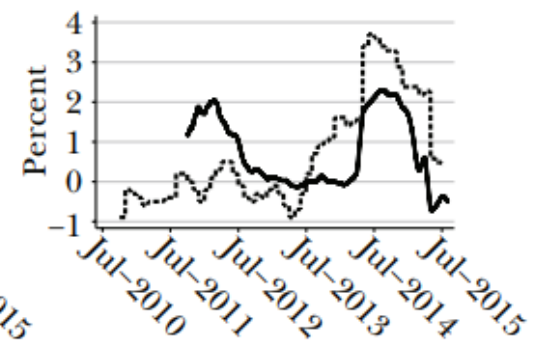
D: United Kingdom



E: Germany



F: Japan



“The Billion Prices Project: Using Online Prices for Measurement and Research”, Cavallo and Rigobon, 2016

Common modelling approaches for nowcasting GDP

- **Autoregressive (AR) Models**
- **Bridge Models or Leading Indicators Models**
- **Dynamic Factor Models (DFM)**
- **Mixed-Data Sampling (MIDAS) Models**
- **Bayesian Vector Autoregressions (BVARs)**
- **Information-Augmented Consensus**
- **Benefits of combining forecasts**

Autoregressive (AR) Models

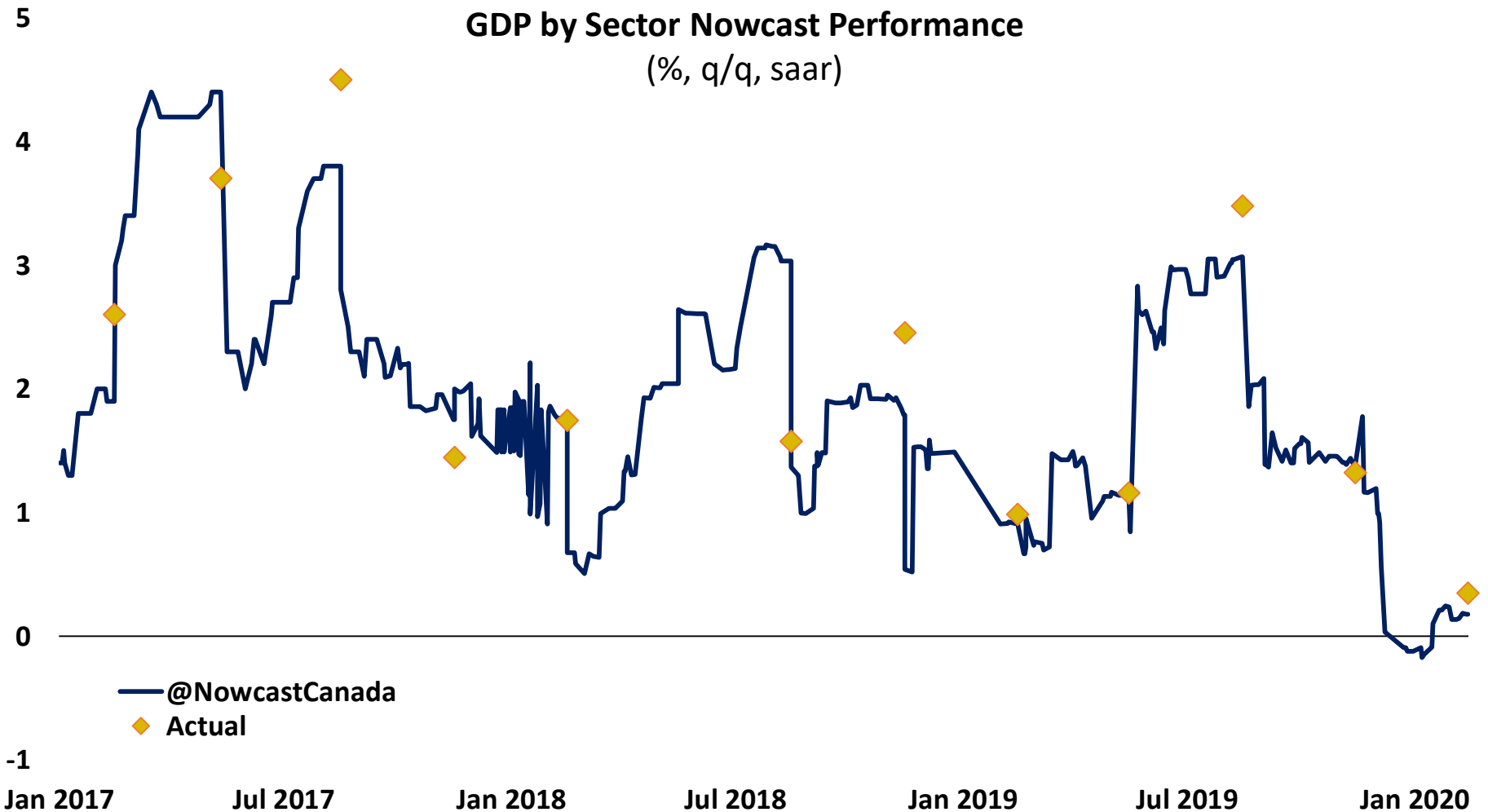
- Simplest type of nowcasting model
- The dependent variable is forecast using only its past values as predictors
- AR models are generally used when comparing the performance of other types of nowcasting models

Bridge Models or Leading Indicator Models

- Similar to an AR model as it uses an autoregressive term plus addition information
- ‘Ragged edges’ can be filled using an auxiliary AR model
- Bridge models have been used extensively at central banks, and although they are relatively simple they have demonstrated good forecasting performance
- Examples: Atlanta Fed’s *GDPNow* and Institute of Fiscal Studies and Democracy’s *Nowcast Canada*

Bridge Models or Leading Indicator Models

Example: Nowcast Canada

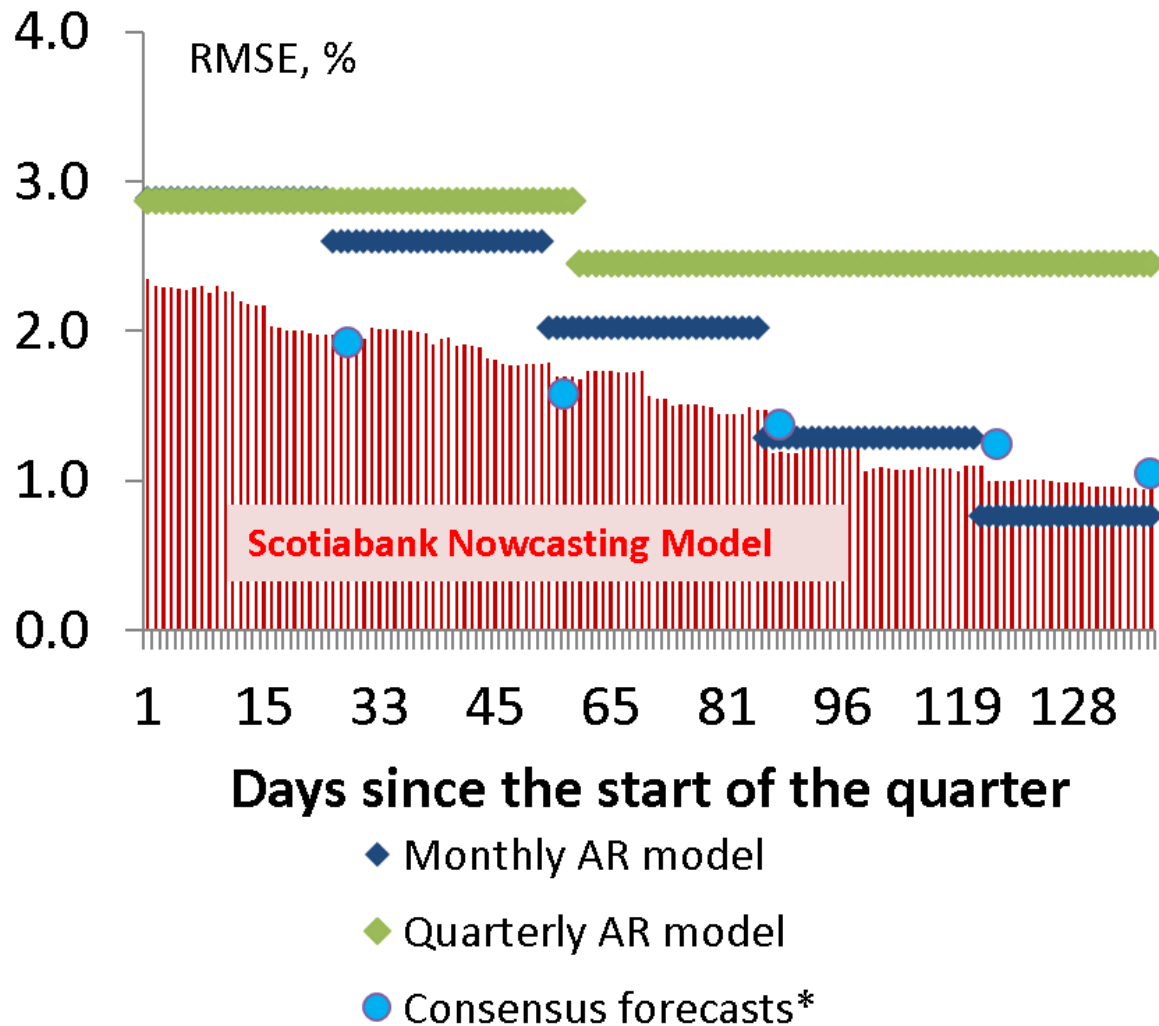


“Nowcasting: Economic Forecasting Meets Just-In-Time Delivery”, Bartlett and McKellips, 2017

Dynamic Factor Models (DFM)

- Factor models utilize the co-movement of a large set of indicators to estimate common factors, which in turn represent the underlying comovement of that set of variables
- They provide a rigorous framework for quantifying the impact of economic “news” on the nowcast of GDP
- These have become popular among central banks, as they have useful properties for nowcasting
- Example: New York Fed’s *Nowcasting Report* and Scotiabank’s nowcasting model for Canada

Dynamic Factor Models (DFM) Example: Scotiabank Economics



“Introducing Scotiabank’s Nowcasting Model for the Canadian Economy”, Nikita Perevalov, 2018

Information-Augmented Consensus

- Evaluates the incoming flow of information contained in economic announcements
- Tracks whether key economic data have come in stronger, weaker, or as expected during the current quarter relative to a baseline consensus forecast
- Data releases are weighted relative to their importance in updating forecasts of real GDP growth during the current quarter
- Example: St. Louis Fed's *Economic News Index*

Mixed-Data Sampling (MIDAS) Models

- MIDAS models are a popular type of models whose main feature is the ability to estimate using mixed frequency data
- The MIDAS regression reduces the number of parameters to be estimated by assuming that the lag coefficients on the high frequency variables can be approximated by a distribution
- The distributional assumption reduces the number of parameters to be estimated to only those characterizing the weighting function of the distribution
- The same variables can be used in MIDAS models as in bridge equation models

Bayesian Vector Autoregressions (BVARs)

- Vector autoregressions (VARs) and Bayesian vector autoregressions (BVARs) are among the most common models used by policymakers for forecasting and economic analysis because of their simplicity and good forecasting performance
- The BVAR differs from a VAR in that it uses prior assumptions on the parameters to reduce the problem of parameter proliferation
- Besides being very flexible forecasting tools, BVAR models allow a richness of dynamic interrelations between the variables that is missing in some other models

Data used to nowcast real GDP: Canadian example

National monthly gross domestic product by industry, summary of Methods and data sources

