

Presented By:

Aishwarya Sharma  
Harpreet Kaur  
Jagdeep Brar

IMAGE: <https://wallpapersafari.com/w/swTjG4>



# Nowcasting Macroeconomic Indicators using Google Trends



THE  
UNIVERSITY OF  
BRITISH  
COLUMBIA

Date: 21<sup>st</sup> June, 2022



# OUTLINE



- 1 INTRODUCTION TO TEAM AND CLIENT
- 2 OVERVIEW OF PROJECT
- 3 DATA SET
- 4 METHODOLOGY
- 5 ANALYSIS AND INTERPRETATION
- 6 CONCLUSIONS
- 7 FUTURE DIRECTIONS



# Introduction To Team



# AISHWARYA SHARMA

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- Bachelors in Computer Science
- Former Software Developer in Hewlett Packard Enterprise (HPE)
- Passion for data and listen to music in free time



# JAGDEEP BRAR

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- Ph.D. in Applied Mathematics
- Worked on Credit Risk Management Projects as a Postdoc
- Likes painting and cooking!!



# HARPREET KAUR

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- Gold Medalist in Applied Mathematics
- Former Software engineer
- Love hiking, making and tinkering



# Introduction To Clients

Statistics  
Canada



SPECIAL  
PROJECTS



## NICK NEWSTEAD

- Economist, Sociologist
- Data Exploration and Integration
- Strong Data Science Background

A photograph of a woman with long brown hair and glasses, wearing a blue top, speaking into a black microphone. She is standing in front of a red curtain. A white name tag is visible at the bottom of the frame.

# MARINA SMAILES

- Senior Analyst
- Data Exploration and Integration Lab
- Microdata, Demographic Analysis

# OVERVIEW



Economic Indicators →

Crucial for country's  
policy and decision  
making

Issue



Information contains lag

Aim



Develop model to  
nowcast indicators using  
Google Trends



# What is Lag in Information ?



## Retail Trade Sales (RTS) monthly (x 1,000)

North American Industry Classification System (NAICS)	November 2021	December 2021	January 2022	February 2022	March 2022
Retail trade [44-45]	58,750,669 <sup>A</sup>	57,919,779 <sup>A</sup>	59,951,705 <sup>A</sup>	60,077,703 <sup>A</sup>	60,093,050 <sup>A</sup>
Motor vehicle and parts dealers [441]	15,632,744 <sup>A</sup>	16,034,363 <sup>A</sup>	16,683,956 <sup>A</sup>	16,045,062 <sup>A</sup>	15,011,554 <sup>A</sup>

No values for April and May 2022 – lag of 2 months

**Solution:** Use alternate data source to estimate current period indicators

**Alternate data source:** Google Trends

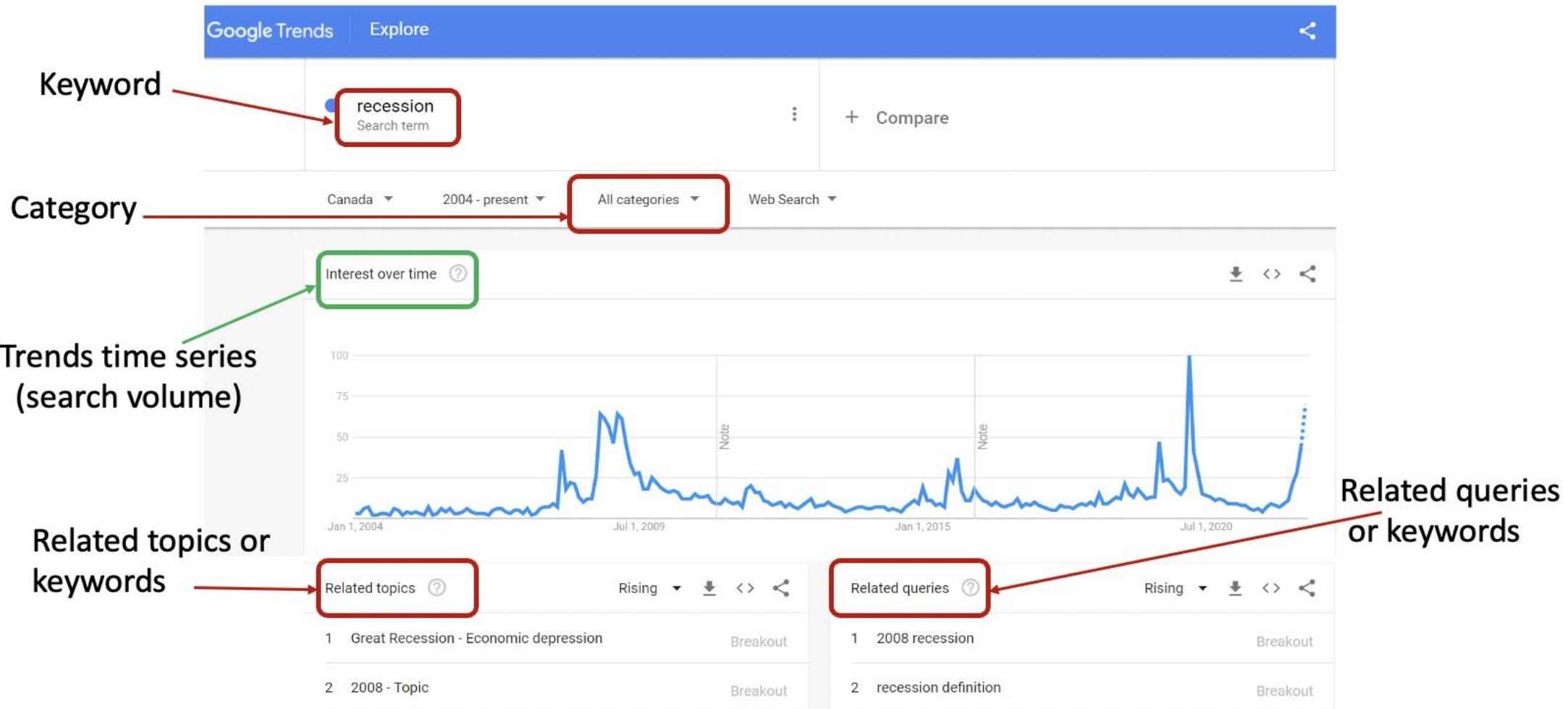
Snapshot: <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2010000802>



# What are Google Trends ?

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Image: <https://www.thenina.com/what-does-a-value-of-100-mean-in-google-trends/>



