

Firmin Ayivodji

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Dissertation Committee and References

Professor Benoit Perron (**Chair**)
University of Montreal
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Professor Marine Carrasco
University of Montreal
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Professor Christopher Rauh
University of Cambridge
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Research Interests

Primary: Econometrics, Macroeconometrics, Big Data, Machine Learning/NLP, Causal Inference.

Secondary: Climate Finance, Real Estate, Housing Economics, Household Finance, ESG Investing.

Education

2017-present: PhD Candidate in Economics and Data Science, University of Montreal (UdeM), Canada.

2014–2017: MSc in Statistics and Economics, Ecole Nationale de la Statistique et de l'Analyse Economique (ENSAE), Senegal.

2010–2013: BSc in Statistics, Ecole Nationale d'Economie Appliquée et de Management (ENEAM), Benin.

Working Papers

1. *"High-Frequency Inflation Expectations from Big Data: A Natural Language Approach"* (**JMP**).
2. *"Identification and Estimation of Common Factors in Group Factor Models"*.
3. *"Can Media Narratives Predict House Price Movements?"*, with Christopher Rauh.
4. *"Regional and Sectoral News-Based Indicators for Macroeconomic Forecasting"*.
5. *"Food Security and the COVID-19 Employment Shock in Nigeria: Any Ex-Ante Mitigating Effects of Past Remittances?"*, with Al-mouksit Akim and Jeffrey Kouton (**R&R at Food Policy**).
6. *"Economic Government Support and the COVID-19 Lockdown-Compliance in Africa"*, with Al-mouksit Akim and Marius Amba.

Work in Progress

1. *"Next-Generation Agent-Based Model of Canada: DSGE Models in a Data-Rich Environment"*, with Sacha Gelfer, Wenting Song, and Bank of Canada.
2. *"Monetary Policy Narratives and House Price Expectations"*, with Juste Djabakou.
3. *"Deep Dynamic Factor Models in a Data-Rich Environment"*.

Research Grants, Scholarships, & Fellowships

2022: First International Workshop on Interactive Causal Learning, Travel grant.

2022: IVADO/Fin-ML, Mitacs, and Borealis AI Fellowship (declined).

2022: Canadian Economics Association, Travel grant.

2021: International Monetary Fund (IMF), Summer Fellowship.

2020-2023: FRQSC - Doctoral Research Scholarships, Econometrics and Artificial Intelligence.

2017-2023: PhD Fellowship of CIREQ and Department of Economics, University of Montreal.

Teaching and Academic Experience

Instructor, University of Montreal (UdeM)

- Econometrics I, undergraduate, Winter (2023).
- Econometrics II, undergraduate, Winter (2020).

Instructor, Ecole Nationale de la Statistique et de l'Analyse Economique (ENSAE)

- Big Data, Machine Learning and Econometrics, Graduate, Guest speaker, Fall (2021).
- Econometrics of Panel Data and Quantile Regression, Guest speaker, Winter (2016).

Teaching Assistant, University of Montreal (UdeM)

- Econometrics Master's, Fall (2021), Fall (2020), Fall (2019).
- Macroeconometrics Master's, Winter (2021).
- Econometrics II, undergraduate, Winter (2022), Fall (2021), Winter (2021).
- Introduction to Macroeconomics, undergraduate, Fall (2019).
- Principles of Economics, undergraduate, Summer (2022), Summer (2021).

Research and Work Experience

July 2023 – present: **Research Economist, Bank of Canada**, Model Development Division, Canada

April – June 2023: **Research Economist, Observatoire de la Francophonie Économique**, Canada

March – May 2023: **AI Research Scientist, PMGS Inc.**, Canada

October 2022 – February 2023: **Lead Advisor - AI Scientist, AI Global Pros Inc.**, Canada

October 2021 – October 2022: **Research Assistant** for Prof. **Karim Chalak**, UdeM, Canada

June – August 2021: **PhD Intern, International Monetary Fund (IMF)**, Strategy, Policy, and Review Department, Washington, US

November 2020 – January 2021: **Research Assistant** at **Observatoire de la Francophonie Économique**, Montreal, Canada

January 2018 – September 2019: **Economic Researcher** at **Macroeconomics, Trade and Investment (MTI) Global Practice**, World Bank, Washington, USA

August 2018 – August 2019: **Research Assistant** for Prof. **Christopher Rauh**, UdeM, Canada

August – October 2016: **Research Officer, International Monetary Fund (IMF)**, Dakar, Senegal

May 2015: **Data Scientist Intern, ENSAE-United Nations Industrial Development Organization (UNIDO) Cooperation**, Dakar, Senegal