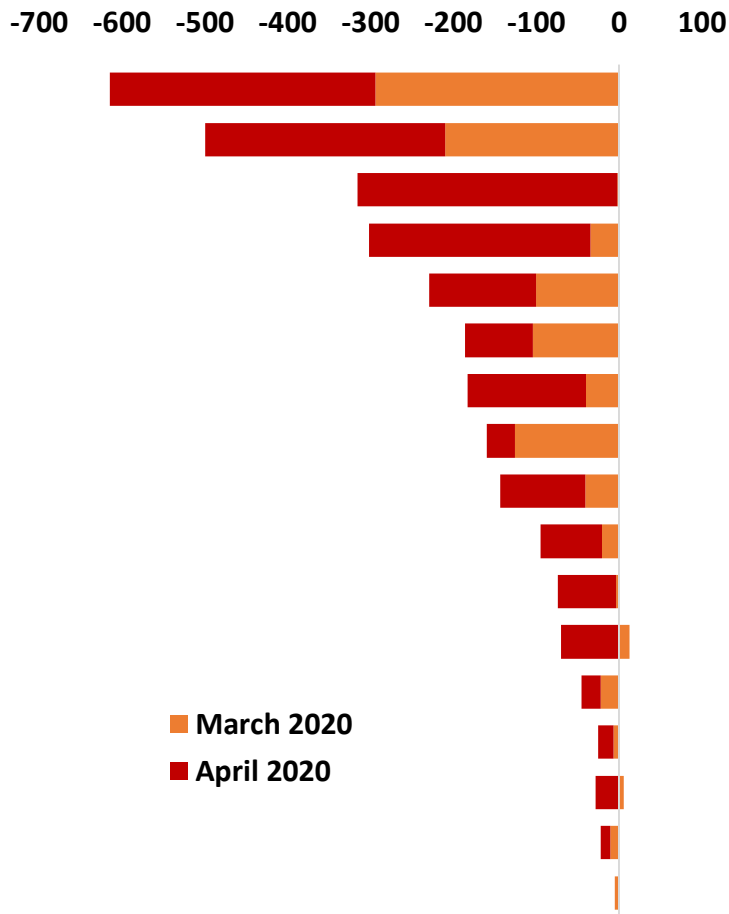
Code	Industry name	Type of indicators	Methods and data sources
111	Crop production	Gross output	Crop output in constant prices, Income and Expenditure Accounts, Record no. 1901 , Canadian Grain Commission. Farm cash receipts for field-grown vegetables and for greenhouse, nursery and floriculture production, Record no. 3437 . Farm product price indexes, Record no. 5040 .
112	Animal production	Gross output	Farm cash receipts for most livestock, dairy products and eggs, Record no. 3437 . Farm product price indexes, Record no. 5040 . Domestic exports quantities for animal aquaculture multiplied by base year prices, Record no. 2201 .
113	Forestry and logging	Gross output	Cubic metres of cut timber multiplied by base year prices, Provincial Departments (Quebec, Ontario and British Columbia).
114	Fishing, hunting and trapping	Gross output	Annual estimates of fish landing quantities multiplied by base year prices from Fisheries and Oceans Canada are interpolated by domestic exports of fish, Record no. 2201 . Raw materials price indexes, Record no. 2306 .
115	Support activities for agriculture and forestry	Revenues and employment	Revenues declared on the Goods and Services Tax remittance form, Canada Revenue Agency. Average weekly earnings, Labour Force Survey, Record no. 3401 , and Survey of Employment, Payrolls and Hours, Record no. 2612 . Number of employees, Survey of Employment, Payrolls and Hours, Record no. 2612 .
211113	Conventional oil and gas extraction	Gross output	Physical quantities multiplied by base year prices, Crude oil and natural gas, Record no. 2198 .



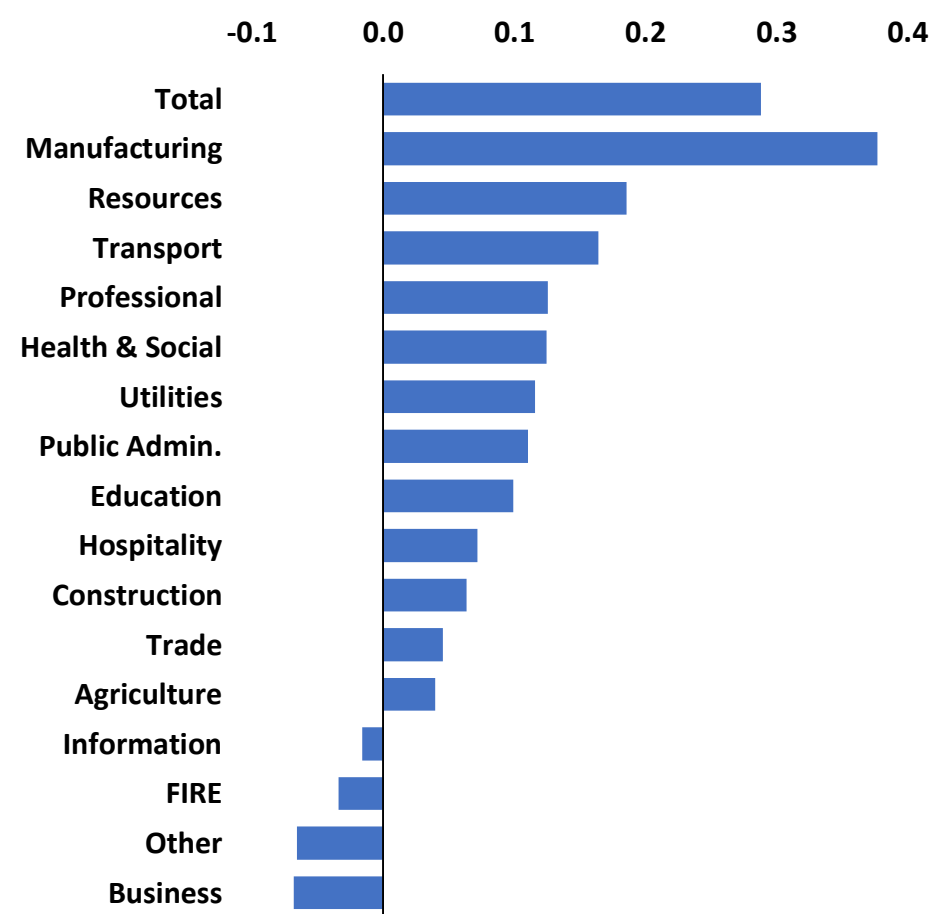
Most country statistical agencies provide some sort of documentation on how they construct GDP

Data used to nowcast Canadian real GDP: Some official data are timely but of limited use

Monthly Change in Employment by Sector
(thousands)

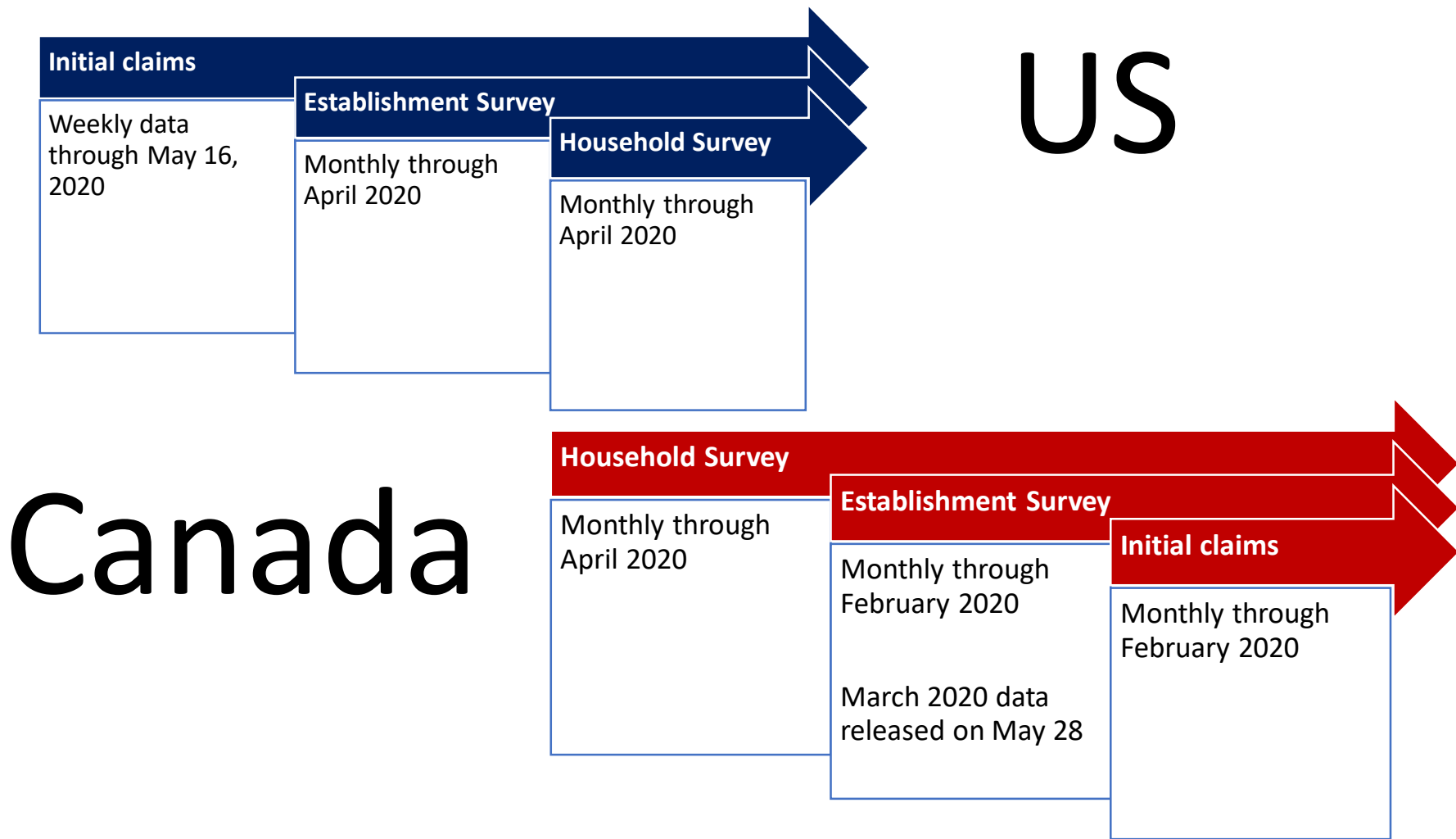


LFS & SEPH Employment Correlations
(Feb 2002 to Feb 2020)



However, the Labour Force Survey is only used to a very limited extent in estimating GDP

Data used to nowcast Canadian real GDP: Most official Canadian data are significantly lagged



Jobs data is the most egregious example of extraordinarily delayed official information in Canada