Snapshot: <https://trends.google.com/trends/?geo=CA>

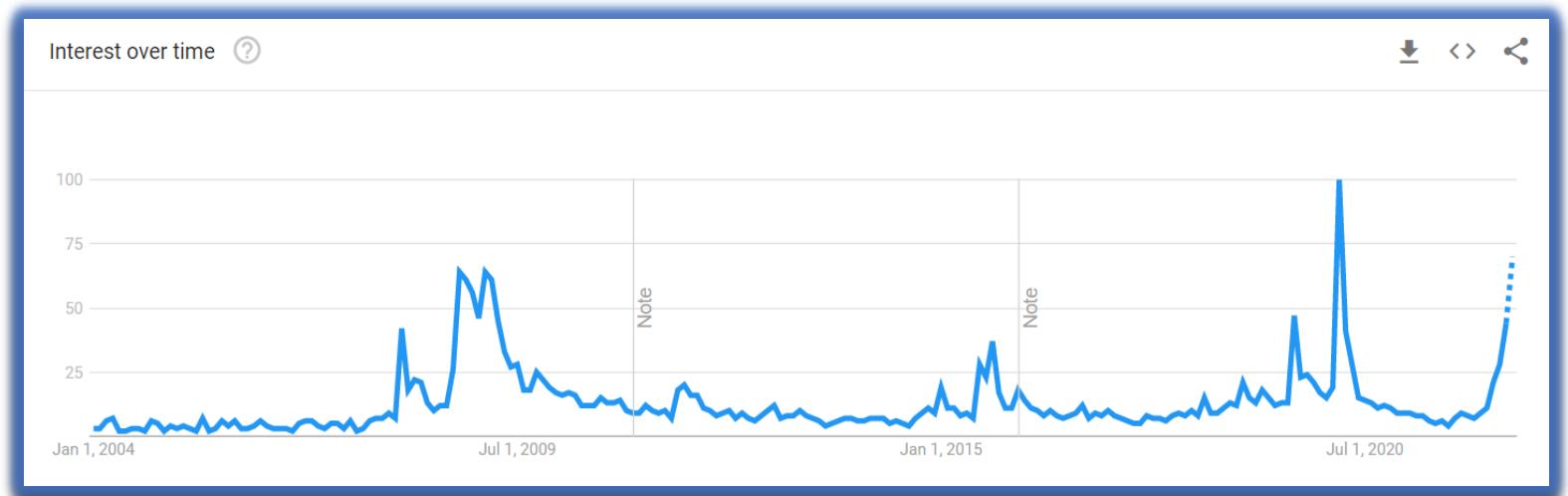
# Why Google Trends ...?



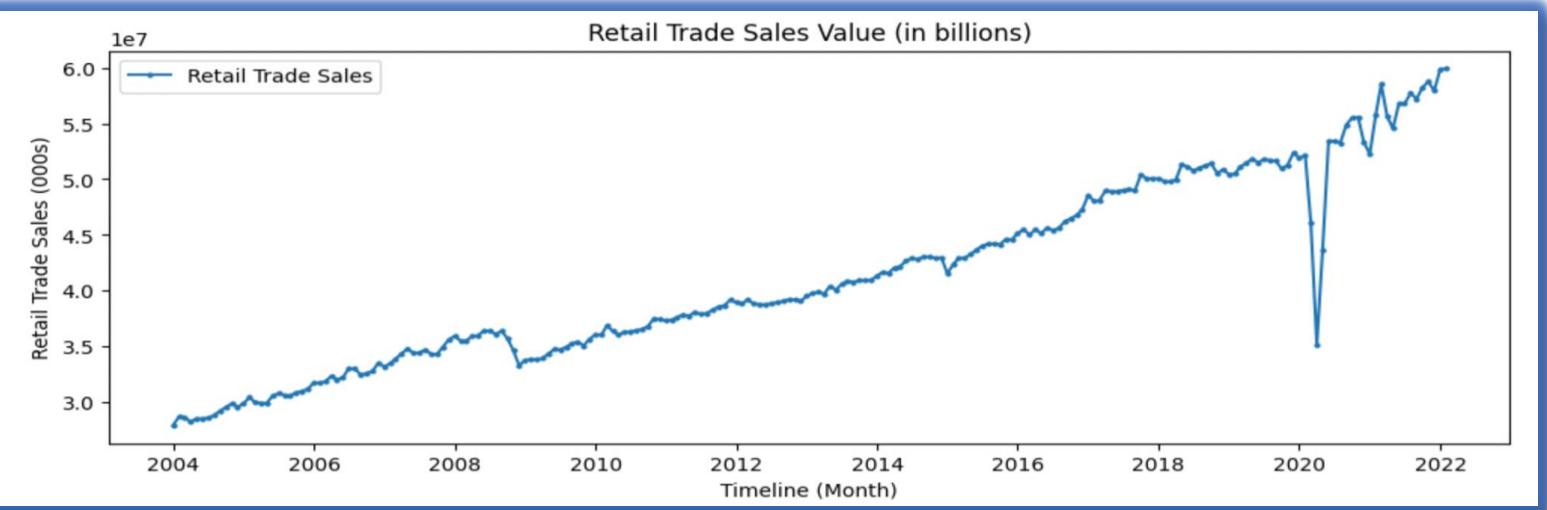
Image : <https://www.searchenginejournal.com/google-trends-seo/226809/>

## Google Trends of keyword ‘recession’

- ❖ Available in real time
- ❖ Search behaviors can be informative
- ❖ Can capture the economic activity



Macroeconomic indicator – Retail trade sales



# Why Nowcasting and not Forecasting

*Today's Google Trends may help to predict today but may  
not tomorrow*

*In other words, PREDICTING PRESENT!!*



Image : <http://clipart-library.com/clip-art/stick-person-transparent-background-23.htm>

# Project Goal:

To Nowcast

- ✓ GDP
- ✓ Retail Trade Sales
- ✓ E – Commerce Sales

Using Google Trends



Image : <https://www.vectorstock.com/royalty-free-vector/colorful-3d-background-statistics-template-growth-vector-1974965>