August – November 2013: **Data Scientist Intern, Direction of Forecasting and Business Cycle**, Benin

Seminar and Conference Presentations (* scheduled)

2023:

NBER-NSF Time Series Conference (poster session); 17th International Conference on Computational and Financial Econometrics*; 57th Annual Meetings of the Canadian Economics Association; Bank of Canada Brown Bag Seminar*; Recent Developments in Econometrics, CIREQ; Department of Mathematics and Statistics (UdeM); Concordia University*; Desautels McGill University*; HEC Montreal; UdeM Macroeconomic Brown Bag; 3rd GREDI/CREATE/CIREQ PhD Student Research Workshop; 1st CIREQ Interdisciplinary Conference on Big Data and Artificial Intelligence; 62th Congress - Société Canadienne de Science Économique; 18th CIREQ PhD Students' Conference.

2022:

6th Annual Toronto Machine Learning Summit (TMLs); IVADO Digital October; CIREQ Montreal Econometrics Conference in Honor of Eric Renault (poster session); 56th Annual Meetings of the Canadian Economics Association; 61st Congress of the Canadian Society of Economic Sciences; 17th CIREQ PhD Students' Conference.

Conference Organization:

- Co-organizer of 1st CIREQ Interdisciplinary Conference on Big Data and Artificial Intelligence, 2023.
- Volunteer of 61st congrès annuel Société Canadienne de Science Économique (SCSE), 2022.
- Volunteer of International Association for Applied Econometrics (IAAE) Annual Conference, 2018.

Skills and Languages

Programming: Python, MATLAB, STATA, Dynare, R, SAS, Julia, Git, ArcGIS, VBA, \LaTeX .

Languages: English (proficiency), French (native).

Summary of working papers

High-Frequency Inflation Expectations from Big Data: A Natural Language Approach (JMP)

In this study, we leverage cutting-edge textual analysis and machine learning methods on a comprehensive dataset of more than 2 million newspaper articles and 40 million tweets across Canadian provinces to build novel high-frequency and real-time indicators of consumer inflation expectations at both the national and subnational levels. To achieve this, we first identify news articles and tweets related to inflation or prices. Additionally, we apply deep learning methods to extract information specifically related to future price dynamics. Then, we construct daily measures of text-based inflation expectations as the difference between the number of news articles or tweets about inflation and the number of tweets about deflation. Our findings indicate a high correlation between the resulting text-based inflation expectations indices with consumers' survey-based inflation expectations and official inflation data. Subsequently, we use a mixed-frequency machine learning approach to generate nowcasts/forecasts of quarterly inflation expectations based on large sets of text indicators and Google Trends search volume data for inflation-related terms. The results demonstrate that news and social media data contain valuable information regarding inflation dynamics, and our newly developed indicators effectively anticipate consumer expectations. The paper also illustrates how the use of SHAP values can help open the "black box" of nonlinear models and facilitate semi-structural analysis. The findings suggest that newspaper and social media data can serve as a timely source for market participants and policymakers to elicit beliefs on inflation or future price dynamics.

Identification and Estimation of Common Factors in Group Factor Models

This paper examines the comovement among factors extracted from two distinct large panels (or groups) of variables. We show that estimating factors introduces a bias in the estimated correlation between factors, which becomes negligible if the factors are estimated from panel data sets containing a large number of cross-sectional series. We show that a modified version of the wild bootstrap algorithm proposed by Gonçalves and Perron (2014) can correct the bias and provide reliable inference on the correlation of interest. Additionally, we apply our modified wild bootstrap method to analyze the influence of institutional factors on economic growth, as examined in Deniz et al. (2018), and the degree of synchronization of business cycles in developed and emerging economies, as explored in Kose et al. (2013) and Aastveit et al. (2015).

Can Media Narratives Predict House Price Movements?, with [Christopher Rauh](#)

Housing forms a large share of wealth for many households and the housing market functions as a barometer reflecting the prevailing macroeconomic conditions. In this paper, we investigate whether information from Canadian local newspaper articles about housing market narratives could improve local housing price predictions. We build separate future and past topic indexes to capture prior and posterior media narratives about the housing market. We use the mixed-frequency machine learning approach to generate a sequence of nowcasts/forecasts of quarterly housing prices based on a vast local newspaper corpus related to the housing market. The predictions are based on linear models estimated via the LASSO, Ridge, and Elastic net, nonlinear models based on Random Forests, Extreme Gradient Boosting, and Artificial Neural Networks, and ensembles of linear and nonlinear models. The results indicate that news data contain valuable information about the housing market's direction. Finally, we identify the economic drivers of our machine learning models by applying a novel framework based on SHAP values, uncovering nonlinear relationships between the predictors and house prices.