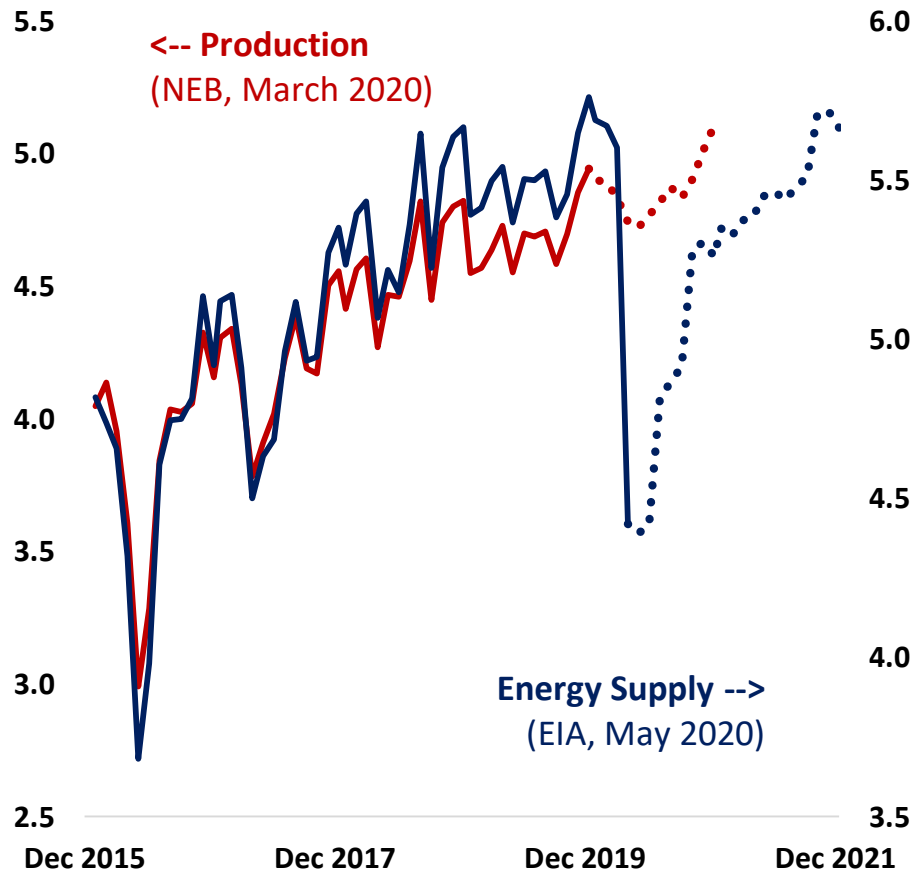
Data used to nowcast Canadian real GDP: Contending with the 'ragged edge'

	2020Q1			2020Q2		
	January 2020	February 2020	March 2020	April 2020	May 2020	June 2020
Equity prices						
Interest rates						
Exchange rates						
Rig counts						
Rail carloads						
US oil imports						
Economic Mood Index						
EIA energy supply						
NEB crude oil production						
CFIB Business Barometer						
Markit manufacturing PMI						
Ivey PMI						
ADP Payrolls						
Labour Force Survey						
SEPH						
Employment Insurance						
Auto production						
Merchandise trade						
Manufacturing shipments						
Auto sales (Desrosiers)						
Wholesale						
Retail						
Auto sales (StatCan)						
Housing starts						
Existing home sales						
Building permits						

Data are released at different frequencies and lags to the reference period, creating a 'ragged edge'

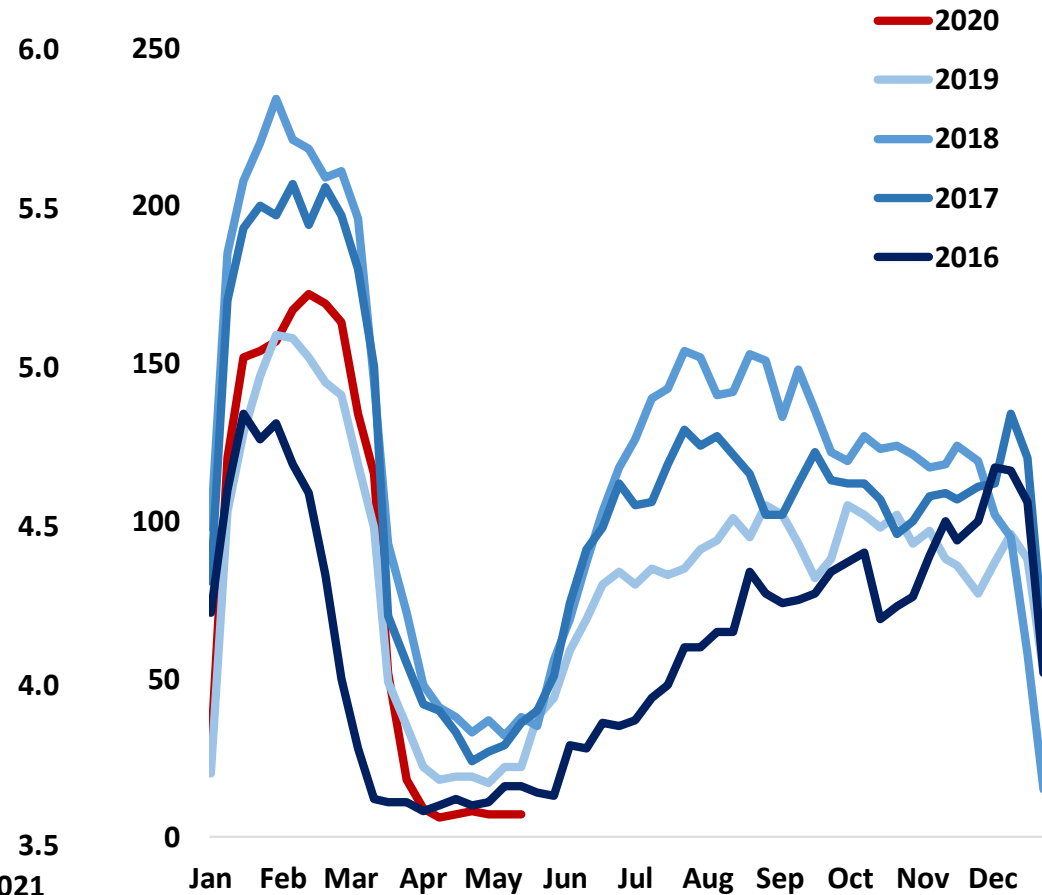
Data used to nowcast Canadian real GDP: Examples of unofficial 'hard' data for Canada

Canada Oil Production & Energy Supply
(millions of bbl/day)



Sources: National Energy Board, Energy Information Administration.

Canada Rig Counts

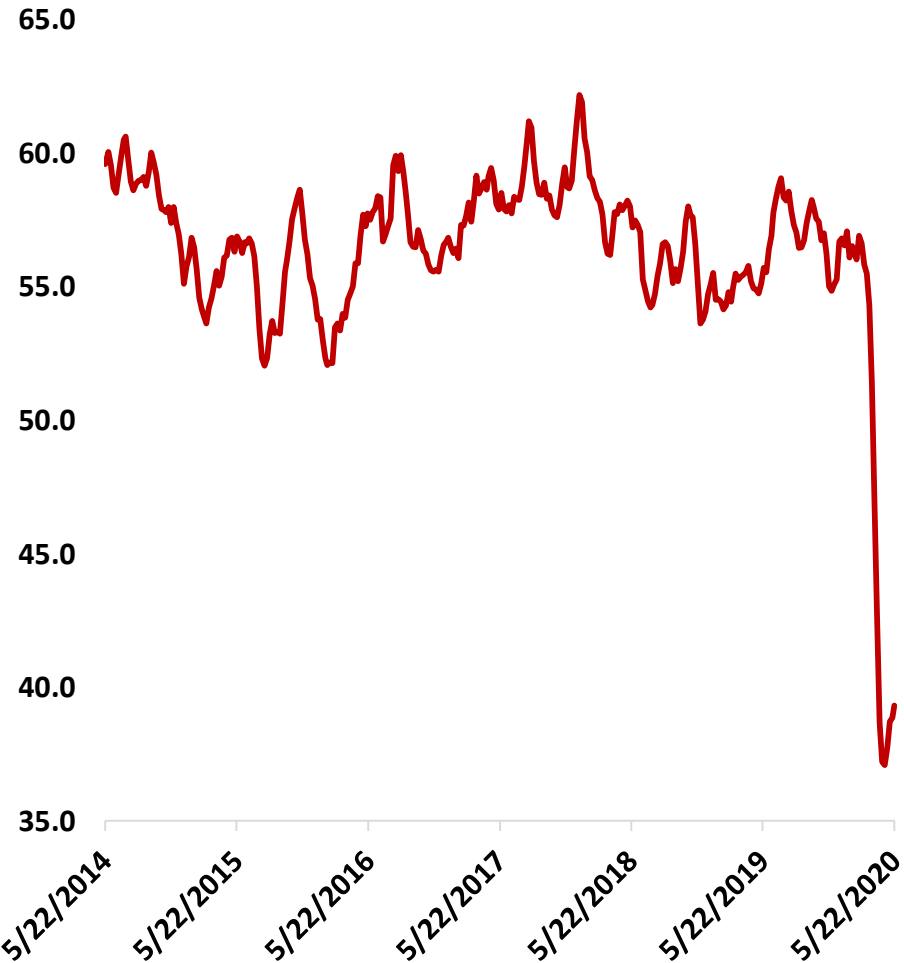


Source: Baker Hughes.

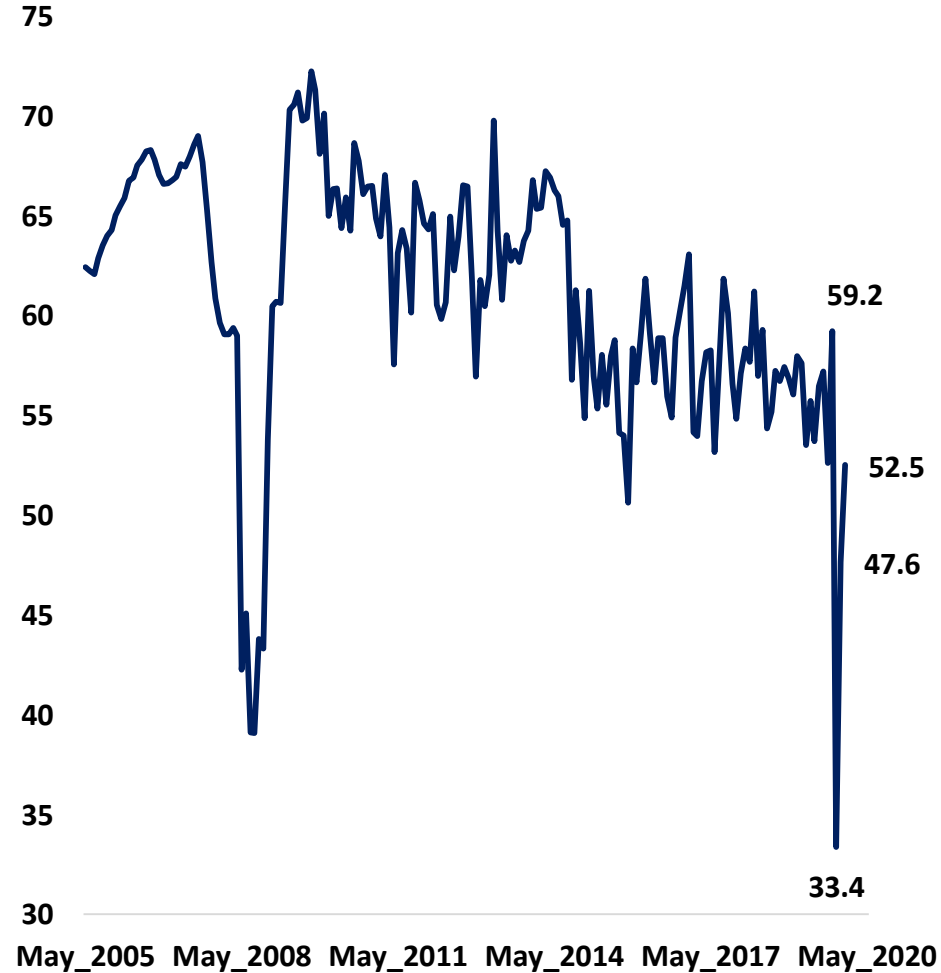
Other examples include ADP employment and weekly US crude imports from Canada