# Description of Data



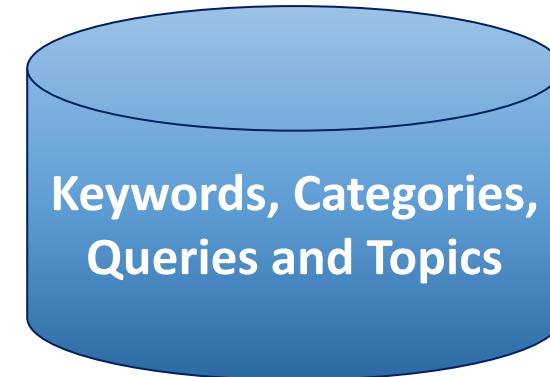
Statistics Canada



.CSV files



Google Trends using `pytrends`



Keywords, Categories,  
Queries and Topics

Response variable



Predictors

## Statistics Canada Data

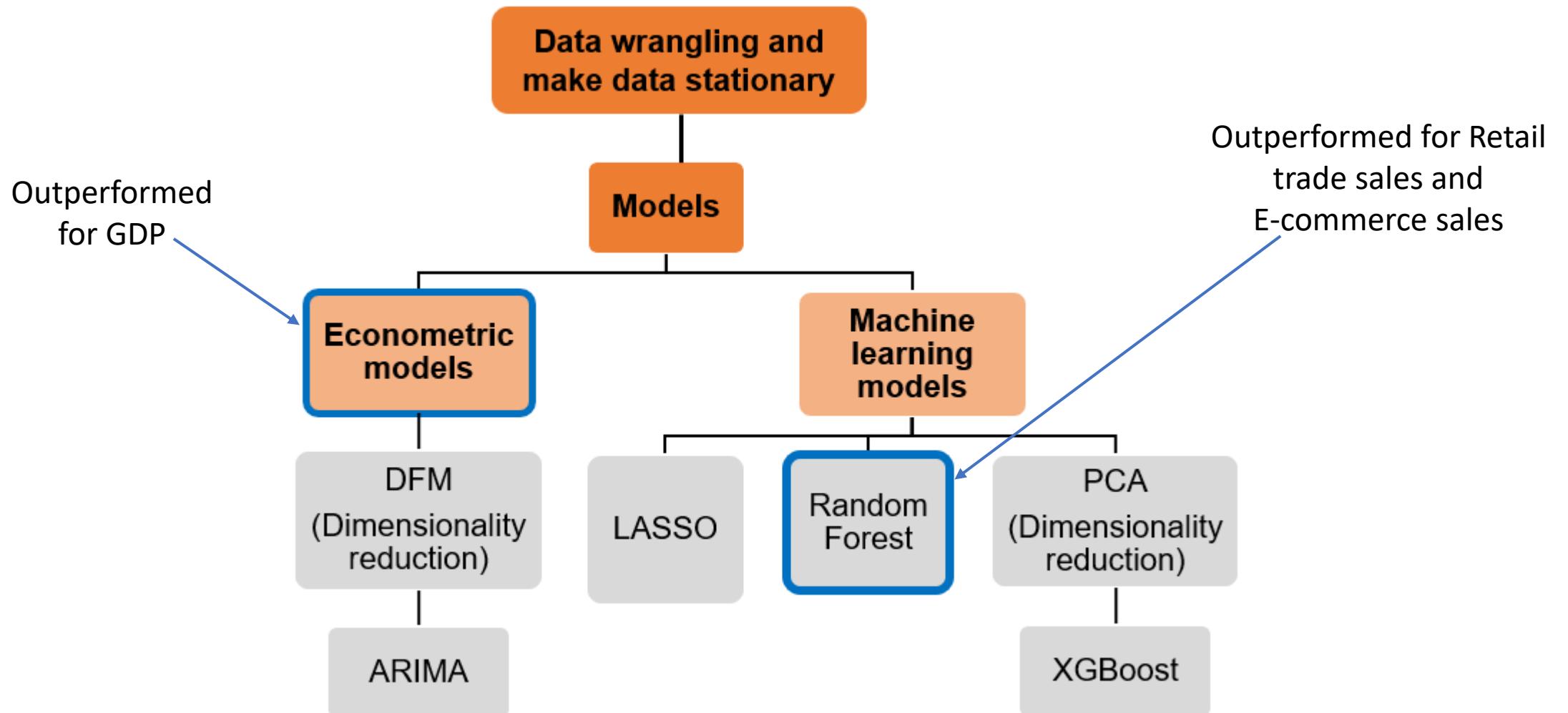
Economic Indicator	Timeline	Frequency
Retail trade sales	1991-2022	Monthly
E-commerce sales	2016-2022	Monthly
GDP	1961-2021	Quarterly

## Selected Data for Analysis

Economic Indicator	Timeline	Frequency	Num. of observations	Num. of predictors (trends)
Retail trade sales	2004-2022	Monthly	217	396
E-commerce sales	2016-2022	Monthly	74	31
GDP	2004-2022	Quarterly	72	446

# METHODOLOGY

Image : [https://www.123rf.com/photo\\_54129389\\_methodology-concept-business-man-with-hand-pressing-a-button-on-blurred-abstract-background.html](https://www.123rf.com/photo_54129389_methodology-concept-business-man-with-hand-pressing-a-button-on-blurred-abstract-background.html)



ARIMA - Autoregressive Integrated Moving Average,

DFM - Dynamic Factor Model, LASSO - Least Absolute Shrinkage and Selection Operator, PCA - Principal Component Analysis



# Stationary Time Series



Normalized data

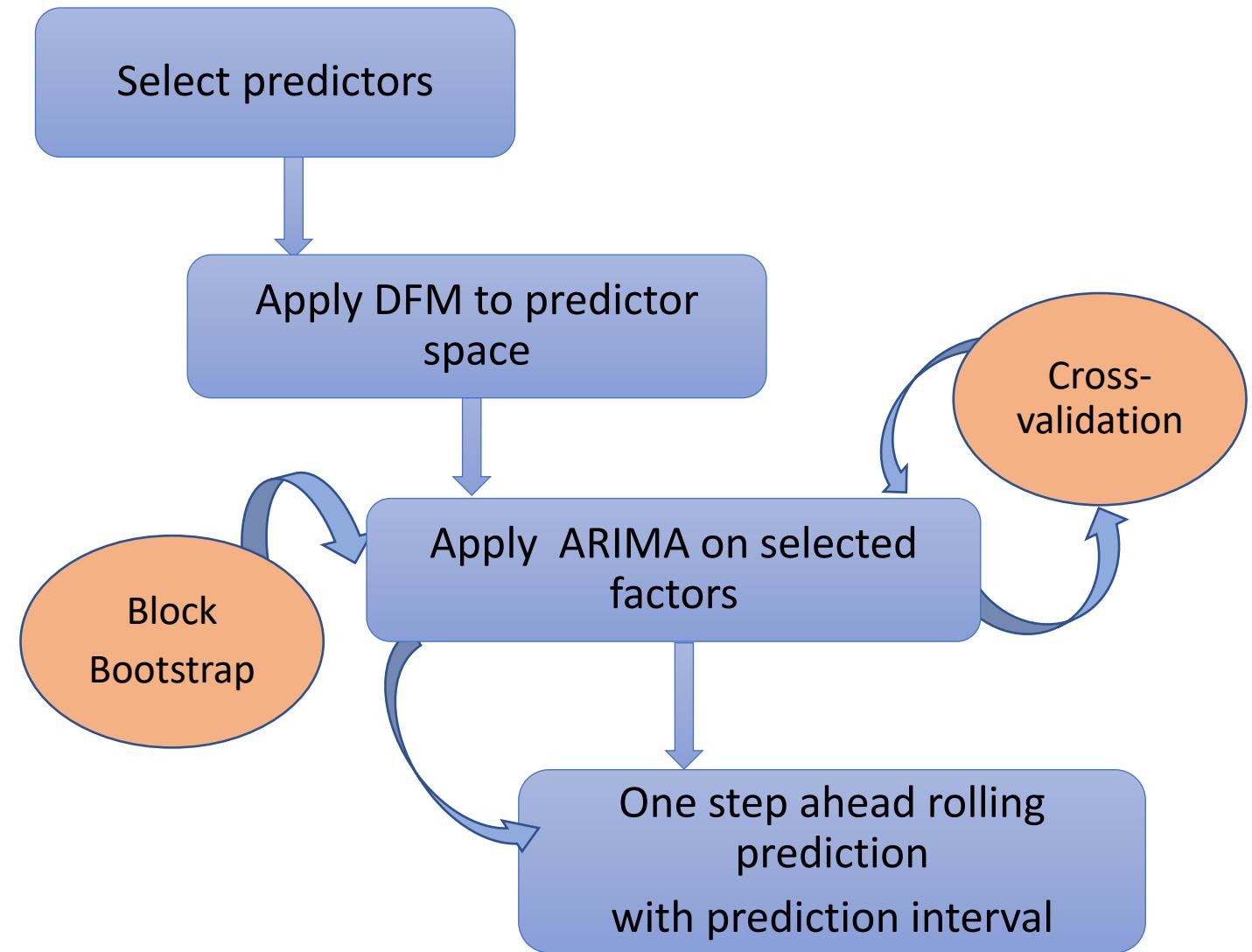


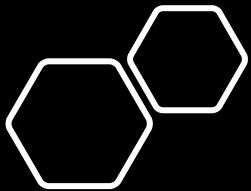
Removed trend



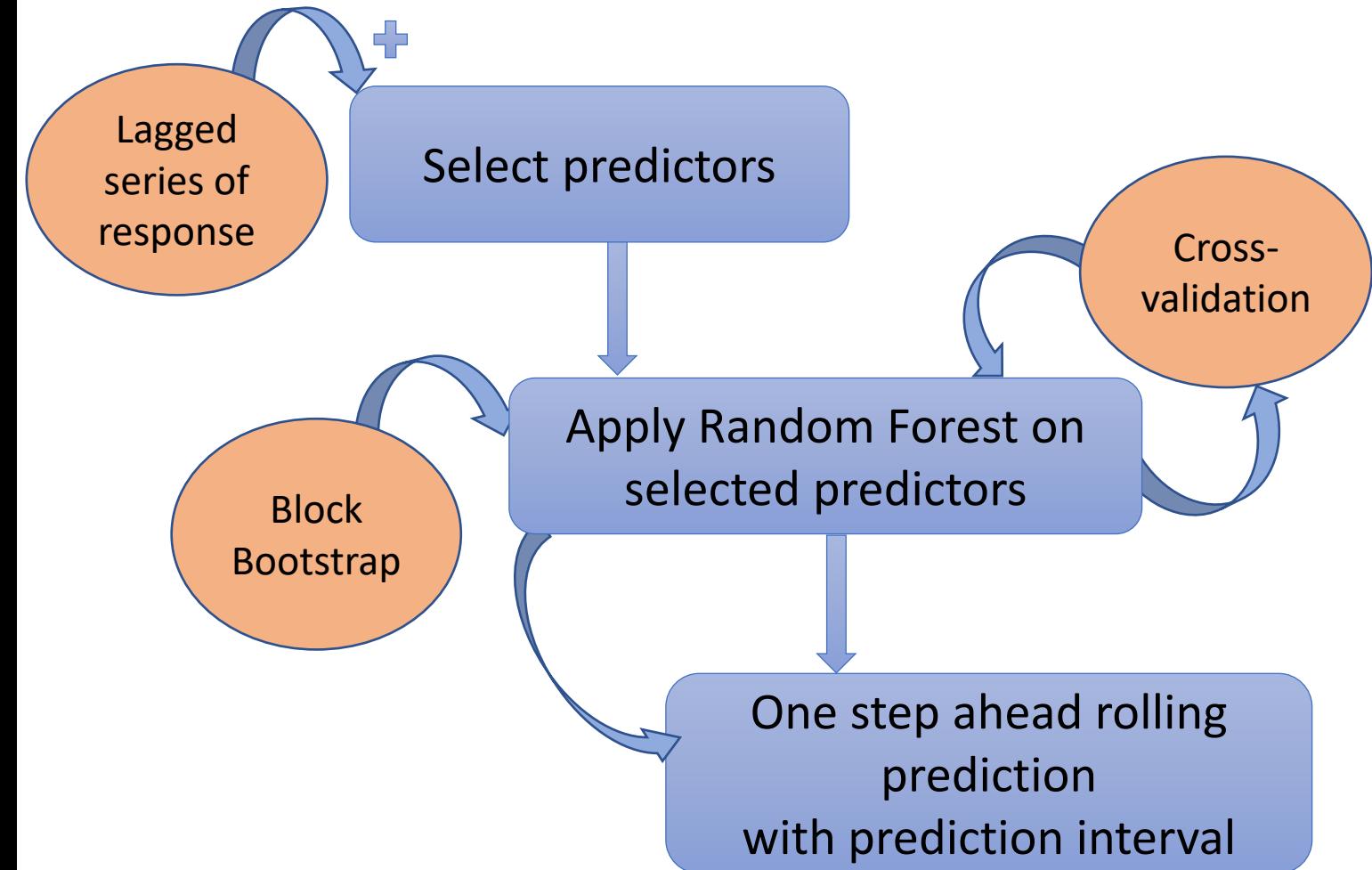
Removed seasonality

# Econometric Model- GDP





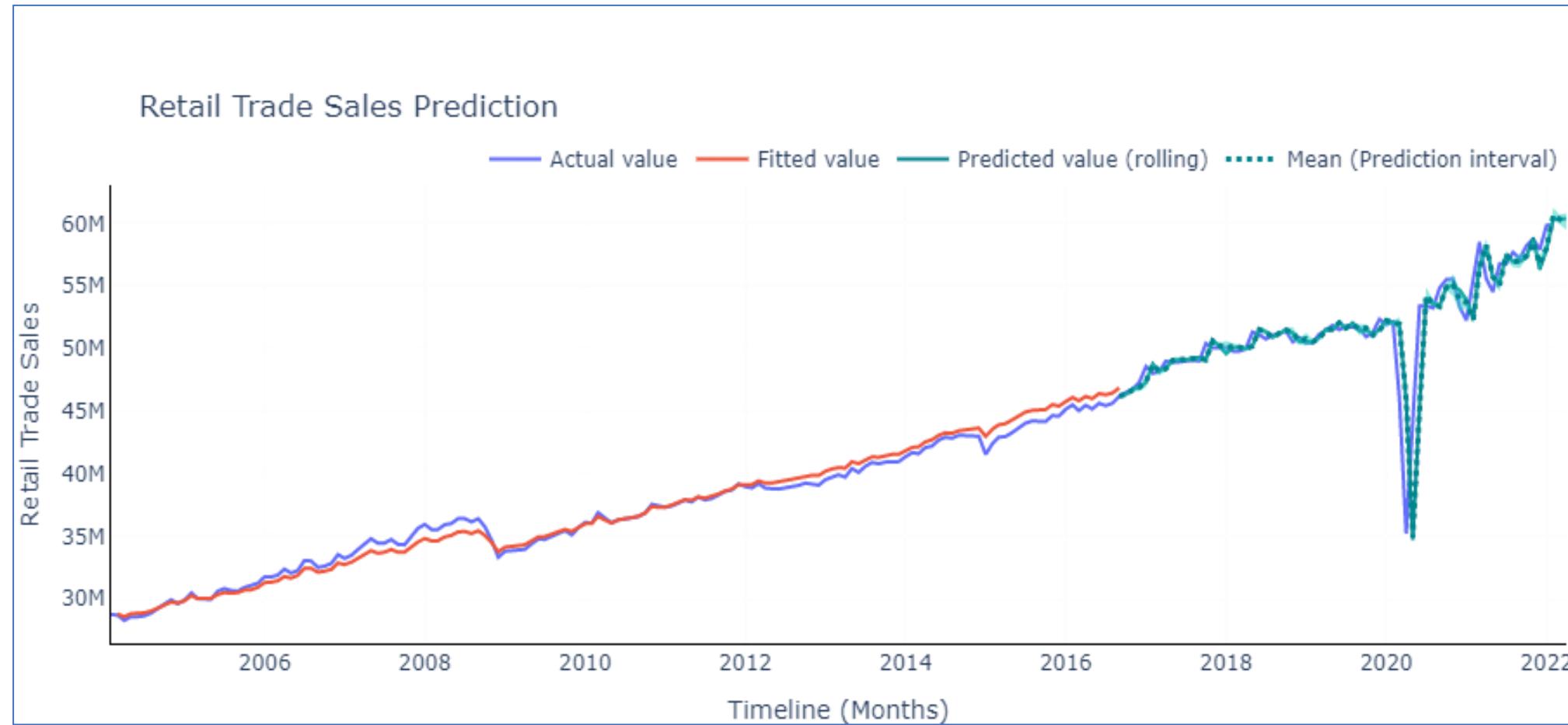
# Machine Learning Model- Retail Trade Sales and E – Commerce Sales