Data used to nowcast Canadian real GDP: Examples of unofficial survey data for Canada

Weekly Canadian Economic Mood Index



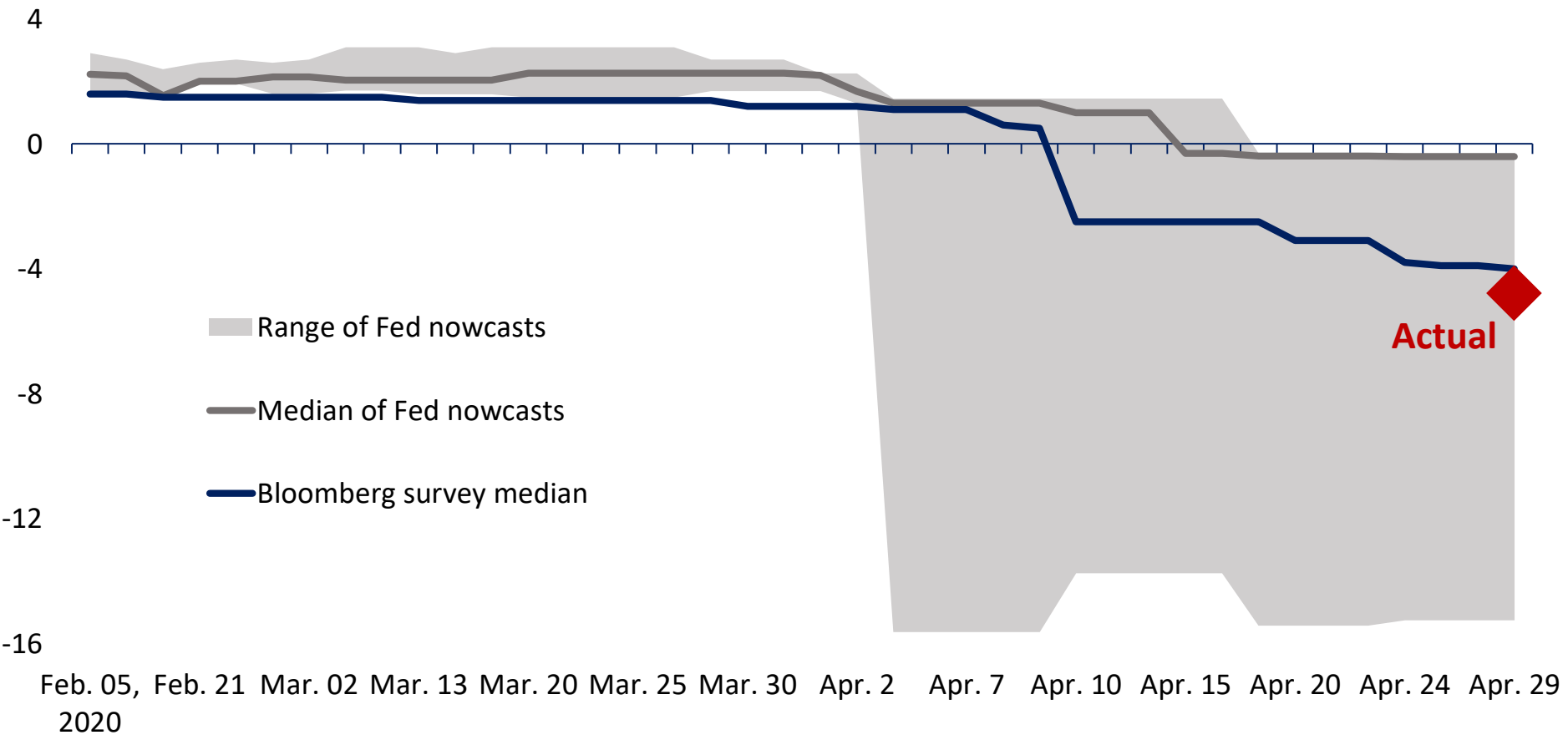
CFIB Retail Sentiment (sa)



Other examples include Conference Board Consumer Confidence and the BOC's Business Outlook Survey

How have nowcasts performed during the pandemic? Not all that well in the US

2020Q1 Nowcast of US Real GDP Growth (% , q/q, saar)

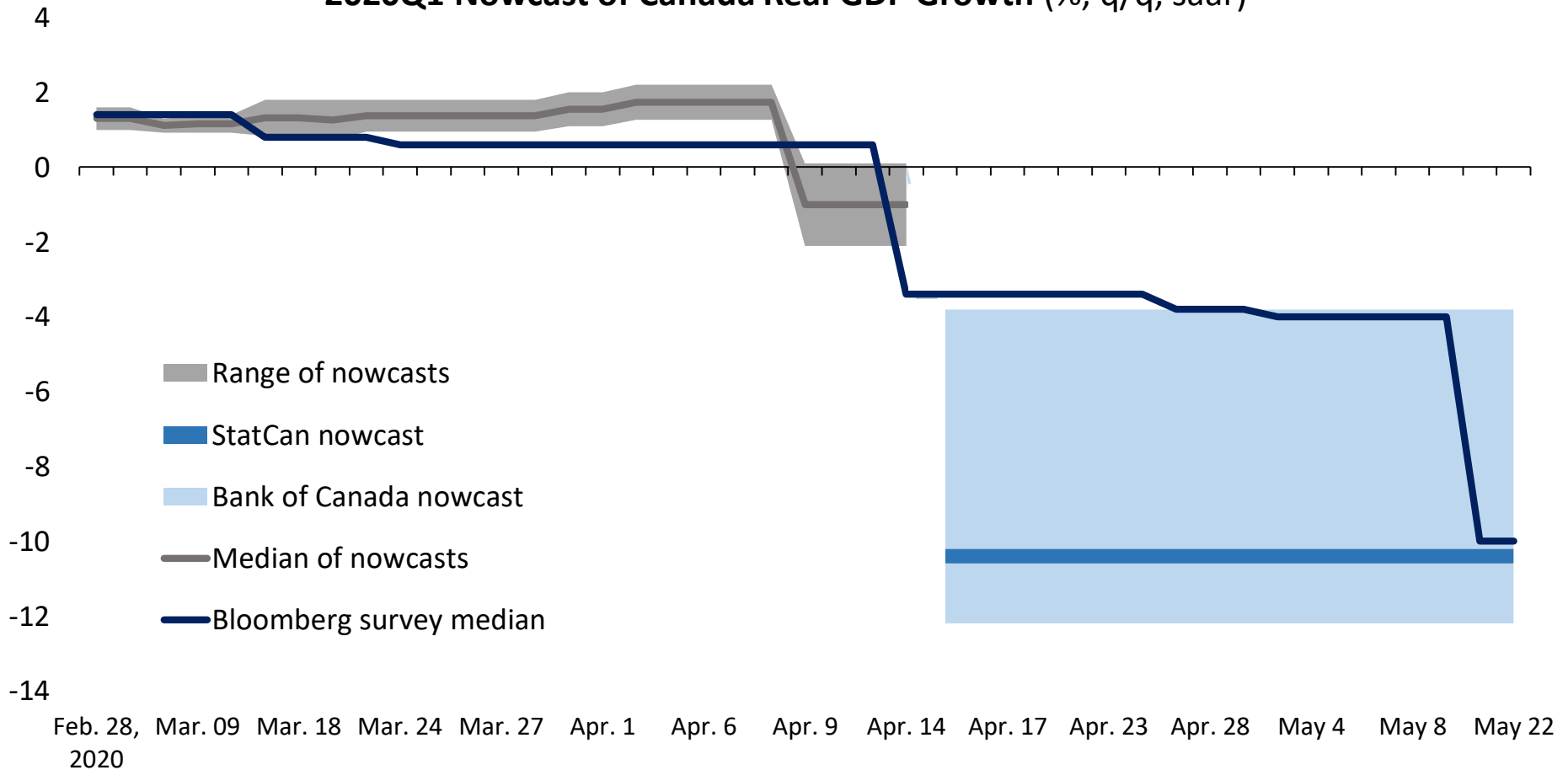


Sources: Atlanta Fed, New York Fed, St. Louis Fed, Bloomberg.

Individual Fed nowcasts were well off the mark in Q1

How have nowcasts performed during the pandemic? In Canada, we have yet to find out

2020Q1 Nowcast of Canada Real GDP Growth (% , q/q, saar)

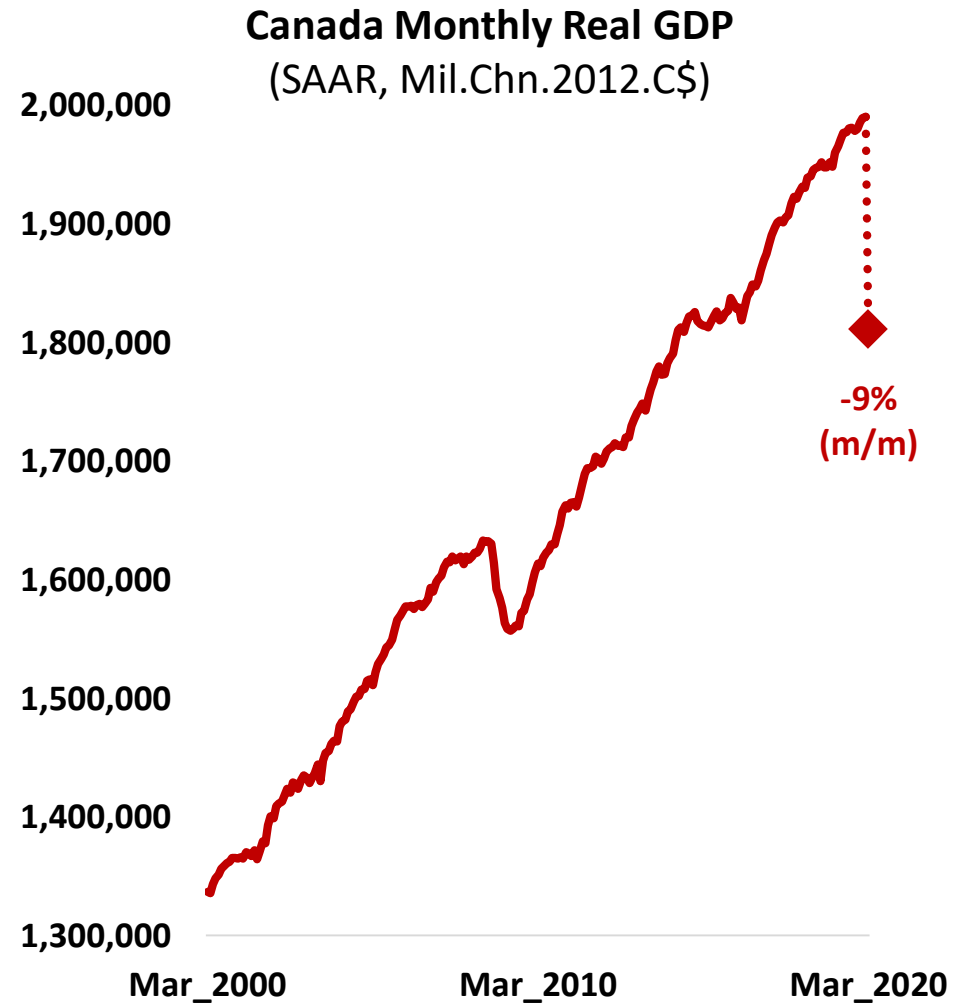


Sources for Canada: Nowcast Canada, Scotiabank, Statistics Canada, Bank of Canada, Bloomberg, OMERS Economic Research.

Unofficial nowcasts were shelved following the release of official nowcasts from StatCan and the BOC

How have nowcasts performed during the pandemic? Taking a closer look at StatCan's inaugural nowcast

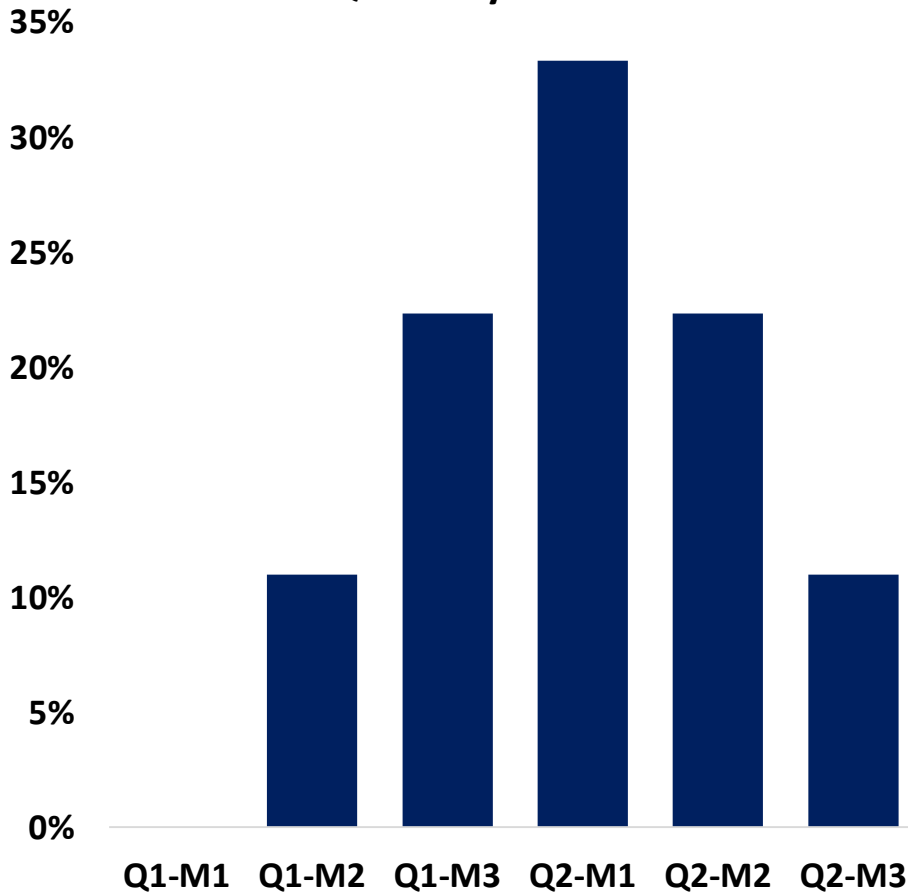
- StatCan's inaugural nowcast was based on internal and external data available at the time of publication as well as expert views
- No industry-level detail was provided
- Released before official February 2020 real GDP
- As the nowcast did not conform to the typical process, it is unclear whether another will be published



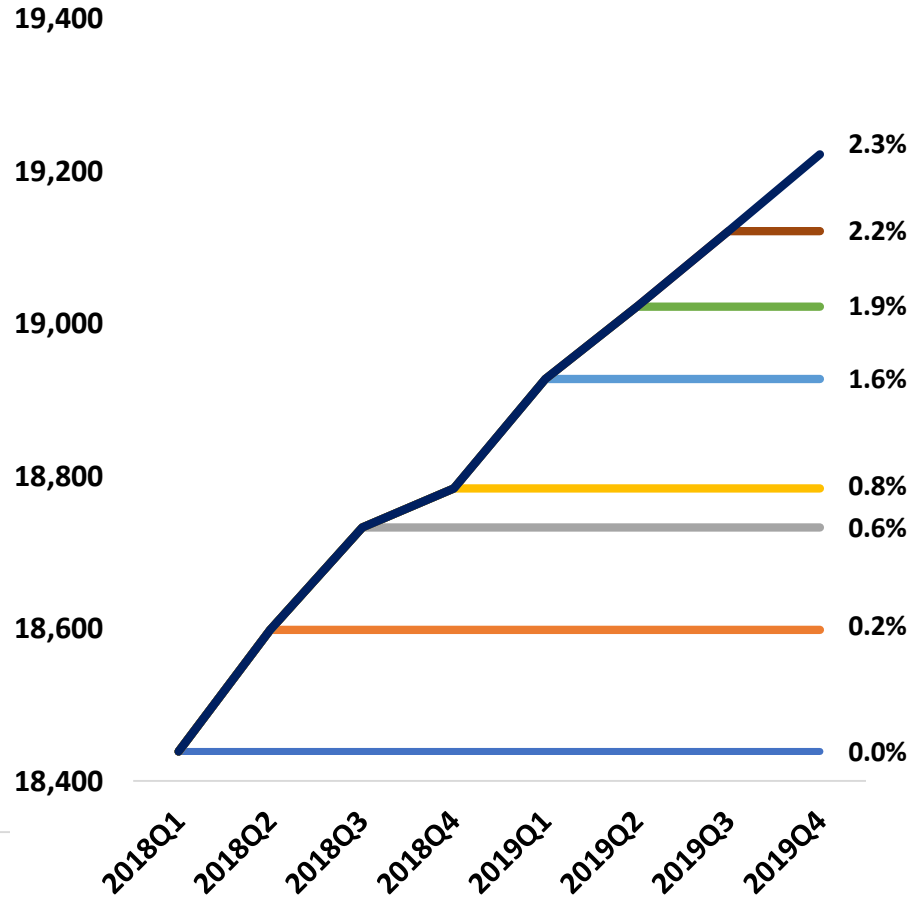
A -9% (m/m) drop in March 2020 translated into a -2.6% (q/q, sa) decline in 2020Q1 real GDP

The trouble with nowcasting during a pandemic: Getting to the starting line - Explaining the handoff

Weight of Individual Months on Quarterly Growth



Handoff to 2019 Annual GDP Growth



If real GDP was unchanged in March 2020, 2020Q1 growth would have been +0.4% (q/q, sa)

The trouble with nowcasting during a pandemic: StatCan has tried to fill some of the data gap

Value of Total Building Permits
(%, y/y)

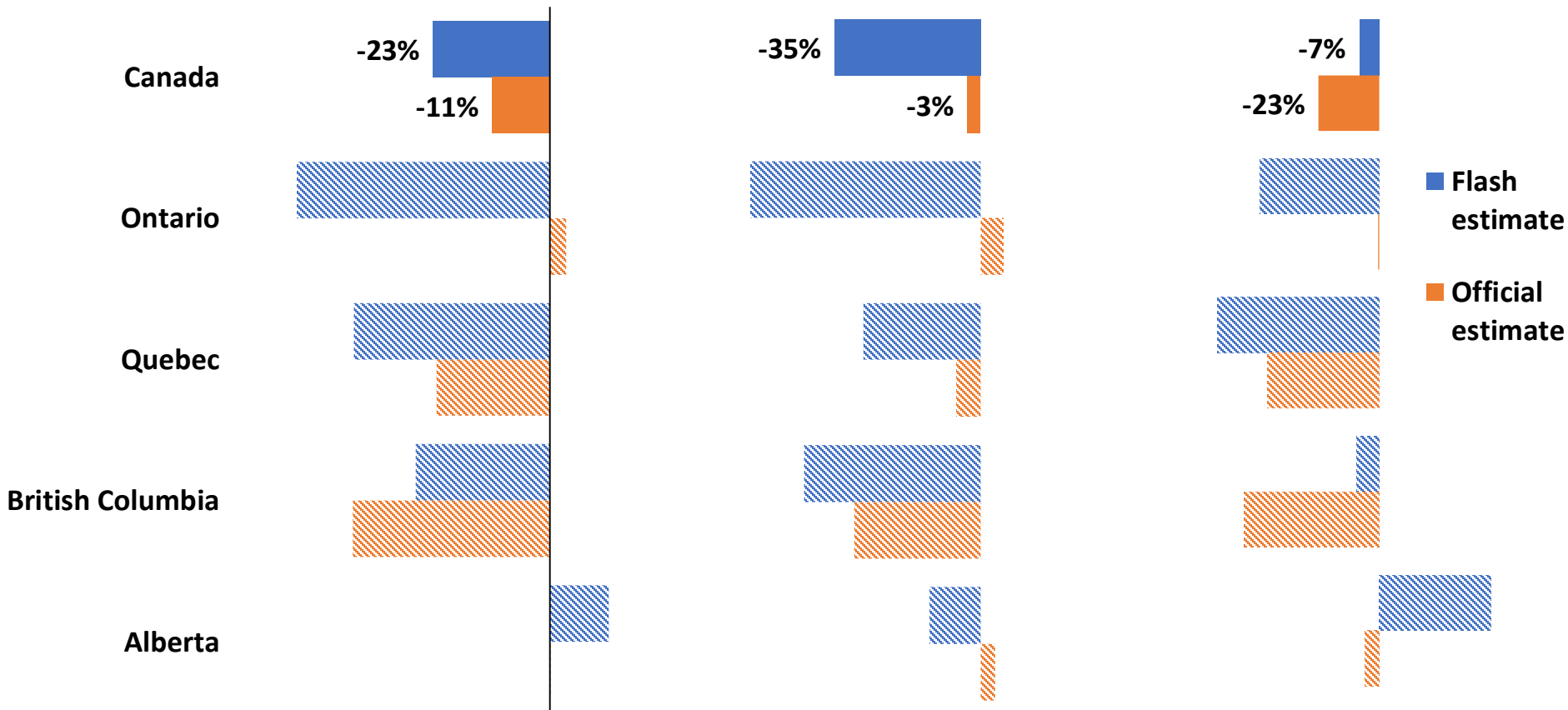
Value of Res. Building Permits
(%, y/y)

Value of Non-res Building Permits
(%, y/y)

-60% -40% -20% 0%

20% -60% -30% 0%

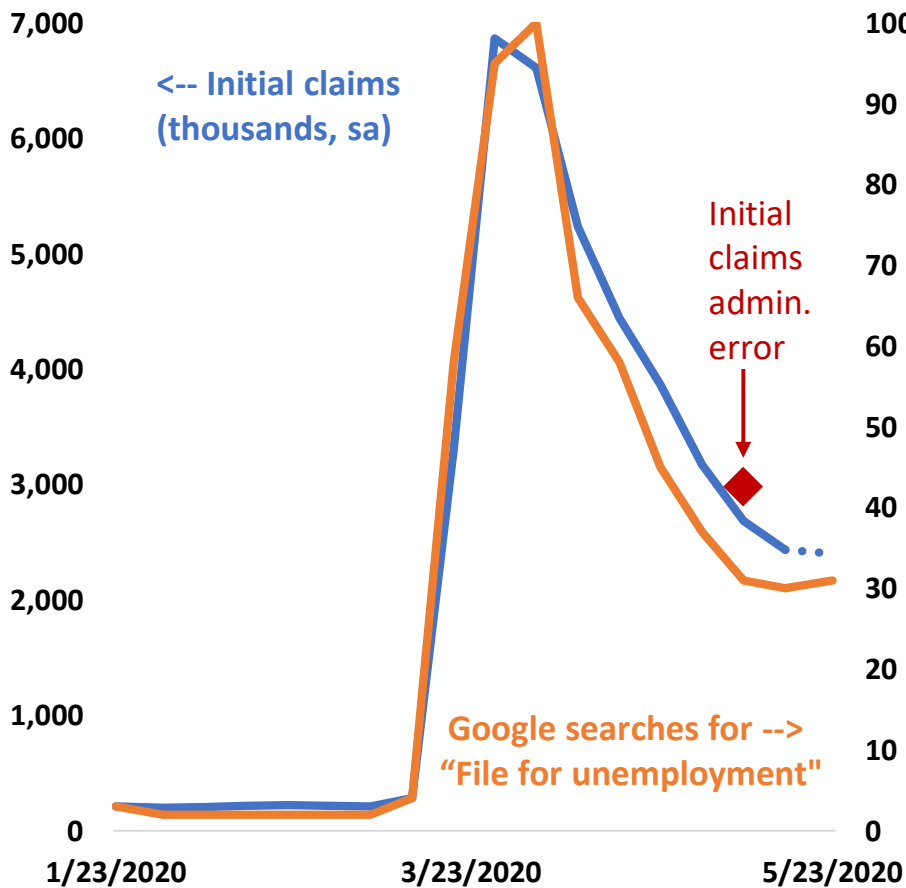
30% -60% -30% 0% 30% 60%



But some of StatCan's flash estimates have been subject to sizeable subsequent revisions