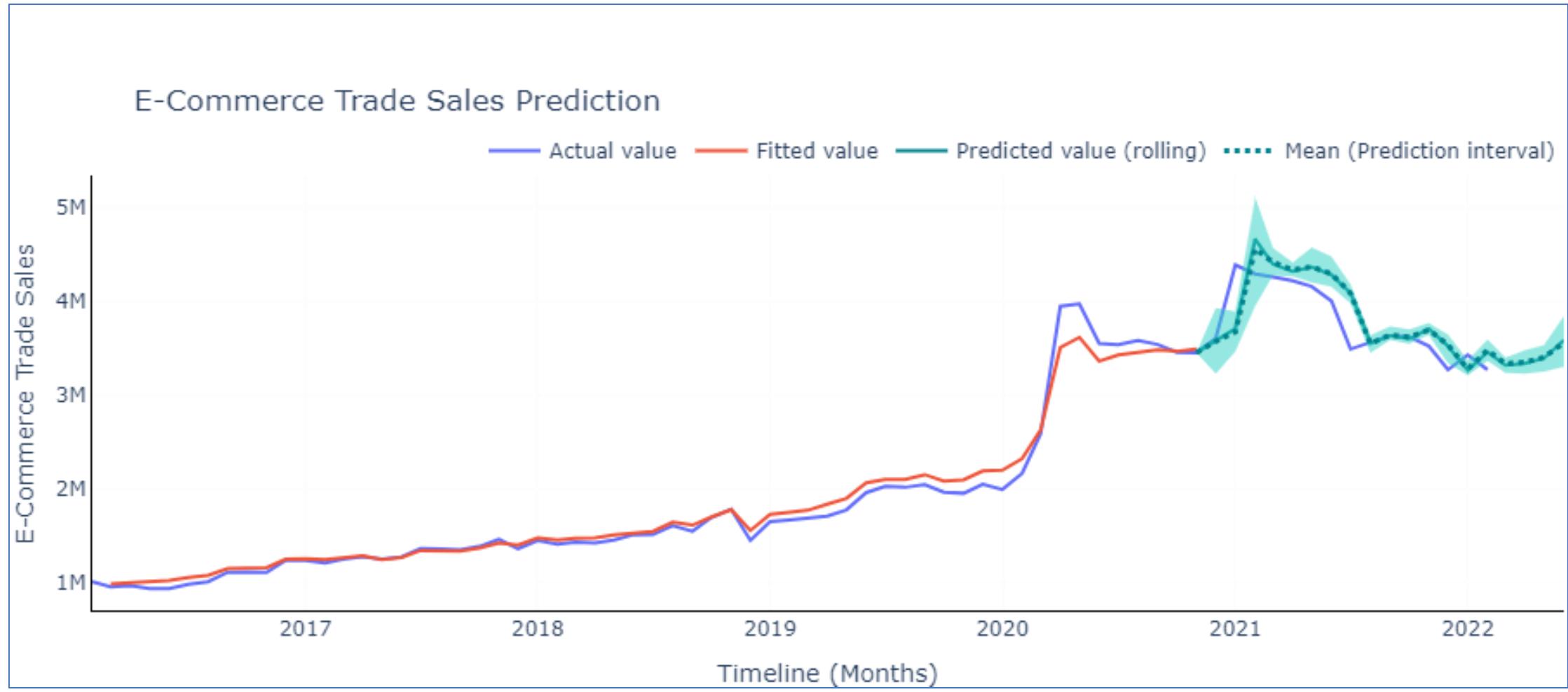
# ANALYSIS AND INTERPRETATION



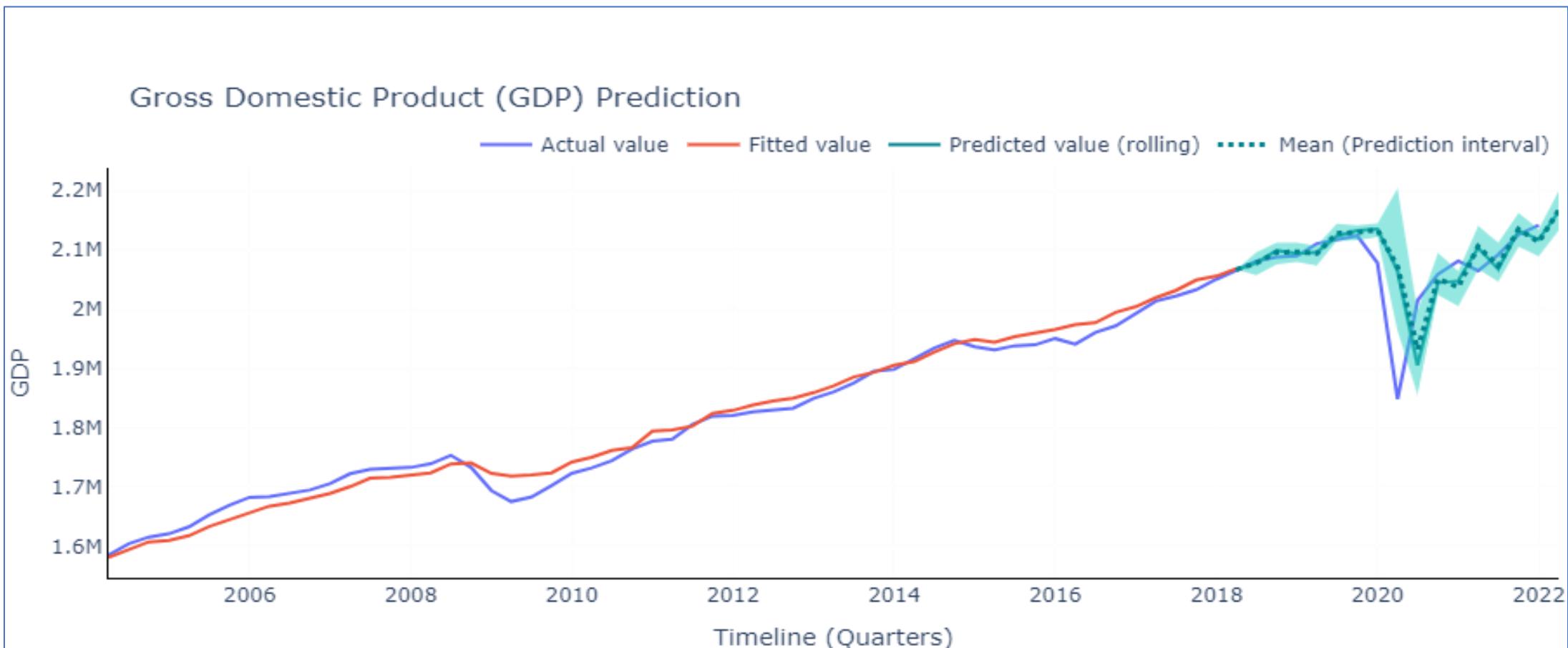
# Retail Trade Sales Value Prediction (x 1,000)



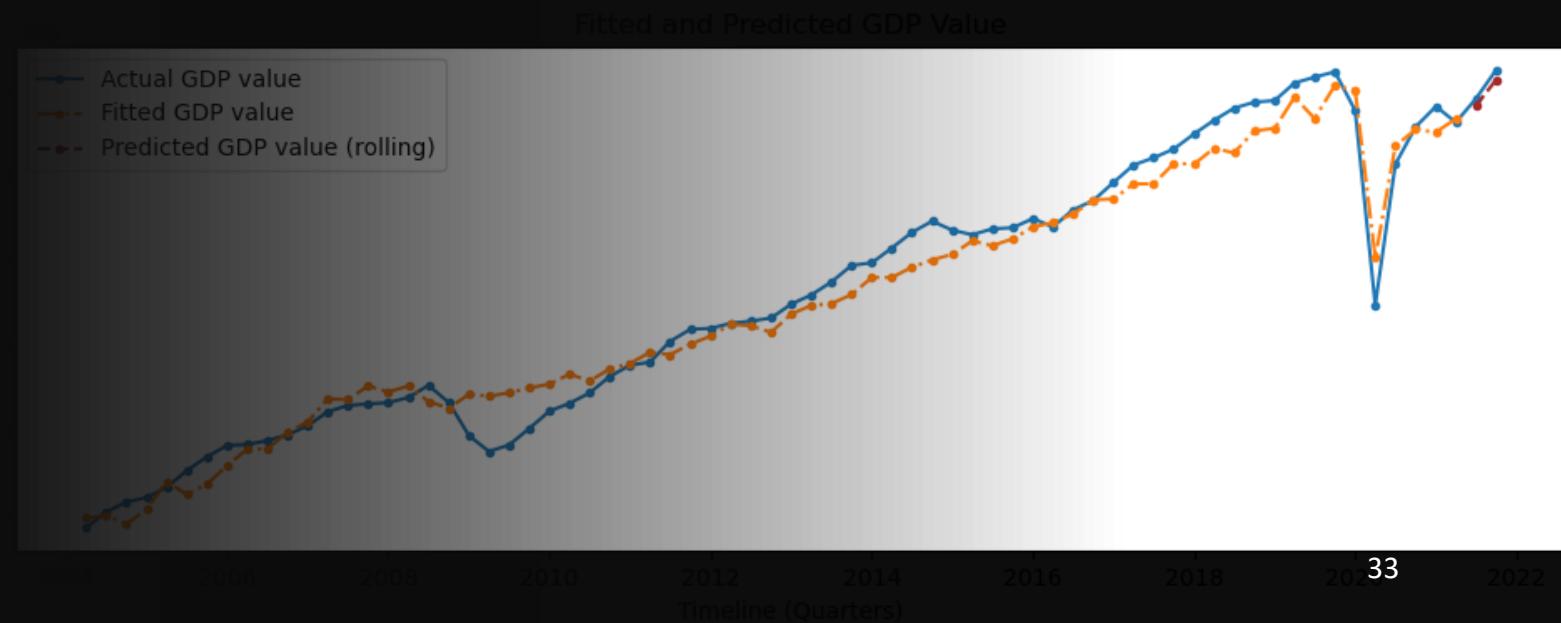
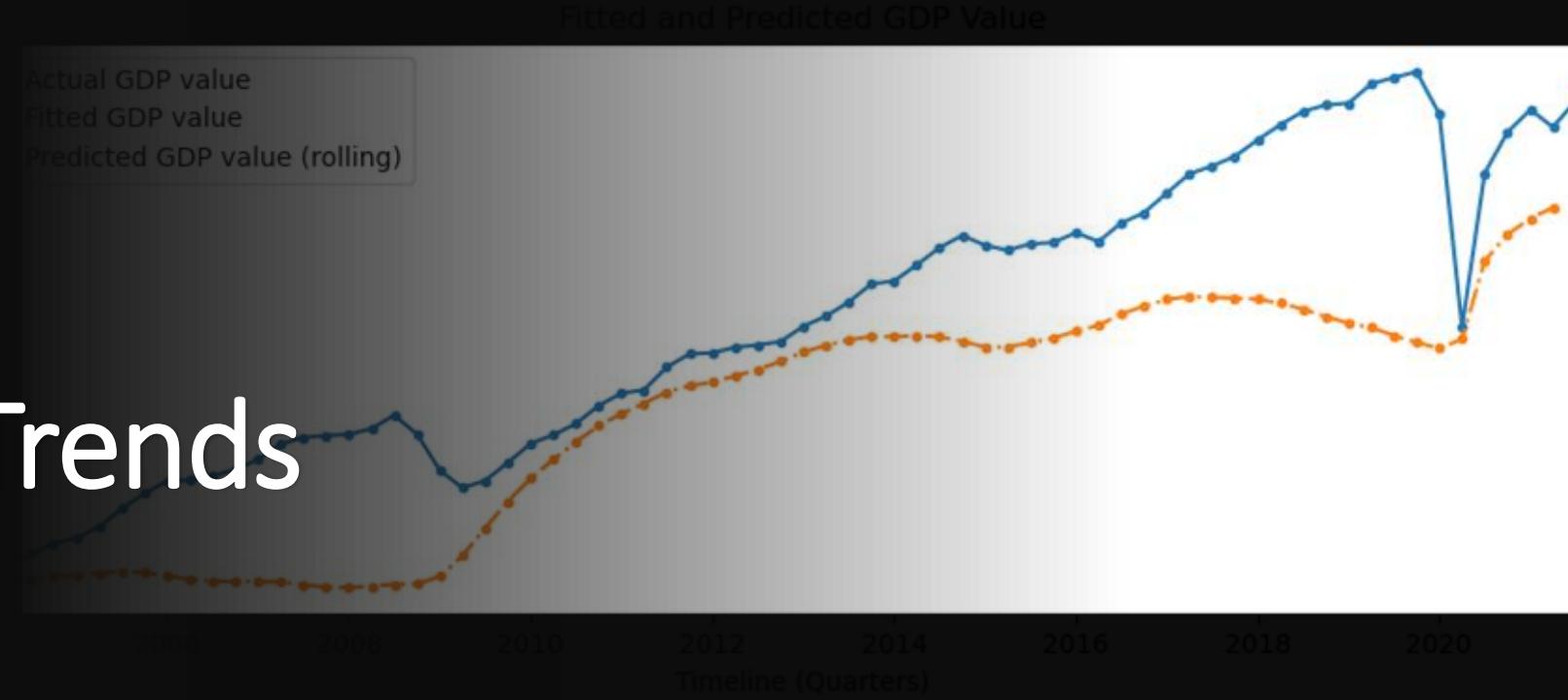
# E – Commerce Sales Value Prediction (x 1,000)