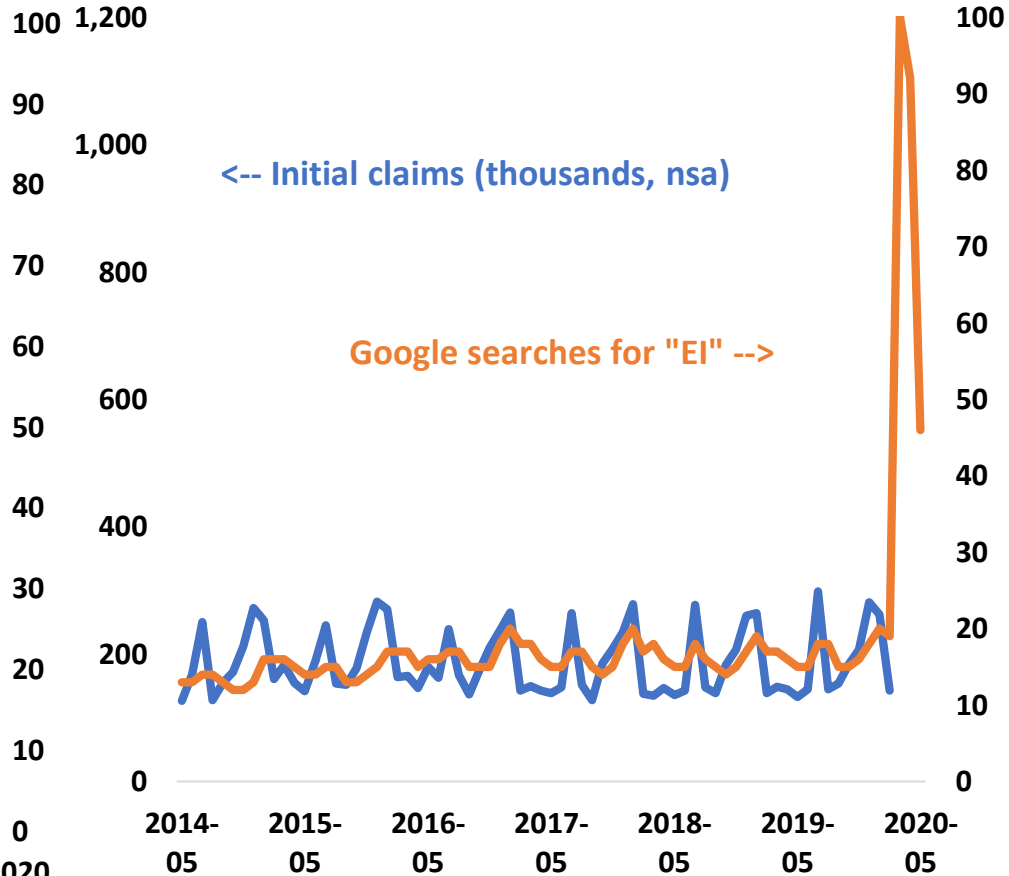
The trouble with nowcasting during a pandemic: StatCan isn't the only agency having these problems

US initial claims vs Google Trends



Sources: Bureau of Labor Statistics, Google Trends, TD Securities.

Canada initial claims vs Google Trends



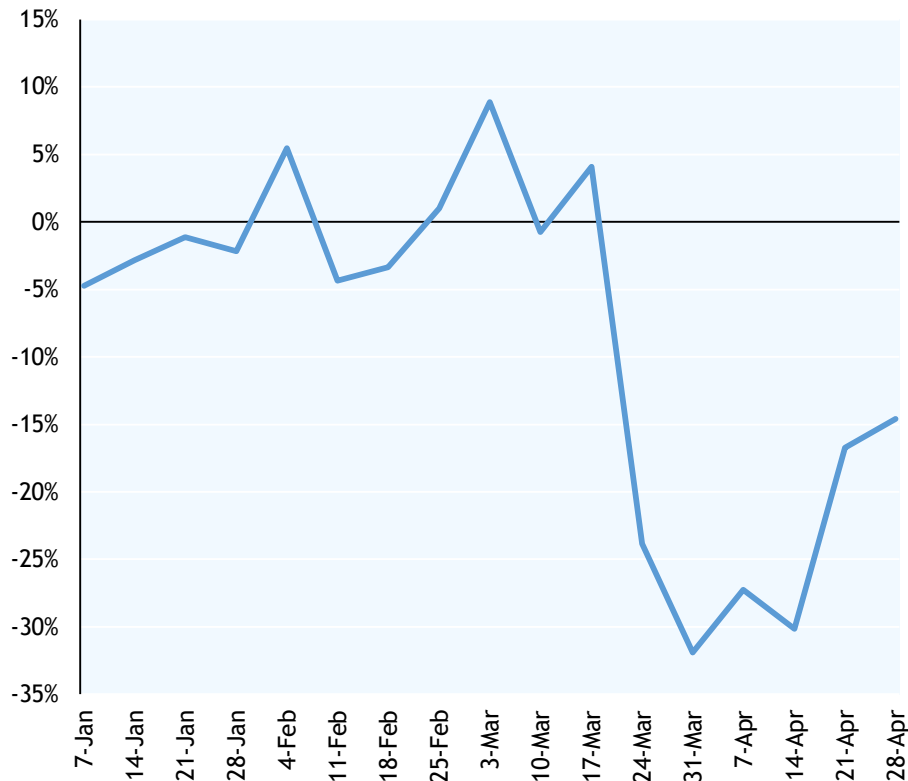
Sources: Statistics Canada, Google Trends.

A recent administrative error in US initial claims further highlights the value of using multiple data sources

The trouble with nowcasting during a pandemic: Flash estimates must be verified, where possible

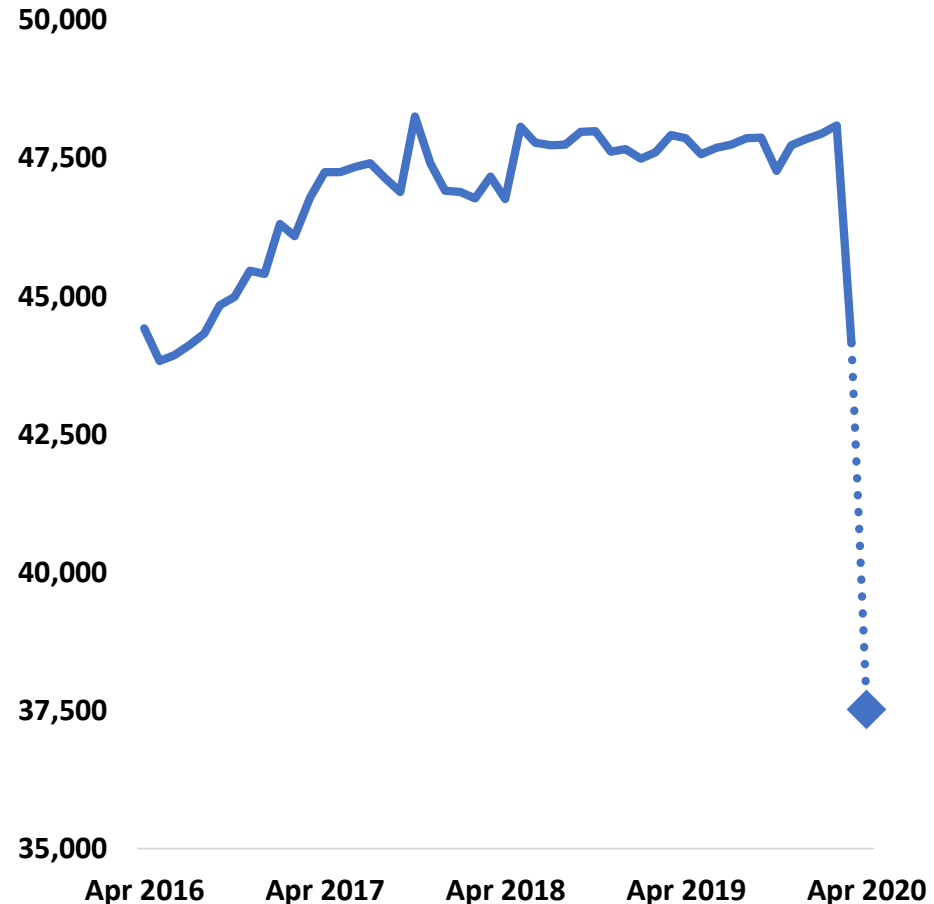
Green shoots after all?

Spending relative to pre-COVID average in 2020, % change



Source: RBC Economics, RBC Data & Analytics

Canada Real Retail Sales (SA, Mil.Chn.2012.C\$)

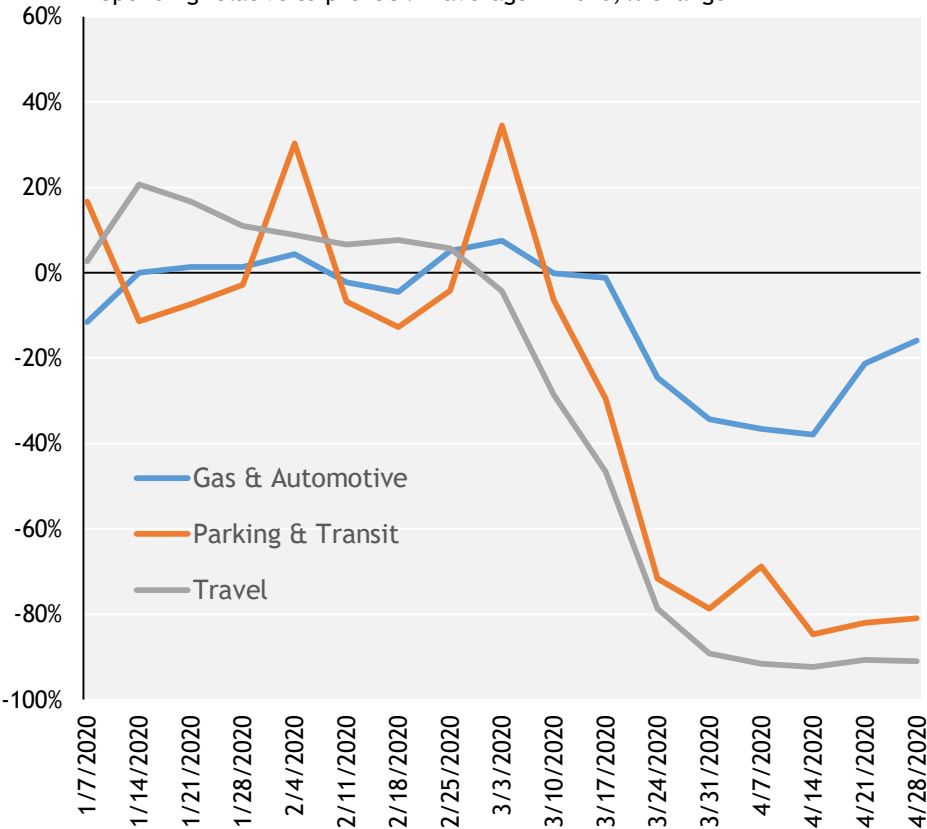


StatCan's flash estimate of April 2020 retail sales is -15.6% (m/m), similar to RBC credit card data