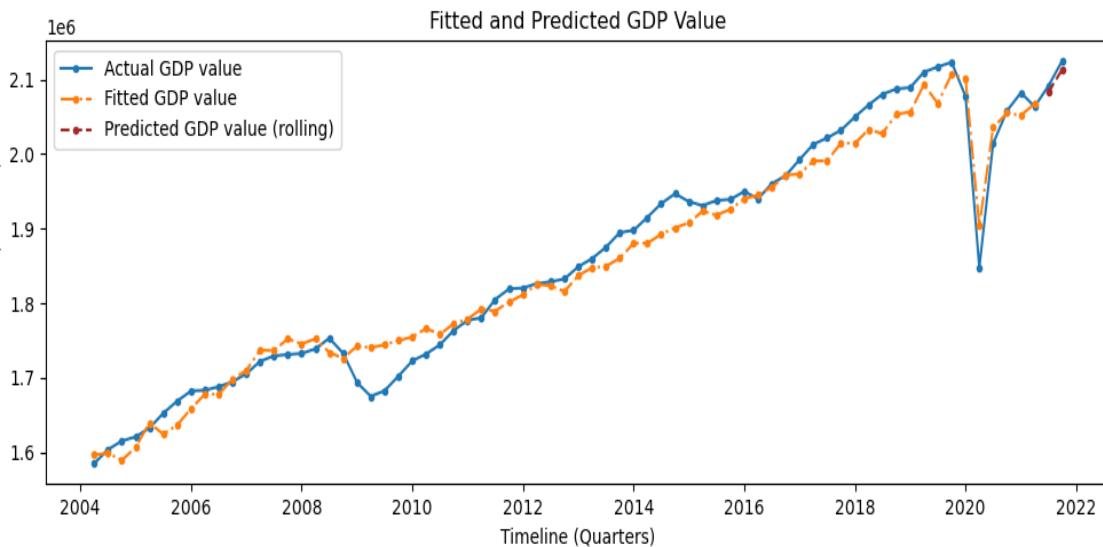
# GDP Value Prediction (x 1,000,000)



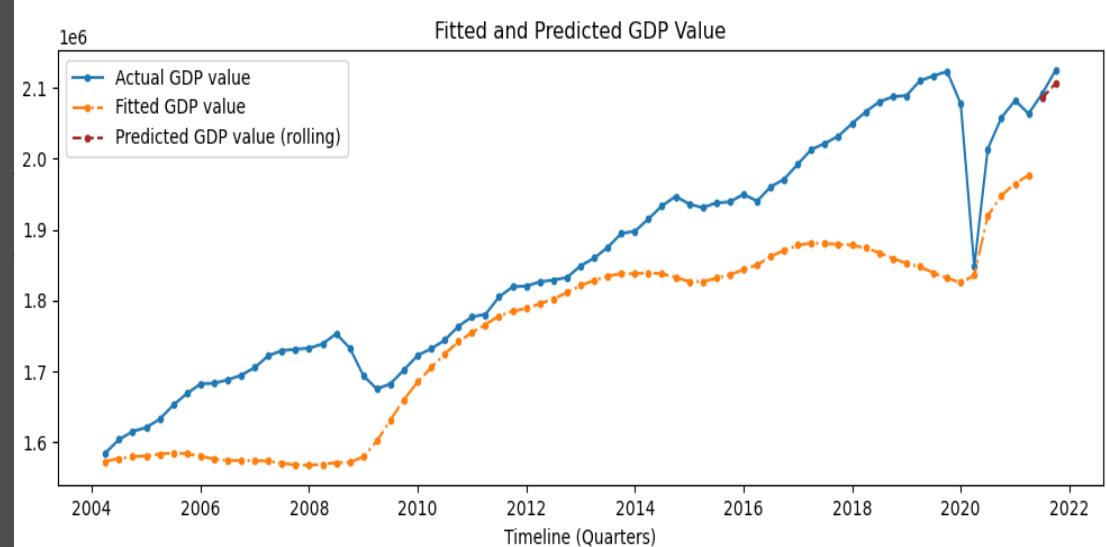
# Does Google Trends really help?



# Model fit using Google Trends



# Model fit without using Google Trends



<b>INDICATORS</b>	<b>TIMELINE</b>	<b>PREDICTED VALUE</b>	<b>STATISTICS CANADA</b>
Gross Domestic Product (x 1,000,000)	Jan - 2022	2,116,718	2,140,751
	April - 2022	2,163,537	-
Retail Trade Sales (x 1,000)	March - 2022	60,305,994	60,093,050
	April - 2022	60,411,554	-
E – Commerce Sales (x 1,000)	March - 2022	3,315,434	3,034,992
	April - 2022	3,333,537	-