The trouble with nowcasting during a pandemic: Using novel data sources for Canadian activity

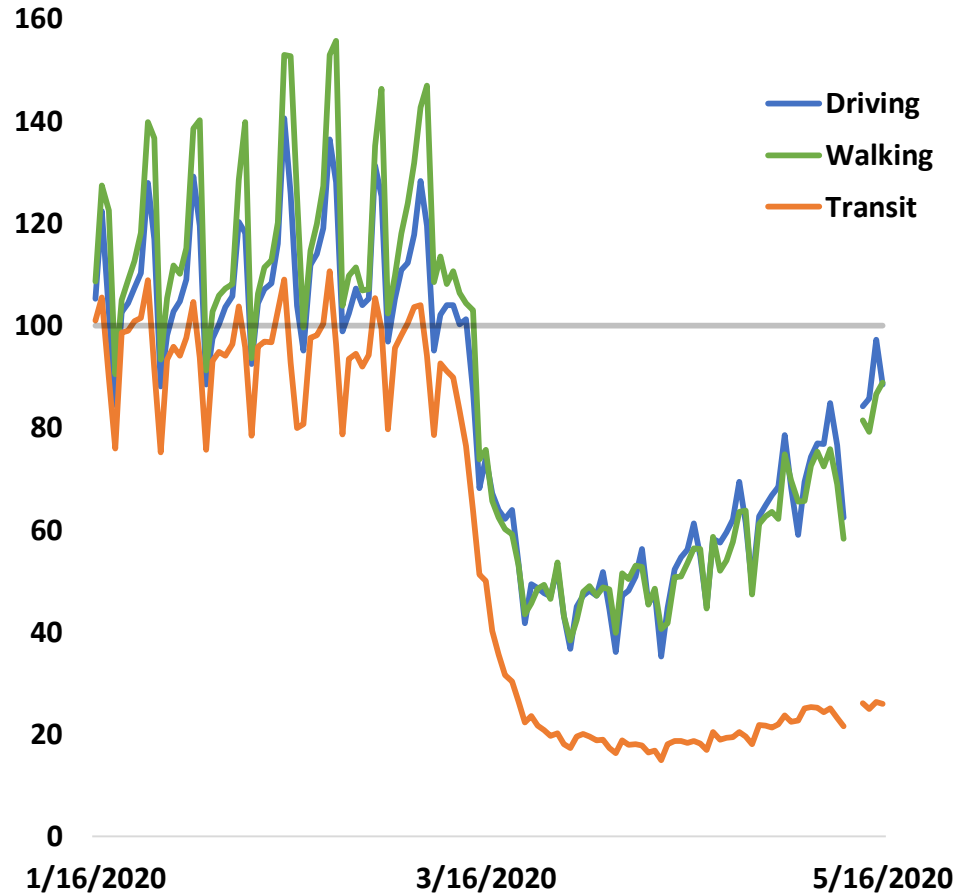
Travel and commute

Spending relative to pre-COVID average in 2020, % change



Source: RBC Economics, RBC Data & Analytics

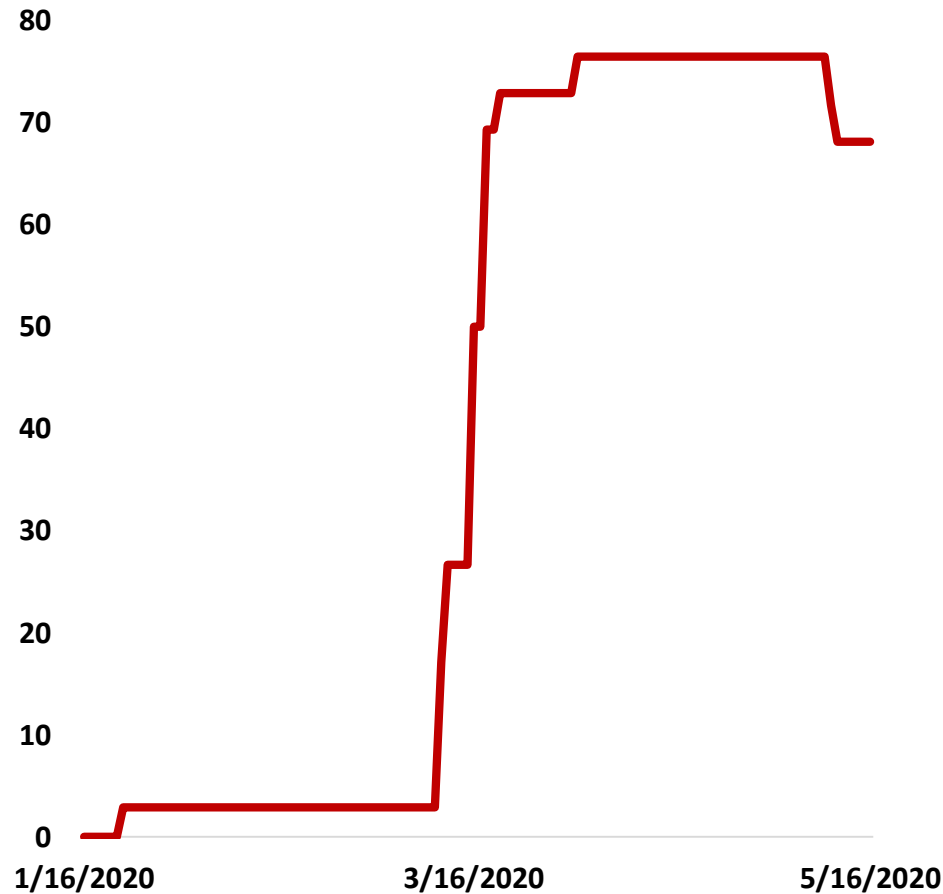
Apple Mobility Trends for Canada (Jan. 13, 2020 = 100)



Speaks to an increase in gasoline demand and possible upside to auto sales from current low levels

The trouble with nowcasting during a pandemic: Using novel data sources for Canadian activity

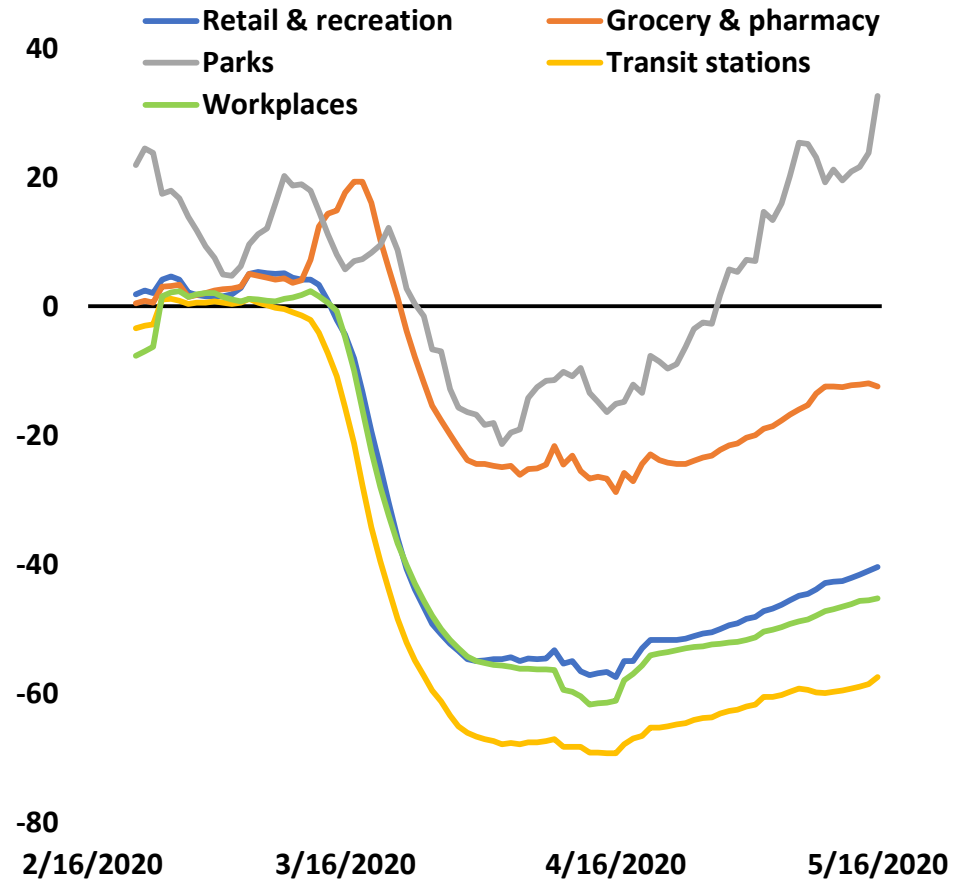
Canada Stringency Index



Source: Oxford University

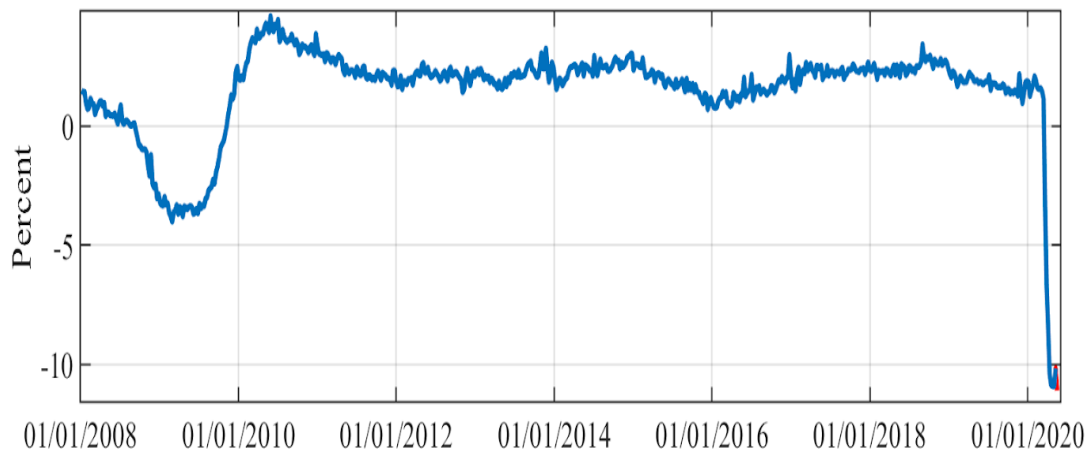
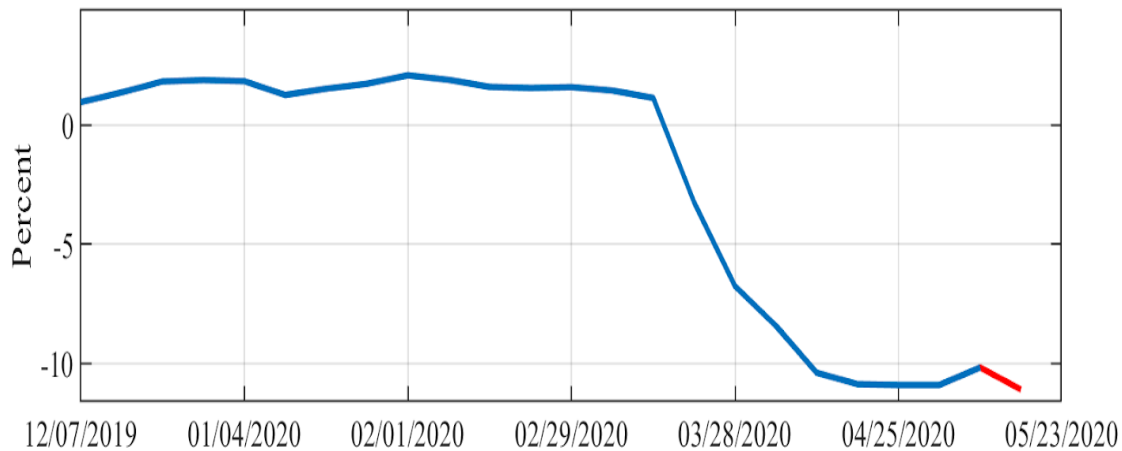
Canada - Google Mobility Report