# DASHBOARD

<https://nowcasting-indicators-canada.herokuapp.com/>

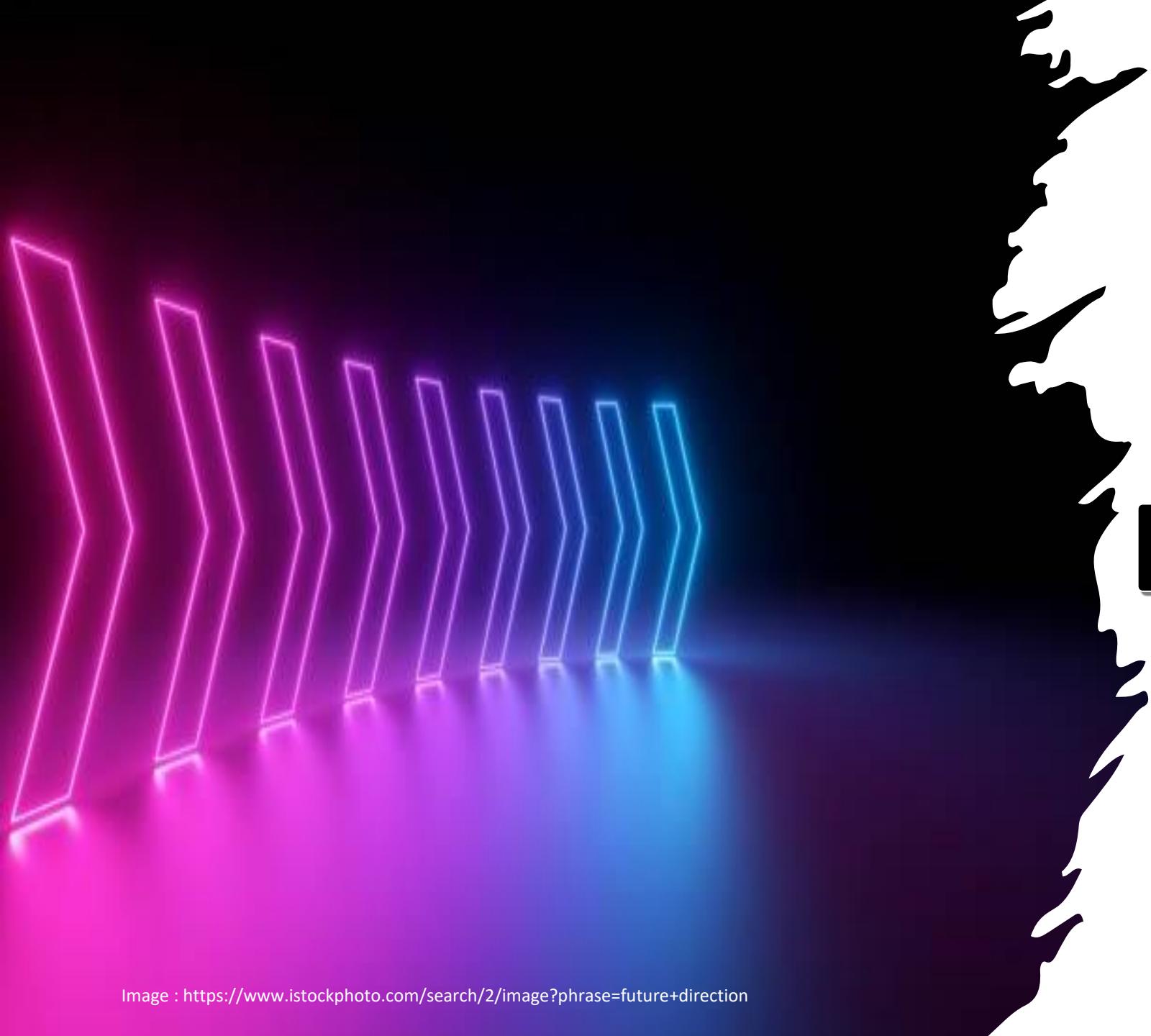
# CONCLUSION



- Keywords capture behavior of economic activity
- Google trends are informative in nowcasting
- Nowcasted indicators assist in policy making for government of Canada.



Image : <https://stock.adobe.com/ca/search?k=%22statistics+background%22>



# **FUTURE DIRECTIONS**

- Nowcast the macro-economic indicators at granular level
- Research for more keywords or categories to increase accuracy of models
- Add more components to the Dashboard



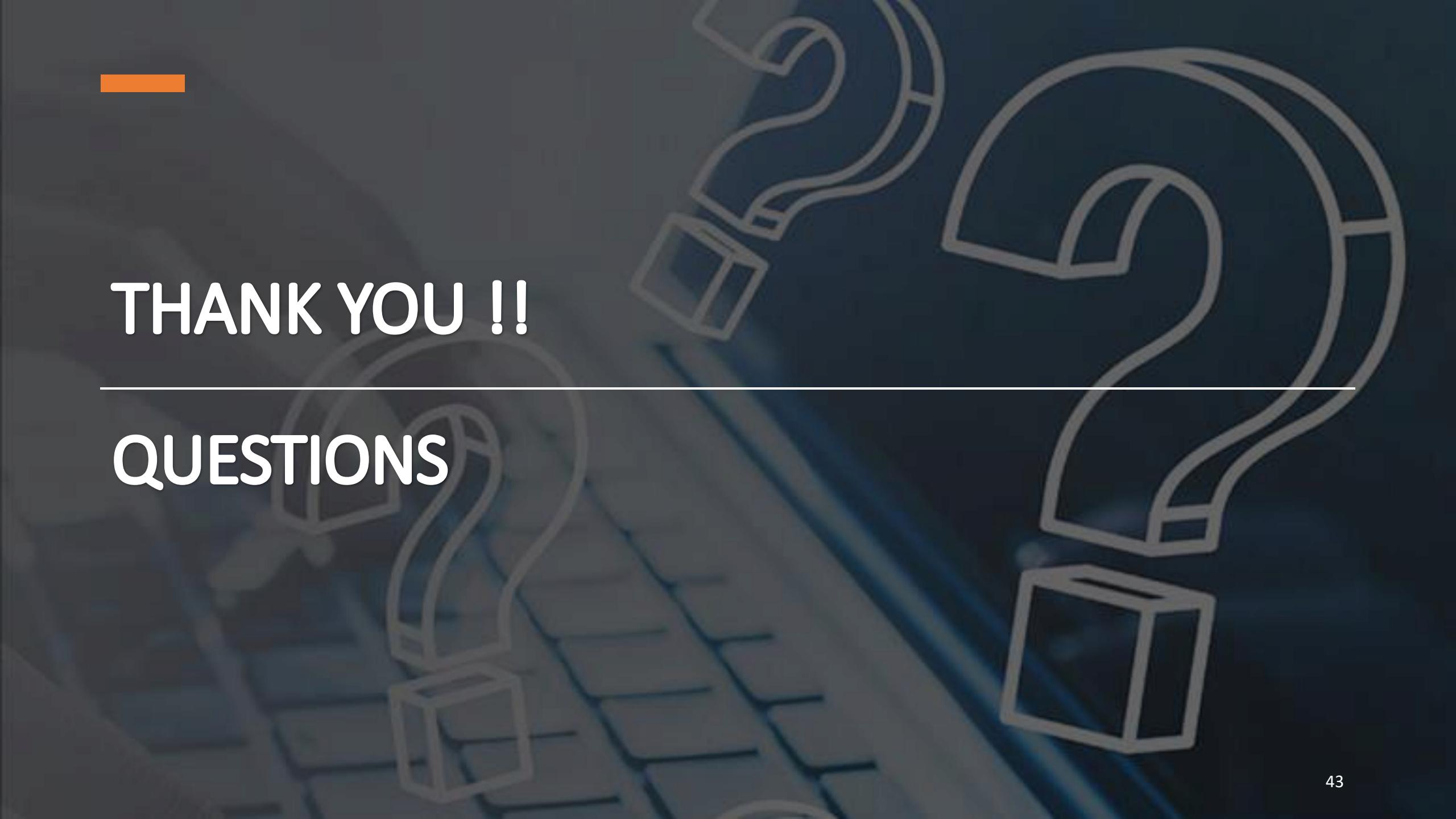
**Nick Newstead**  
**Marina Smailes**  
Statistics Canada

**Prof. Irene Vrbik**  
**Prof. Firas Moosvi**  
UBCO



# References

1. H. Choi, H. Varian, **Predicting the present with Google Trends**, *Economic record*, 88 (2012), 2-9.
2. Stock, J.H. and Watson, M.W., 2016. **Dynamic factor models, factor-augmented vector autoregressions, and structural vector autoregressions in macroeconomics**. In *Handbook of macroeconomics* (Vol. 2, pp. 415-525). Elsevier.
3. Woloszko, N. (2020). **Tracking activity in real time with Google Trends**, OECD Economics Department Working Papers, No. 1634, OECD Publishing, Paris.
4. Dauphin, M.J.F., Dybczak, M.K., Maneely, M., Sanjani, M.T., Suphaphiphat, M.N., Wang, Y. and Zhang, H., 2022. **Nowcasting GDP-A Scalable Approach Using DFM, Machine Learning and Novel Data, Applied to European Economies**. International Monetary Fund.
5. Richardson, A., van Florenstein Mulder, T. and Vehbi, T., 2021. **Nowcasting GDP using machine-learning algorithms: A real-time assessment**. *International Journal of Forecasting*, 37(2), pp.941-948.
6. Logo source: [UBC Logo](#), [Statistics Canada](#), [Google Trends](#)



THANK YOU !!

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QUESTIONS