(% change from ref. period)



Grocery & pharmacy is performing well through the crisis but public transit has been hit hard

The trouble with nowcasting during a pandemic: Economists are using much higher-frequency data



Data Series Employed in the WEI

Redbook Research: Same-store retail sales average

Unemployment insurance: Initial claims, state programs

American Staffing Association Staffing Index

Rasmussen Consumer Index

Raw steel production

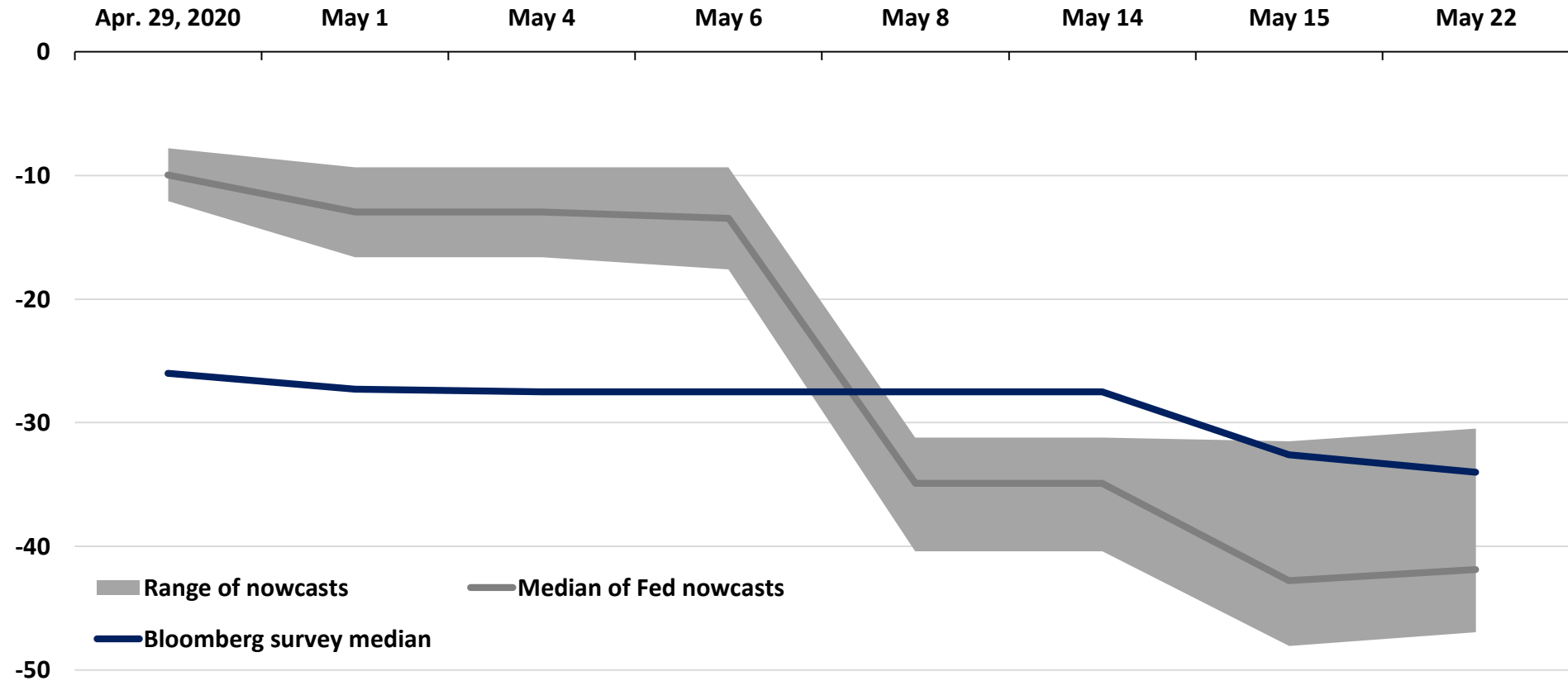
Electric utility output: United States ex. AL and HI

U.S. fuel sales to end users

US Weekly Economic Index (WEI) from Daniel Lewis (NY Fed), Karel Mertens (Dallas Fed), and Jim Stock.

The trouble with nowcasting during a pandemic: Markets and models are more closely aligned for Q2

2020Q2 Nowcast of US Real GDP Growth (%)



Sources: Atlanta Fed, New York Fed, St. Louis Fed, Bloomberg, OMERS Economic Research.

Given the weight of the handoff in a given quarter, a shock at the beginning makes nowcasting easier

The trouble with nowcasting during a pandemic: Nowcasters are keeping their caveats



The growth rate of real gross domestic product (GDP) is a key indicator of economic activity, but the official estimate is released with a delay. Our GDPNow forecasting model provides a "nowcast" of the official estimate prior to its release by estimating GDP growth using a methodology similar to the one used by the U.S. Bureau of Economic Analysis.

GDPNow is not an official forecast of the Atlanta Fed. Rather, it is best viewed as a running estimate of real GDP growth based on available data for the current measured quarter. There are no subjective adjustments made to GDPNow—the estimate is based solely on the mathematical results of the model. **In particular, it does not capture the impact of COVID-19 beyond its impact on GDP source data and relevant economic reports that have already been released. It does not anticipate the impact of COVID-19 on forthcoming economic reports beyond the standard internal dynamics of the model.**



The Nowcast and COVID-19

The New York Fed Staff Nowcast is a purely statistical model. It uses historical relationships to estimate the implication of macroeconomic data, as they are released, for current and next quarter GDP growth. The model does not incorporate information from data at higher frequency than monthly (so no data for March are incorporated until early April, for example) and therefore adjusts only gradually to rapidly evolving economic conditions.

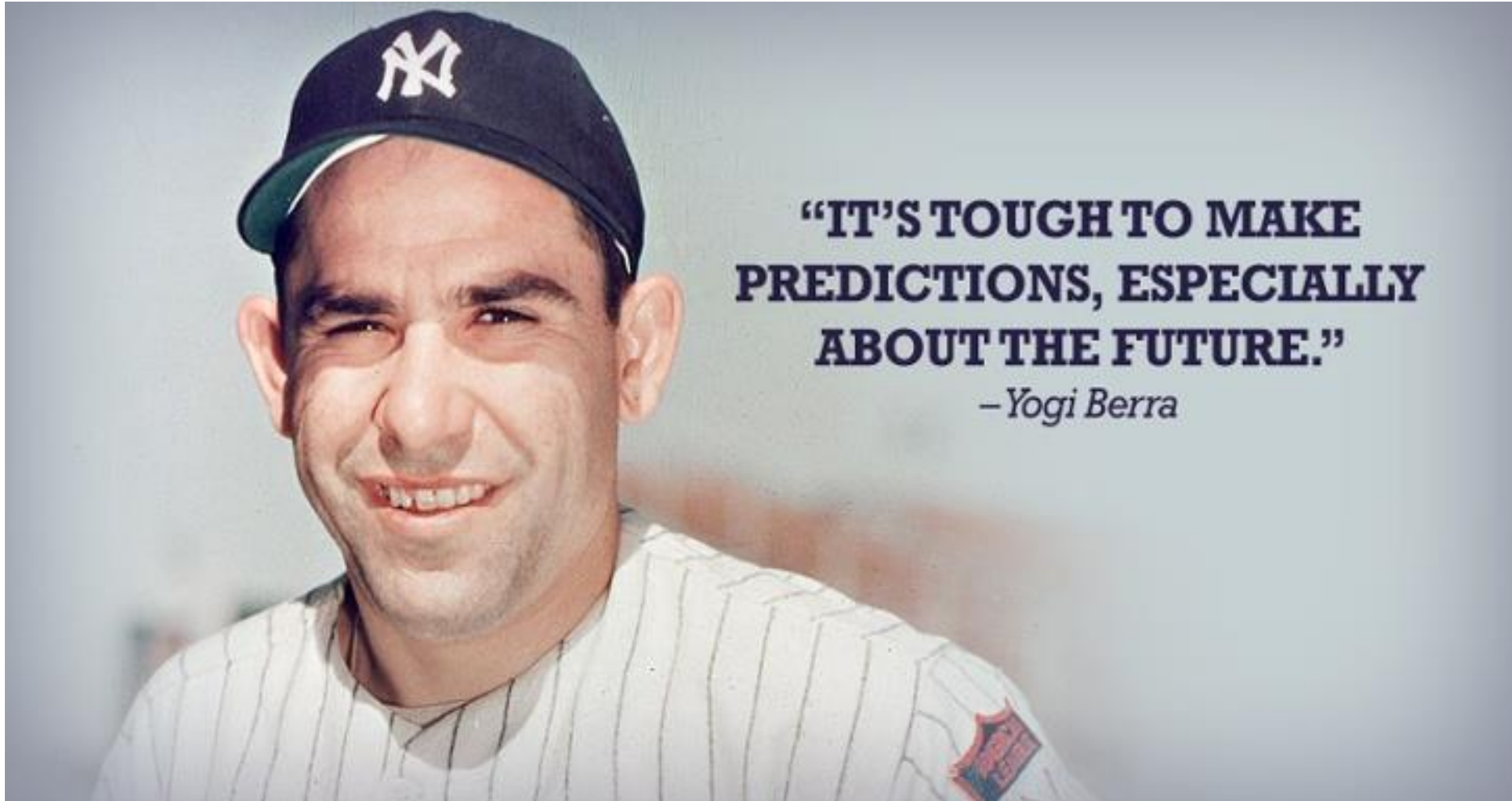
Despite the data starting to reflect COVID-related impacts, nowcasters are remaining cautious

Conclusion

- **Nowcasting helps to provide a coherent and consistent estimate of the current state of the economy**
- **Nowcasting models are highly varied, with their own strengths and weaknesses**
- **Nowcasts struggled in 2020Q1 but are performing better in Q2**
- **To improve performance, there is an increasing focus on using more timely and idiosyncratic data but with short time series**
- **Officials are doing a good job of trying to fill the data gap, but should take advantage of the crisis to permanently improve the timeliness of data releases, particularly for labour data**

Conclusion:

At the end of the day, forecasting isn't easy



Nowcasting models are just one set of tools in a forecaster's toolbox